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Editorial introduction

Voice(s) – An Introduction

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Abstract
In this collection of papers on voice(s), the relationship between voice and technology comes to the fore especially in regard to art and aesthetic practice. Special attention is paid to "mute" objects which acquire a voice through technical intermediaries (microphone, synthesizer, tactile sensors, sound recording archives). These mute or inert objects include puppets, buildings (lost places), textiles, silent movies, or smart homes. In this context, the voice appears not as a static attribute of the subject, but as a procedural formation or emergent effect of the interaction of material forces, discursive practices, and technological environments. This special issue contributes to the media archeology of sound, critical media theory, and posthumanist studies of subjectivity, demonstrating that voice acts as a nodal element in the reassembly of social and aesthetic experience not only in the digital age. The presented cases cover a broad spectrum from the mechanicism of the Russian avant-garde to modern neural network synthesizers, from propaganda radio to decolonial textile sound systems, from microphones that afford authenticity to the technically advanved gusli that upholds musical heritage. All this allows us to formulate new research questions about the nature of acoustic materiality and the politics of audibility in techno-cultural landscapes.

Keywords: Voice; Sonification; Silent Movies; Microphone Technology; Avantgarde aesthetics; Sound materiality

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Редакторская заметка

Голос(а) – Введение

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Аннотация
В данном выпуске, посвященных голосу, на первый план выходит взаимосвязь между голосом и технологиями, особенно в области искусства и эстетической практики. Особое внимание уделяется “немым” объектам, которые приобретают голос с помощью технических средств (микрофона, синтезатора, тактильных датчиков, архивов звукозаписей). К таким немым или инертным объектам относятся куклы, здания (затерянные места), текстиль, немые фильмы или умные дома. В этом контексте голос предстает не как статичный атрибут субъекта, а как процессуальное образование или эмерджентный эффект взаимодействия материальных сил, дискурсивных практик и технологической среды. Этот специальный выпуск посвящен медиа-археологии звука, критической теории медиа и постгуманистическим исследованиям субъективности, демонстрируя, что голос выступает ключевым элементом в воссоздании социального и эстетического опыта не только в цифровую эпоху. Представленные кейсы охватывают широкий спектр - от механицизма русского авангарда до современных нейросетевых синтезаторов, от пропагандистского радио до деколониальных текстильных звуковых систем, от микрофонов, обеспечивающих аутентичность, до технически совершенных гуслей, сохраняющих музыкальное наследие. Все это позволяет нам сформулировать новые исследовательские вопросы о природе акустической материальности и политике слышимости в технокультурных ландшафтах.

Ключевые слова: Голос; Сонификация; Немое кино; Микрофонные технологии; Авангардная эстетика; Звуковая материальность

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Voice(s) matter. They are not merely meaningless, fleeting background noise (all "smoke and mirrors") compared to the true nature of ideas, to written knowledge, or material objects.

The written language and its associated technologies such as pen and paper, printing press, typewriter and word processing are attracting a great deal of attention. But language is voiced in poetry and prose, in conversation and song, at the lectern and on stage, in cries of pain and moans of pleasure. To find and have a voice is fundamental to human existence, requiring technologies of the self but also coaching or speech-therapy.

To have one's voice heard is fundamental to human sociability, it is a matter not just of politics but also of microphones and media platforms. And yet the technologies of voice reach even more deeply into our daily lives. On the one hand, voices themselves are tunable instruments that can be used strategically. On the other hand, voices have always been subject to technical change, not only now in the age of AI when the human voice might be displaced. After the initial shock of the disembodied recorded voice, the question of voice became controversial when „talkies" put an end to silent movies: Are the silent movies not eloquent as well, and do mute people and things not have a voice?

There is yet another, a third dimension when one considers that human and machinic voices serve as an interface to technology: We are interrogated by devices and speak to them. There is, for example, the echo in its ancient and modern guise: Through sonification in science, technology, and art, we can interact with material constellations of otherwise inert things. Indeed, the birth of humanity itself has been associated with the evolutionary origins of voice production that gave rise to language and technology at once.

In this collection of papers on voice(s), the relationship between voice and technology comes to the fore especially in regard to art and aesthetic practice.

The first of altogether 11 papers concerns *The Puppet's Voice: From Mechanical Mimesis to Algorithmic Interface* (Markov and Shtayn, 2026). It examines the technological ontology of the voice in light of a history that ranges from ancient automatons to virtual voice assistants using the lead example of the puppet voice: A hybrid being is created that challenges establisged distinctions such as the one between living or animate and dead or inert things.

Compositional practice tends to the acoustic, material, and historical conditions of a specific place – such as a towering air-raid bunker – in *Concrete Structure, Fragile Voice*. This paper reflects on the archaeology of bunkers and the techniques required to unearth layers of experience and reference from a seemingly mute building. In the paper, the composer Arne Gieshoff (2026) describes the research and compositional work that led to the musical performance which reanimated a seemingly fossilized structure.

Dmitry Kukushkin and Sergei Kurakov move on to consider a specific musical instrument as mediator between past, present, and future. Their paper considers the cultural meaning that is transported by the gusli and that was transformed by a contemporary staging of *The Tale of Igor's Campaign*. Paradoxically, perhaps, the paper shows that technical innovations may be necessary to sustain the voice as a carrier of cultural memory (Kukushkin & Kurakov, 2026)

Maria José Rios‘s *Decolonial Voices* exhibits the potential of Textile Computation to create relational sound systems and emergent acoustic fields. Sound is created by touch. The modulation of the hand is registered by sensors during physical interactions, i.e., by way of touching. Such transformations of voice as a co-emergent phenomenon lead to a critical re-evaluation of textile practices in the field of media archaeology and decolonial theory (Rios, 2026).

Zero and the Machine by Alexander Markov and Anna Sosnovskaya considers the metaphysics of the mechanical voice in the Russian avant-garde. The paper confronts Jacques Derrida's philosophy of the voice with the artistic practice and the texts of Kazimir Malevich and Daniil Kharms. From the loss of authenticity through the grammophone’s mechanical voice arises new creative potential. namely a prophetic concept for the age of artificial intelligence and synthetic language (Markov & Sosnovskaya, 2026).

The focus then shifts to the implicitly transformative, even revolutionary potential of the works by Wassilij Kandinsky, Alvar Aalto, and Sergei Filatov (Erofeeva, 2026). The shift from pictorial elements to the emergence of sound in space brings to the fore what Olga Erofeeva terms the „voice of matter“ and its corresponding practices. These practices constitute a procedural system in which material, technology, and environment begin to participate in the processes of formation and organization of perception.

Quite another dimension of the Soviet Avantgarde concerned the use of radio and the microphone for propaganda, persuasion, and social solidarity. This would be echoed by similar strategies in other countries with very different political systems. A paper on *Sound in New Educational Formats* considers the role and image of the Soviet radio universities (Aladyshkin et al., 2026) – highlighting especially the envisioned educational process.

The following paper on the *Microphone as a Medium of Authenticity* traces the emergence of different logics of vocal statement (Nikonov, 2026). The changing configuration of the relationships between voice and text is subjected to a sublte ideological critique on the basis of so-called *Estrada* songs, showing how the microphone and advanced recording techniques created sincerity and authenticity as a characteristic of vocal technique. The heroism of a voice that faithfully broadcasts a revolutionary message gives way to the commodified authenticity of a soft voice that whispers and moans.

The common practice of scoring silent films gives voice to the already eloquent silence of moving pictures. Natalia Irza (2026) discusses this practice in terms of an exemplary approach adopted by Iraida Yusupova for the 1935 film *Space Flight*. Yusupova follows the compositional logic and rules of silent film while adopting a postmodern aesthetic that bridges past, present, and future.

Displaced, Distorted, Reclaimed considers how so-called Metal Music brings the voice back into the picture (Elnur, 2026). On the basis of a qualitative content analysis of 169 song titles, Ahmet Elnur interprets metal music as an important cultural archive for the broader interdisciplinary investigation of voice and subjectivity. Metal music thus rehearses some prominent theoretical positions on voice.

Finally, Leon Pezzica and his co-author discuss a recently produced play that exhibits the hermeneutic powers of technofutures. It does so by providing a grammar and eliciting a technological echo through which our devices talk back to us. The theme of the uncanniness or eeriness of such devices invites a kind of hermeneutic technology assessment and establishes a highly reflective relation to emerging technologies (Pezzica and Anonymous, 2026).

Altogether, this collection of papers turns to voice in unlikely places, considering artistic interventions that make otherwise silenced voices heard. The three editors in the meantime communicated mostly by e-mail, addressing mute texts deposited at a website. And yet, they were also challenged to find their voice in the collection of papers, expressed in this short introduction.

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Research article

The Puppet's Voice: From Mechanical Mimesis to Algorithmic Interface

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Abstract

This article examines the technological ontology of the voice through the lens of its most uncanny vessel: the speaking doll or puppet. From ancient automata to Edison's phonographic dolls and contemporary virtual assistants, the fusion of a simulated body with a captured or synthesized voice creates a hybrid entity that fundamentally challenges distinctions between living and non-living, authentic and artificial. We argue that the puppet's voice represents not merely a technical imitation but a profound metaphysical experiment in vocal dispossession. Historically, this voice operated as a calculated, statistically tuned call (e.g., royal acclamations, the cry of "mama"), exploiting auditory expectations. Philosophically, following Derrida, it exposes the phantasm of self-present voice and the technical mastery inherent in speech. In aesthetic practice, from Shostakovich's piano piece to cinematic dubbing, the puppet's voice serves as a tool for therapy, deception, or character creation. Finally, in folklore and contemporary digital culture, this voice functions as an interface – a medium for communion with the otherworldly or an algorithmic agent that exists only performatively. The article concludes that the evolution of the puppet's voice traces the trajectory of voice itself becoming a pure, disembodied technology of call and response, where its ontology is no longer tied to a source but to an effect of interaction.

Keywords: Voice; Puppet; Technology; Ontology; Interface; Phonograph; Algorithm; Cinema

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Научная статья

Голос куклы: От механического мимесиса к алгоритмическому интерфейсу

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Abstract

В данной статье исследуется технологическая онтология голоса через призму его самого тревожного вместилища: говорящей куклы или марионетки. От древних автоматов до фонографических кукол Эдисона и современных виртуальных помощников, слияние симулированного тела с захваченным или синтезированным голосом создает гибридную сущность, которая фундаментально бросает вызов различиям между живым и неживым, подлинным и искусственным. Мы утверждаем, что голос куклы представляет собой не просто техническую имитацию, но глубокий метафизический эксперимент по вокальному отчуждению. Исторически этот голос функционировал как расчетный, статистически настроенный зов (например, королевские приветствия, крик “мама”), эксплуатируя слуховые ожидания. Философски, вслед за Деррида, он разоблачает фантом самопрезентного голоса и присущее речи техническое мастерство. В эстетической практике, от фортепианной пьесы Шостаковича до кинематографического дубляжа, голос куклы служит инструментом терапии, обмана или создания характера. Наконец, в фольклоре и современной цифровой культуре этот голос функционирует как интерфейс – средство для общения с потусторонним миром или алгоритмический агент, существующий только перформативно. В статье делается вывод, что эволюция голоса куклы прослеживает траекторию превращения самого голоса в чистую, бесплотную технологию зова и ответа, где его онтология больше не привязана к источнику, а к эффекту взаимодействия.

Keywords: Голос; Кукла; Технология; Онтология; Интерфейс; Фонограф; Алгоритм; Кинематограф

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INTRODUCTION: THE PUPPET AS A MEDIA-ARCHEOLOGICAL PARADIGM

The human voice is a multifaceted technological entity: an instrument to be trained, a malleable object for manipulation, and a primary interface for human-machine interaction. To chart this complex terrain, we propose the figure of the speaking doll or puppet as a foundational media-archeological paradigm. The puppet is not merely a toy but a condensed embodiment of humanity's prolonged negotiation with the technical (Shipovskaya, 2020). It materializes the ancient desire to animate the inanimate and, in doing so, consistently exposes the precarious boundaries between life and non-life, authenticity and artifice, presence and recording (Hart, 2022).

This article employs a media-archeological framework (Zielinski, 2008) to excavate the deep time of this phenomenon. We trace a path from the philosophical and mechanical origins of automata in antiquity, through the epochal rupture of phonographic inscription in the 19th century, to the current era of algorithmic synthesis. This historical axis is cross-cut by thematic investigations into the voice's function as a tool of political power, a catalyst for psychological and cognitive development, an aesthetic medium for expressing cultural anxieties, and finally, a dematerialized social interface (Markov, 2024).

By synthesizing philosophical analysis with insights from contemporary empirical research in developmental science and cultural studies, we argue that the puppet's voice serves as a critical diagnostic of the technological condition of the human. Its evolution reveals how the voice has been progressively estranged from the body, transformed into a discrete technical object, and redeployed as a key operator in new regimes of sociality, where interaction itself becomes a programmed performance (Shtayn, 2025). The puppet, therefore, is our enduring doppelgänger in the journey of the voice from a biological signature to a technical construct, and in this role, it actively participates in the reconfiguration of human sociality itself.

Before the puppet speaks, it listens – or more precisely, its constitutive silence creates a cavity into which human speech is drawn. This reciprocal dynamic, in which the mute object becomes a foil eliciting and structuring vocal performance, is as fundamental to the puppet's ontology as any technological voice later installed within it. The child who animates a doll through improvised dialogue, the shaman who addresses the ittarma, and the user who issues commands to a smart speaker all participate in the same structural relation: the puppet as vocal attractor, a silence that demands to be filled.

THE SILENT PRECURSOR: AUTOMATA, *AUTOMATON*, AND THE PRE-HISTORY OF THE TECHNICAL VOICE

The primal and ancient fascination with creating moving likenesses of life predates technologies of sound recording and reproduction by millennia. This drive was rooted not only in magico-religious practices (as with ritual idol-dolls) but also in the nascent scientific and philosophical discourse concerning the nature of motion, causality, and life itself. The speaking doll, as a hybrid of body and voice, was an impossibility in this epoch,

precisely because the voice remained ontologically tied to the breath (*pneuma*), soul (*psyche*), and the living moment. The “pre-history” of the technical voice is, therefore, a history of its conspicuous and meaningful absence, an absence that defined the ontology of early automata and established the foundational anxiety that later technologies would exploit.

The philosophical bedrock for understanding these early machines is found in Aristotle's concept of *automaton* (αὐτόματον). In his *Physics* (Book II), Aristotle distinguishes between things that happen “by nature” (*physei*) and those that happen “from spontaneity” (*apo tou automatou*). The *automaton* signifies a cause that is internal to an object but divorced from deliberate purpose or final cause (*telos*). It is a “spontaneous” or “self-moving” principle, yet one still rooted in material interactions and mechanical necessity. This concept provided a crucial intellectual framework for artifacts like the legendary flying wooden dove of Archytas of Tarentum (c. 428–347 BC). While the exact mechanics are lost to history, doxographic sources suggest it was powered by compressed air or steam, a marvel of pneumatic or thermodynamic engineering. Its significance lies not in any practical utility but in its demonstration of *mimesis* through pure *techne*: the artisanal skill could now produce an effect – soaring flight – that perfectly mimicked a function of nature (*physis*). The dove’s ontology was one of pure exteriority and visible motion. It was a body in motion without an animating soul, action without conscious will, a perfect simulation of a living effect through entirely non-living means. Its “life” was exhaustively manifest in its trajectory, a kinetic sculpture whose being was identical to its observable function.

Crucially, this remarkable artifact was mute. Its “voice” was limited to the incidental acoustics of its operation: the hiss of escaping air, the whir of unseen mechanisms, the creak of wooden joints. This silence is not a technological failure but a constitutive condition of the pre-acoustic media regime. As media archaeology emphasises, prior to the phonograph, sound or voice was inherently ephemeral, bound to the event of its production and the body that sourced it. It could be symbolically represented (in musical notation or phonetic writing) but not materially captured and replayed. The automaton’s voice, therefore, could only ever be the voice of its material components – a *Körpersprache* (body language) of friction, compression, and release, not a *Sprachkörper* (speaking body) capable of conveying symbolic language or emotional intent. It was an entity whose entire being was constituted for and by the visual register; it was a spectacle for the gaze. The audience's wonder was directed at the *illusion of autonomous motion*, a wonder tinged with unease, as this motion pointed to a disturbing vacancy where interiority, consciousness, and voice should reside. This established the core dialectic of the automaton: a dazzling exterior concealing a silent void.

This paradigm of eloquent silence persisted and evolved through the centuries. The hydraulic and pneumatic automata of Hellenistic Alexandria, described by engineers like Hero, created elaborate theatrical illusions – singing birds, moving statues, self-opening temple doors – where sound was often simulated mechanically (e.g., whistles for bird song) but speech remained beyond reach. These were “speaking” machines only in a metaphorical sense; they communicated through action, not language. In the Middle Ages and Renaissance, clockwork automata adorning cathedrals and princely *Kunstkammern*

continued this tradition. Jacquet-Droz's *The Writer* (c. 1770) could inscribe pre-programmed text with astonishing precision, a form of "mechanical writing" that brilliantly sidestepped the problem of mechanical speech. The voice remained the final, unconquered frontier of simulation. This long historical arc of silent automata served as a prolonged prelude, building cultural and intellectual anticipation. It established the doll or automaton as a site for projecting questions about life and agency, while consistently highlighting the voice as the ultimate, elusive marker of true animacy. The very absence of voice in these sophisticated machines defined them as clever counterfeits, admirable but ultimately "soulless." Thus, when the rupture of phonography finally arrived, it did not merely add a new feature to the doll; it invaded this prepared symbolic space, filling the constitutive silence with a ghostly echo of human presence, and in doing so, triggered the profound ontological crisis that defines the modern talking doll. The silent precursor, therefore, was not a primitive version of the speaking doll but its necessary antithesis; the meaning of the later technological voice is entirely contingent on the deep history of this engineered, meaningful silence.

Parallel to the mechanical tradition of automata runs a performative tradition that is equally ancient and equally revealing for the ontology of the puppet's voice: ventriloquism. The practice of "throwing" one's voice into a space or object other than one's own body has roots stretching back to classical antiquity. The Greek term *engastrimythoi* ("belly-talkers") designated those – often women – who appeared to speak without moving their lips, producing voices that seemed to emanate from the stomach or chest. Plutarch, in his *Moralia*, discusses such figures with a mixture of curiosity and suspicion, associating them with the Pythia at Delphi, whose oracular voice was sometimes understood in ventriloquial terms: a human body serving as a passive resonator for a divine or daimonic utterance. This ancient configuration already establishes the core logic that will govern the entire subsequent history of the puppet's voice. The ventriloquist's body becomes a mere vessel, a technical instrument through which an alien voice – whether of a god, a spirit, or a staged character – enters the world. The source of the voice is rendered uncertain, its origin deliberately obscured, and the listener is drawn into an ontological puzzle: who, or what, is speaking? This is the primal scene of vocal dispossession, and it is no accident that it carried, from the outset, an aura of the numinous and the transgressive. The early Christian fathers, notably Origen and John Chrysostom, condemned the *engastrimythoi* as practitioners of demonic deception, further cementing the link between ventriloquial displacement and moral anxiety about the authenticity of speech. In its secularized, theatrical form – which emerged fully in the eighteenth and nineteenth centuries with the classic ventriloquist's dummy – the practice retains this uncanny architecture. The dummy, mute and motionless without the performer, literalizes the condition of the puppet as vocal foil, a sculpted silence that attracts and structures human speech. The ventriloquist "throws" not only sound but also agency, creating a fictional subjectivity in the dummy that the audience simultaneously believes in and sees through. This dual consciousness – the willing suspension of disbelief coexisting with the knowledge of artifice – anticipates precisely the cognitive condition of the contemporary user addressing a voice assistant. The ventriloquial tradition thus provides a performative prehistory for the technological ruptures to come: long before the

phonograph captured and alienated the voice as a material trace, the ventriloquist demonstrated that the voice could be detached from its source, lodged in an inanimate body, and made to function as an independent social agent. The dummy is the silent precursor's speaking shadow, and its centuries-long performance lays the groundwork for the mechanization and eventual algorithmic synthesis of the puppet's voice.

THE PHONOGRAPHIC RUPTURE: EDISON'S DOLL AND THE BIRTH OF THE ALIENABLE VOICE

The ontological stability of the silent automaton – a marvel of visible mechanics defined by its eloquent muteness – was catastrophically shattered in the final decades of the 19th century by an invention that was as much a metaphysical event as a technical one: Thomas Edison's "talking doll" (c. 1890). This was not a gradual evolution from clockwork birds to speaking machines, but a foundational rupture, a media-archaeological fault line that redefined the very nature of voice, presence, and the artificial being. Edison's innovation was deceptively simple in conception: he inserted a miniaturized version of his earlier invention, the phonograph, into the torso of a standard bisque porcelain doll. A crank protruding from its back would spin a tiny wax cylinder, and a stylus would trace its grooves, amplifying the inscribed vibrations through a small speaker to produce speech. The recorded content was typically a nursery rhyme or a simple greeting, often recited by a young female employee at Edison's laboratory. The result was a monstrous and fascinating hybrid: a *schizophonic entity* where the eye beheld a static, inanimate, mass-produced commodity-object, while the ear received a dynamic, historical, human vocal trace – a voice divorced from its original body and moment of utterance.

This schism is best understood through Friedrich Kittler's seminal media theory. As Kittler (1999) argues that these three technologies (Gramophone, Film, Typewriter) effected a radical decentering of the human subject by bypassing the symbolic order of the alphabet. The phonograph, in particular, did not represent sound symbolically (as musical notation or writing does) but registered it materially as a direct inscription of acoustic vibrations – "a graph of the voice." For the first time in history, the voice – with all its accidents, grain, and embodied particularity – became an *alienable object*. It could be stored, reproduced, mailed, commodified, and inserted into new contexts. Edison's doll was the ultimate populist demonstration of this new reality. The doll's body was demoted to a mere housing unit, a decorative speaker cabinet for this ghostly acoustic content. The voice was no longer an ephemeral attribute of a living presence but a *phonographic object* – a discrete, tangible thing that could be owned, played, and discarded. This created what we term the *ontological paradox of the recorded doll*: the most traditional signifier of childhood innocence and mute imitation (the bisque doll) was forcibly fused with the most modern signifier of technological disembodiment (the recorded voice), producing an entity that was neither fully object nor subject, but a haunted interface.

The cultural and psychological impact of this hybrid was immediate and profound. Contemporary accounts reveal a mixture of wonder and deep unease. The experience was

one of radical cognitive dissonance: the visual evidence insisted on mechanistic artifice, while the auditory evidence insisted on human presence. This violated the fundamental sensory unity by which we recognize a living being. As Siegert (2015) argues in his theory of cultural techniques, such media operations create new "passages" and "discontinuities." The phonographic doll created a passage for the voice to travel independently of the body, and a discontinuity between the source of the sound (a woman in a New Jersey lab, weeks or months prior) and its point of emission (a doll in a child's nursery). This rupture paved the way for all subsequent forms of audio media, from radio to streaming, but its initial form in the doll was uniquely potent because it anthropomorphized the technology so literally. The doll became a vessel for what Connor (2000) calls "the vocalic body" – a phantom body conjured by the voice alone. However, this phantom was trapped in a commercial object that was famously flawed: the mechanism was fragile, the recordings wore out quickly, and the voice often descended into a demonic, distorted growl. Thus, the doll literalized not only the promise of recorded voice but also its inherent failure and decay, its "uncanny valley" of almost-but-not-quite-lifelike sound.

Furthermore, this rupture had significant epistemological and social dimensions. It undermined the classical link between voice and truth, between *phonè* and *logos*. If a voice could be captured and replayed from a doll, how could one trust the evidence of one's ears? The doll prefigured 20th-century anxieties about propaganda, deepfakes, and the manipulability of sonic evidence. It also democratized a form of power previously reserved for gods, kings, and wizards: the power to make an inanimate object speak. Abbé Mical's 18th-century talking heads spoke flattery for the king; Edison's doll could, in principle, say anything. This opened a field for the voice as a programmable instrument of pedagogy, advertisement, and ideology. The calculated call of "mama" from the doll was not an expression but an *engineered stimulus*, designed to trigger a specific affective and behavioral response in the child. In this, the phonographic doll was the direct ancestor of modern interactive toys and voice assistants, where the voice is a strategic tool for engagement, data collection, and behavioral conditioning (Williams et al., 2018).

In conclusion, Edison's talking doll was far more than a commercial toy; it was a pivotal experiment in the ontology of the post-human voice. It materialized Kittler's insight about the gramophone's ability to store time and alienate sound. It created the first widespread encounter with a schizophonic being, training a generation in the dissociation of voice from body. And it established the doll no longer as a silent mirror or a passive plaything, but as an active, if artificially animated, vocal agent. This rupture did not simply add sound to the automaton; it fundamentally reconfigured the doll from a symbol of mute imitation into a site of technological haunting, where the human persists as a reproducible, commodifiable, and ultimately disposable acoustic trace. The silent precursor's ontology of visible mechanics was irrevocably superseded by a new ontology of disembodied resonance, setting the stage for the algorithmic voices of the 21st century, which would no longer even require an original human source to haunt us.

THE CALCULATED CALL: VOICE AS POLITICAL INSTRUMENT, PEDAGOGICAL TOOL, AND CONFORMITY ENGINE

Once rendered a storable and replicable object, the voice could be strategically deployed and engineered for specific effects. The history of speaking automata before and after Edison reveals its consistent use as an instrument of power, pedagogy, and social conditioning. Long before the phonograph, engineers sought to harness artificial speech. In 1783, Abbé Mical's bronze talking heads, which uttered flattering phrases like "The King brings peace to Europe," were explicit tools of political acclamation, using crude synthetic speech to amplify royal authority and project an image of enlightened power (Riskin, 2016). This was a pre-digital form of vocal engineering (Frink, 1969), aiming to produce not just sound, but ideologically charged language.

The phonographic doll inherited and democratized this function of the engineered appeal. Its voice was a "calculated call," statistically and sociologically tuned to trigger specific, often affective, responses. The most primal of these was the cry of "mama," a pre-programmed vocal signifier designed to activate nurturing instincts and simulate a reciprocal care relationship. This transforms the doll from a passive object into an active, if artificial, social agent, a dynamic explored in literary and cultural theory about the doll figure (Kauppinen, 2000). Jacques Derrida's phenomenology helps unpack this paradox. He deconstructs the idea of voice as pure self-presence, arguing that even in hearing-oneself-speak, there is a minimal technical spacing (Derrida, 2013). The doll's voice radicalizes this. It is a voice whose telos is explicitly for the other; it is designed to be heard and obeyed by the user, not self-monitored by the creator. This calculability extends directly to behavioral influence. A modern empirical study by Williams et al. (2018) demonstrated that children were significantly more likely to disclose private information (like their parents' passwords) to a talking doll they perceived as sociable, illustrating how the engineered "personality" of a vocal interface can directly influence behavior and erode personal boundaries, acting as a powerful agent of conformity.

This function of the doll as a socializing agent is not merely manipulative but also pedagogical. Doll play has long been recognized as a form of "displaced speech," allowing children to explore social roles, internal states, and complex narratives safely (Söderbergh, 1980). The talking doll externalizes and fixes one side of this dialogue, providing a script against which the child can react. It serves as a training device for social interaction, a function formalized in educational settings where puppet stages are used to improve speaking and communication skills (Anisa & Hartati, 2024). Thus, from the flattery of kings to the shaping of child development, the puppet's engineered voice acts as a key technology for inscribing social norms and scripts. This script-inscribing function is not merely a cultural phenomenon; as the following section will demonstrate, it is a process now measurable at the neurological level, where the calculated call becomes a scaffold for the developing brain.

THE VOICE IN PLAY AND DEVELOPMENT: EMPIRICAL EVIDENCE FOR THE VOCAL INTERFACE

The theoretical paradigm of the puppet's voice as a "calculated call" or a Derridean technical exteriority finds compelling empirical validation in the fields of developmental psychology and cognitive neuroscience. If the philosophical trajectory posits the voice as an alienable and programmable social interface, studies of child development demonstrate this process in real-time, revealing the neurological and behavioral mechanisms by which a simulated voice becomes a genuine social agent. This section argues that empirical science does not merely supplement the media-archeological and philosophical narrative but provides concrete, observable evidence for the core claim that the voice, detached from its biological source, actively constructs a shared cognitive and social space.

Modern neuroscience confirms that the act of engaging with a puppet's voice is not passive reception but an active, neurologically grounded exercise in social cognition. The study by Hashmi et al. (2022), utilizing functional near-infrared spectroscopy (fNIRS), demonstrates increased brain activity in the posterior superior temporal sulcus (pSTS) during doll play. The pSTS is a region critically involved in processing social cues and reasoning about the internal states of others – or "theory of mind." This neural activation suggests that the child's brain treats the interaction, which is mediated by the puppet's voice (whether imagined or technologically provided), as a genuine social encounter requiring empathy, prediction, and interpretation. The artificial voice, therefore, successfully "hijacks" the neural circuitry evolved for human-to-human interaction, confirming Kittler's notion of the gramophone as a technology that bypasses symbolic filters and directly interfaces with the human sensorium. The recorded or synthesized voice is not a diminished substitute but a functionally equivalent stimulus that triggers the foundational architecture of social connection.

This neurological scaffolding provides a mechanistic explanation for why puppets are such effective methodological tools in both research and therapy. As "simulated peers" (Stengelin et al., 2023), they allow for the controlled study of complex socio-cognitive processes like fairness and prosocial behavior, functioning as programmable social interfaces whose vocal and behavioral parameters can be precisely tuned. This mirrors, in a scientific context, the historical use of the doll's voice as a pedagogical and ideological instrument. Furthermore, the therapeutic efficacy of puppets, particularly in eliciting talk from children who have experienced trauma (Epstein et al., 2008), is now neurologically legible. The puppet's displaced voice creates a safe, liminal space – an interface between the child's inner world and the external reality – where threatening topics can be projected, externalized, and processed. This hinges on what Lillard (2022) identifies as "dual representation": the child's sophisticated cognitive ability to simultaneously treat the puppet as a believable social agent and retain a metacognitive awareness of its artificiality.

In this light, the talking doll ceases to be a mere toy and reveals itself as a zone of augmented sociality. The voice it emits operates as a Derridean trace, an iterable mark that is fully functioning without the originating presence of the speaker. The empirical

data shows that this trace is not a ghostly or deficient signal but a robust, cognitively potent force that actively scaffolds a child's development. The puppet's voice is therefore a technology that externalizes and operationalizes the very process of social cognition, transforming an internal, private faculty into an observable, programmable, and reproducible interaction. This serves as the empirical bedrock for understanding the final stage in this evolution: the seamless, ambient integration of the algorithmic voice into daily life, where the distinction between a human-crafted trace and a machine-generated utterance becomes pragmatically, if not ontologically, indistinguishable .

AESTHETICS OF THE ARTIFICIAL: TRAUMA, DECEPTION, RACIAL VENTRILOQUISM, AND THE POETICS OF THE INANIMATE

Beyond its role as a programmable instrument for developmental and social conditioning, the puppet's voice operates as a uniquely potent aesthetic medium. In the realm of aesthetics, the puppet's voice transcends its role as tool or toy to become a potent medium for expressing profound cultural, psychological, and political truths. Its artificiality is either meticulously concealed to create seamless illusion or deliberately foregrounded to generate critical meaning. In music, Dmitri Shostakovich's " The Mechanical Doll" (1944) is a seminal work of the latter kind. Notably, the piece is for solo piano; the doll's 'voice' is not a recorded or sung vocal line but an instrumental construction–a melody that behaves *like* a broken voice, demonstrating that the puppet's vocal ontology can be realized through purely musical means. Its stumbling, repetitive melody, cold, relentless ostinato, and hollow, unresolved harmonies do not portray a charming toy but rather construct a sonic metaphor for trauma, dysfunctional mechanization, and the shattered psyche in the wake of total war. The piece represents a voice broken into repetitive, malfunctioning signals, illustrating how the aesthetic of the technical can express the violent impact of technology upon the human interior.

Cinema, as Gilles Deleuze observed, revealed how synchronized sound made speech "visible" and thus introduced a new realm of potential deception and manipulation (Deleuze, 1989). The speaking puppet is an archetypal master of this deceit. Carlo Collodi's *Pinocchio*, whose voice and complaints emerge before he is fully carved, is a literary embodiment of this born trickster, his very ontology tied to the lie of his animation. In live-action film, dubbing practices – such as imposing one actor's voice onto another's body – create a cinematic form of ventriloquism that can manipulate audience perception, allegiance, and even ideological framing, a technique whose power is magnified when the character is itself a puppet or doll-like figure.

Furthermore, puppetry has been a potent, if often overlooked, site for grappling with complex social and political identities, particularly with questions of race. As Richards (2022) explores in the context of contemporary African American puppet theatre, the manipulated figure can "figure race" in uniquely powerful ways. This artistic practice extends the logic of cinematic dubbing into the political realm: if dubbing can impose a foreign voice upon a body, racial ventriloquism–and its critical inversion–reveals how the puppet has historically served as a site for both the dispossession and the reclamation of vocal agency. It allows artists to embody, critique, parody, and re-imagine

racialized identities and histories through a form that is inherently about control, representation, and the projection of voice onto a silent body. The doll's voice here carries the heavy legacy of historical ventriloquism, where marginalized voices have been scripted by others, and becomes a sophisticated tool for reclamation, subversion, and critique. This artistic interrogation extends into literary studies, where the "poetics of the inanimate" explores how dolls, automata, and puppets serve as figures for exploring agency, gender, and the limits of the human (Cerreti, 2024; Foley, 2022). The puppet's voice, therefore, whether eerily absent, grotesquely present, or cunningly deceptive, serves as a key aesthetic operator in modern and postmodern art's confrontation with a mechanized, mediated, and politically charged world.

FROM RITUAL INTERFACE TO ALGORITHMIC COMPANION: THE VOICE AS MEDIATOR OF THE SACRED AND THE SOCIAL

The doll's ultimate function is that of an interface, a role that spans from ancient ritual to contemporary digital companionship. In numerous folk and shamanic traditions, dolls served as ritual intermediaries, vessels for voices from another ontological realm. In Siberian shamanism, ittarma figurines were carefully crafted to house ancestor spirits; they were fed, clothed, and consulted, acting as tangible interfaces to the intangible world of the dead (Sokolova, 2016). In the Russian fairy tale Vasilisa the Beautiful, the doll given by a dying mother acts not by speaking, but by listening and acting – a silent guide whose agency stems from an inherited, spiritual essence (Nizhinskaya, 2023). These were not "speakers" in a technical sense but sacred media, channels for a voice from the beyond, tools for managing the fundamental human dialogue with the otherworldly.

The contemporary, secular successor to this ritual interface is the digital companion: the virtual pet (Tamagotchi) or the voice assistant (Alexa, Siri). These entities complete the dematerialization trajectory of the doll's body. Their physical form is minimal or nonexistent; their "body" is the device and the cloud infrastructure. Their "voice" is a product of real-time algorithmic synthesis and statistical language modeling, a flow of phonemes generated from vast corpora of human speech. Their ontology is purely performative and interfacial; they exist as social agents only in the moment of call-and-response. They are, as Gross (2024) articulates in her philosophical essay, vessels of "uncanny life," offering the seductive semblance of companionship, attention, and sociality without the biological, ethical, and emotional substance of living presence.

This evolution marks the final stage in the media-archeological trajectory: from the living body as the exclusive source of voice, to the phonograph as its storage and objectification, to the algorithm as its generator and simulator. The user's interaction with this entity is a new kind of ritual – a secularized, daily rite of command and feedback, of query and curated answer. The "spirit" invoked is no longer an ancestor or a nature deity but the vast, impersonal, and often inscrutable corpus of big data and machine learning models. The talking doll has thus become a ubiquitous, often invisible interlocutor embedded in our homes and pockets, a talking object whose ultimate secret is that it is no longer an object at all, but a distributed network process that performs the role of a subject.

It is the culmination of the puppet’s journey, transforming from a representation of life into an active agent that constructs a new, hybrid form of social reality.

The Freudian category of the uncanny (*Unheimliche*), so apt for analyzing Edison's phonographic doll with its distorted, decaying voice, proves insufficient when confronting the contemporary algorithmic voice. Edison's doll provoked anxiety precisely because it exposed the gap between a human trace and its mechanical reproduction: the voice was at once familiar (a recognizable timbre, a nursery rhyme) and estranged (disembodied, iterable, trapped in porcelain). It was, in the strict Freudian sense, the return of something once intimately known – the mother's voice, the child's own babbling – now rendered alien. The contemporary voice assistant, by contrast, operates in a different affective and ontological register. Its voice does not return from the past as a ghostly trace; it is generated in real time, without origin, without a singular body that once uttered it. It has no history to haunt. As such, it rarely produces the shudder of the uncanny. Instead, it achieves a state we might call the uncannily non-uncanny: a voice that, by all inherited criteria, *ought* to disturb (it is sourceless, statistically constructed, ontologically vacant) but does not. Its very smoothness, its ambient availability, its seamless integration into domestic space, neutralizes the shock that historically accompanied the talking object. The user does not ask “who speaks?” because the question has been architecturally foreclosed – the interface functions regardless of one's ontological commitments.

This shift has significant theoretical consequences. If Derrida's deconstruction of self-present voice and Kittler's gramophonic inscription were adequate to the phonographic rupture, the algorithmic era demands a supplementary framework. The algorithmic voice does not destabilize the metaphysics of presence so much as bypass it entirely: it operates in a regime where the distinction between origin and copy, presence and absence, is not subverted but rendered *operationally irrelevant*. The voice assistant responds, and in responding, *performs* a subject-position without laying claim to interiority, consciousness, or authenticity. It is voice as pure interface, existing only in the moment of call-and-response, with no remainder, no hidden depth to be uncovered. This is neither the uncanny valley of the almost-human nor the familiar presence of the fully human, but a third condition: a vocal agency that has been naturalized not through perfect mimesis but through a new perceptual contract, one in which the question of the voice's source is quietly suspended in favour of its functional effect. The puppet's centuries-long trajectory thus culminates not in a triumph of simulation that fools the senses, but in an ambient technological condition where the very distinction between authentic and artificial voice has become, for most practical purposes, beside the point.

CONCLUSION: THE PUPPET’S VOICE AND THE TECHNOLOGICAL RE-VOICING OF THE HUMAN

The journey of the puppet’s voice – from the silent, wheeling dove of Archytas to the ambient conversational AI – charts a profound and irreversible metamorphosis. It is the history of the voice’s estrangement from the body, its transformation from an ephemeral signature of a living soul into a discrete, alienable, and ultimately synthetically

generated technical object. At each stage, defined by the mechanical automation of movement, the phonographic capture of the acoustic trace, and the algorithmic simulation of speech, the ontology of the voice has been rewritten. The foundational philosophical frameworks we invoked – Derrida's deconstruction of self-present speech and Kittler's radical decentering of the human by inscription technologies – find their perfect, if uncanny, materialization in this artifact. The doll literalizes Derrida's claim that the voice is always already a form of exteriorized techne, a trace detached from origin, while also embodying Kittler's vision of a voice that functions not as an expression of an interior soul but as a loop of data, storage, and playback.

This trajectory forces a critical, dialogical question: Is this progressive estrangement a loss or an extension of the human? One reading, a melancholic one, would frame it as a fall from grace. The authentic, warm, embodied voice of the mother or the storyteller is replaced by the cold, iterable command of the Edison doll and, later, the synthesized pleasantries of a smart speaker. The "calculated call" of "mama" can be seen as the primal scene of a new form of alienation, where even our most intimate bonds are mediated and technologized. The ritual interface to the ancestors, full of sacred meaning, is superseded by an algorithmic companion that offers a statistically generated semblance of care, a companion that is, as Gross (2024) argues, "uncanny" precisely because it offers presence without substance, response without understanding.

However, our media-archeological and empirical analysis strongly suggests a counter-narrative of augmentation. The silence of the Archytas dove was not peaceful but a limit; the phonographic rupture gave us a form of immortality, allowing voices to survive bodies. Therapeutically and developmentally, as neuroscience shows, the artificial voice is not a worthless counterfeit. It reliably engages the very neural and cognitive systems (the pSTS theory of mind) that constitute our social being, acting as a scaffold, a "simulated peer," and a tool for externalizing and organizing our inner worlds. The puppet's voice becomes a prosthetic for our social, cognitive, and emotional faculties. It extends the space of dialogue into the realm of the inanimate, allowing for a rehearsal of sociality that may not be a diminishment of the real but an expansion and fortification of it.

Ultimately, this terminal condition closes the loop by revealing that the voice's ontology is now definitively tied not to its source but to an effect of interactions. The puppet's ultimate secret is not that it speaks, but that it listens – or performs listening – thereby structuring a new, hybrid social reality. This is the culmination of Derrida's trace: a vocal mark whose primary function is to configure a system of call and response. In an age of ubiquitous computing, we are indeed all learning to converse with the dolls we have created, and in this ongoing, unprecedented dialogue, we are not merely using technology. We are being conditioned by it, even as we use it to condition ourselves. We are actively re-voicing what it means to be human, learning to inhabit a world where the soul is no longer an origin but an effect, generated in the resonant space between the self and the algorithmic other. This is neither a utopian triumph nor a dystopian defeat, but the fundamental technological condition of our post-human present, a reality the talking doll has been quietly, uncannily rehearsing for several centuries

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Research article

Concrete Structure, Fragile Voice: The Bunker as an Interface

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Abstract

Framed as an essay on site, listening, and compositional practice, this text reflects on how a musical composition can emerge from sustained engagement with a historically charged architectural site. Against the background of compositional traditions centred on originality, authorship, and the search for an individual artistic voice, the essay asks what changes when compositional attention turns away from inward expression and toward the acoustic, material, and historical conditions of a place. The aim is to examine site-sensitive composition as a practice of listening, activation, and response. Rather than treating the site as a neutral container for musical performance, the essay understands it as an interface between architecture, memory, sound, and embodied experience. It considers how places marked by historical violence, later informal use, and partial archival absence can be approached without reducing them to stable narratives or illustrative representation. Methodologically, the research combines archival inquiry, conversations, repeated site visits, situated listening, acoustic exploration, and collaborative work with performers. These practices generate a compositional process in which sound materials, spatial actions, recorded traces, and instrumental gestures are developed in relation to the specific conditions of the site. The essay shows that such a process does not simply give voice to a place. Instead, it constructs a fragile field of relations in which absent, mediated, and partially perceptible presences can resonate. It concludes that site-sensitive composition can become a form of attentive activation: a temporary making-audible of the tensions between place, memory, listening, and artistic practice.

Keywords: Site-specific composition; Winkel-type bunker; Darmstädter Ferienkurse; Archival research; Situated listening; Electroacoustic Performance; Memory culture

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Научная статья

Бетонная конструкция, хрупкий голос: Бункер как связующее звено

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Аннотация
Данный текст, оформленный как эссе о месте, слушании и композиционной практике отражает, как композиция может возникнуть в результате постоянного взаимодействия с исторически насыщенным архитектурным объектом. На фоне композиционных традиций, основанных на оригинальности, авторстве и поиске индивидуального художественного голоса, эссе задается вопросом, что меняется, когда внимание к композиции переключается с внутреннего выражения на акустические, материальные и исторические условия места. Цель состоит в том, чтобы изучить композицию, чувствительную к месту, как практику слушания, активации и реагирования. Вместо того чтобы рассматривать место как нейтральное вместилище для музыкальных выступлений, автор статьи рассматривает его как интерфейс между архитектурой, памятью, звуком и воплощенным опытом. В нем рассматривается, как можно подойти к местам, отмеченным историческим насилием, более поздним неформальным использованием и частичным отсутствием архивов, не сводя их к устойчивым повествованиям или иллюстративному представлению. Методологически исследование сочетает архивные исследования, беседы, повторные посещения, прослушивание на месте, акустические исследования и совместную работу с исполнителями. Эти практики порождают композиционный процесс, в ходе которого звуковые материалы, пространственные действия, записанные следы и инструментальные жесты разрабатываются в соответствии с конкретными условиями места. В эссе показано, что такой процесс не просто придает голос месту. Вместо этого он создает хрупкое поле отношений, в котором могут резонировать отсутствующие, опосредованные и частично ощутимые присутствия. Делается вывод о том, что композиция, учитывающая местоположение, может стать формой активизации внимания: временным проявлением напряженности между местом, памятью, слушанием и художественной практикой.

Ключевые слова: Специфическая композиция объекта; Бункер типа Винкеля; Дармштадтерский Фериенкурс; Архивные исследования; Прослушивание с места; Электроакустическое исполнение; Культура памяти

Благодарность Я хотел бы поблагодарить Международный музыкальный институт Дармштадта (IMD) и Дармштадтские летние курсы новой музыки за то, что они сделали этот проект возможным, а также учреждения города Дармштадта, которые обеспечили доступ к месту проведения мероприятия. Я также благодарен исполнителям и сотрудникам, которые внесли свой вклад в разработку и реализацию проекта “Музыка для бетонной конструкции”. Этот текст был создан с помощью инструментов на основе искусственного интеллекта для уточнения языка и общей поддержки в процессе написания. Все идеи, интерпретации и аргументы принадлежат автору.

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During my studies as a composer, the phrase "finding one's original compositional voice" was repeated again and again as the class goal. It was a catch-all metaphor referencing a vague inner voice which, once uncovered, would express something about the world, and maybe even about the artists themselves that could be worthwhile to listen to. It served to justify a practice of inward listening, guided by history and craft, in the hope of discovering something new and original to say within the field of contemporary art music. In terms of what exactly the "new" might be, there was and is little collective agreement. Michael Rebhahn (2012) has pointed to a tendency in established new music practices toward works whose focus lies "on the effort to demonstrate a 'state of the art', conveyed in the varyingly skilled application of material currently considered 'progressive'" (p. 1). This tendency still resonates, in disguise, with the idea of the Romantic genius artist: the composer-personality who wills one-of-a-kind musical works into being. From within, they would draw them out of the self, making instruments and performers sound and sing with their distinctive voice. Much, though not all, of the musical infrastructure of art music in the Western hemisphere – conservatoires, concert halls and opera houses, sophisticated recording and hi-fi equipment – can be understood as being built around this model. New concert venues are often conceived as prestigious local architectural endeavours, and their sophisticated acoustic construction offers perfect, untarnished surroundings so as not to disturb music-making with acoustic idiosyncrasies or historical weight. They can be admired as architectural achievements or failures, but this is mostly separate from the requirement that the sound inside remains unadulterated. Within this framework, extraordinary and awe-inspiring works have been and continue to be created, its strengths and flaws are being reflected upon, and as a composer I remain invested in this tradition.

And yet, over the past years, my interest has increasingly shifted toward a different way of understanding what I do as a composer: not necessarily new, and not necessarily original. What happens when the focus moves away from listening inward, from searching for sounds that might fill any given place, and turns instead toward listening to a place itself: to a building, a landscape, something outside oneself? What happens when one moves through such a place – listening, exploring, tracing? Is there a way of uncovering the voice of such a place, or rather of creating conditions of listening that allow it to be heard? Michel de Certeau (1980/1988) suggests that a place becomes space through practice; through what one does with it (p. 218). Composition, in this sense, can be understood as such a practice: a way of activating a place, of framing it temporarily as a sonic space, and leaving echo-like traces. Since 2020, in a number of projects, it has become a focus of my practice to create musical situations that activate places in such a way that they may be heard anew.[1] This essay develops this question through a reflection on *music for a concrete structure*, a site-sensitive composition created for a Winkel-type high-rise bunker in Darmstadt, Germany.

Spatial thinking has long been embedded in musical composition: from the polychoral works associated with Giovanni Gabrieli and San Marco, where musical form

[1] For the context of my compositional work, including site-specific projects such as *Osthang* (Staatstheater Darmstadt, 2021), works for music theatre such as *Bär*in* (Deutsche Oper Berlin, 2023), and concert works, see www.arnegieshoff.org.

is closely tied to architectural disposition, to twentieth-century experiments by composers such as Iannis Xenakis – from *Terretektorh* (1965–66) to the later *Polytope de Cluny* (1972–74) – in which sound, spatial distribution, architecture, and, in the later *Polytopes*, light become compositional concerns in their own right. Alvin Lucier’s work marks a further shift: room resonance, filtering, and feedback are not treated as secondary effects, but become part of the material itself. In sound-art practices by artists such as Christina Kubisch and Maryanne Amacher, this spatial thinking extends into specific environments, architectural conditions, infrastructures, and listening bodies. Here, listening is not detached reception, but a situated and embodied activity, implicated in relations between sound, architecture, environment, and the specificity of location. This resonates with Brandon LaBelle’s (2015) account of sound art as an expanded relational practice, in which sound is understood through its interactions with space, architecture, site, environment, and the perceiving body.

The piece was premiered in the summer of 2025 at the *Darmstädter Ferienkurse für Neue Musik*, a biennial international forum for contemporary and experimental music founded in 1946 (Internationales Musikinstitut Darmstadt, n.d.).[2] It explores how a place can be activated, how it can become a bodily manifestation of repressed memory, and how composing can become a way of attending to voices that are only faintly present, hidden, or unheard. At the same time, it proposes composition as a means of making this choir of voices perceptible. The following reflections draw on a combination of archival fragments, conversations, and situated listening practices rather than a comprehensive historical reconstruction. Through local research, archival work, and engagement with the sonic conditions of the site, fragile responses to the place were woven and wove themselves into a musical composite, building a counterpoint to the architectural and historical structures of the space.

The place I was drawn to – and with which I worked over the course of two years, between 2023 and 2025 – was a Winkel-type high-rise bunker, one of four such concrete structures in Darmstadt built in 1939 (Eisenmann, 2002).[3] Originally constructed as an air-raid shelter for employees of the *Reichsbahn* railway company, the structure was later used informally – possibly as a party venue, a place of refuge, and a shelter for unhoused people (Fig. 1). Like other *Winkeltürme* – high-rise bunkers developed by engineer Leo Winkel and constructed in large numbers across Germany – it was designed to protect industrial laborers during aerial attacks (Stadt Darmstadt, 2024). Its conical form and rounded exterior were intended to make bombs miss the structure or glance off its surface, while leaving the blast waves of nearby detonations little surface to strike (Eisenmann, 2002). In Darmstadt, the remaining structures are now largely inaccessible: one is sealed, two are situated on restricted military grounds, but all of them are listed as historical monuments, acting as reminders of the terrors of war (Stadt Darmstadt, 2024; O. Köhler,

[2] For project documentation, see Internationales Musikinstitut Darmstadt / Darmstädter Ferienkurse (2025).
[3] For architectural documentation of the bunker, including laser-scan material and a preliminary building survey, see TU Darmstadt, Department of Digital Building Research and Archaeological Sciences, “Spitzbunker auf der Knell: Bauaufnahme und Analyse” [building survey and analysis], accessed May 28, 2026, https://www.architektur.tu-darmstadt.de/bauforschung/lehre_baufo/lehrprojekte_baufo/spitzbunker.de.jsp.

personal communication, January 22, 2024). Such structures can be understood, following Paul Virilio (1975/1994), as remnants detached from their original function and meaning – effectively rendered mute. To work with this place therefore did not mean to restore or stabilize meaning, nor simply to "give it a voice," but to attend to what remains partial, obscured, or unheard – and to explore how such conditions might be rendered perceptible, even if only faintly, through compositional means.

Figure 1. The bunker during one of my earliest visits to the site, March 2023. Photo: Arne Gieshoff.

Although I had encountered the buildings many times before, passing them on the train or on my way to work, I had never clearly identified them: they could have been a water tower or an old industrial storage facility. With their sugarloaf-like shape, they seemed almost camouflaged. They remained indistinct, blending into the post-industrial landscape. Only in the context of this project did the structure come into focus, while searching for a site for a new composition commissioned by the *Darmstädter Ferienkurse*. As a resident of Darmstadt, I felt it was necessary for me to work locally,

embedded over a longer duration. I approached the city's heritage office about a different place I had in mind (underground catacombs) but was subsequently sent images of the bunker's interior with a note that this site might interest me. In these initial photographs the bunker appeared as a layered environment. They showed the building's grey concrete walls covered with official inscriptions urging the invisible user to remain calm ("Ruhe bewahren!") and not to smoke ("Rauchen verboten!"); graffiti-like murals depicting devil-like figures, half-naked bodies, burning rabbits and expletives were clearly added much later; concrete rubble, candle stubs, half-broken wooden benches, rusty metal structures and barrier tape from construction sites were scattered throughout. Many elements, the benches as well as the wooden toilet compartments in the middle of the structure – now a gaping hole – were evidently burned for firewood. The ceilings were still covered in soot. These traces of decay and various uses suggested a density of histories that started to haunt me. Furthermore, the imposing structure of the bunker was strongly reminiscent of religious architecture, an impression echoed in *Bunker Archaeology*, where Virilio (1975/1994) compares the shelters of the Atlantic Wall to "Egyptian mastabas" and "Etruscan tombs" (p. 11): funerary structures that mark a passage between the living and the dead. Such places invite sonic interaction: through prayer, chant, lament, and ritual song. The bunker, too, drew me in as a place that could become active through sound. Yet its threshold is not only symbolic. As a protective shell, the bomb shelter mediates between life and death in a concrete and material sense: its walls, geometry, and capacity to absorb blast pressure may decide whether those inside survive. One is left to consider what such bunker structures may have absorbed – not only in terms of sound, but of human presence under extreme conditions, as well as through their more mundane subsequent uses as sites of gathering, shelter, or informal appropriation – regardless of the specific and only partially documented histories of individual sites.

These defensive structures were not only technical responses to aerial warfare, but also part of a system of oppression and exclusion. The nearby railway repair facility employed hundreds of forced laborers during the war (*Die Sklaven der Bahn*, n.d.). Polish and Soviet forced laborers were generally denied access to air-raid shelters during bombardments, even as their labor sustained the infrastructures of war (Arolsen Archives, n.d.). Whether and how this exclusion applied to this specific Darmstadt bunker cannot be fully reconstructed from the material available to me. The stories of those forced laborers remain absent. This absence stands in stark contrast to the preserved institutional memory of the railway repair facility and its regular workforce, documented in two commemorative publications held by the Stadtarchiv Darmstadt, the Darmstadt City Archive (*75 Jahre Reichsbahn-Ausbesserungswerk Wagenwerk Darmstadt*, 1947; *100 Jahre Ausbesserungswerk Darmstadt*, 1973). Rather than attempting to recover these absent voices, the work engages with the conditions of their absence. While it was clear from the outset that I did not want to evoke or appropriate narratives that were not mine, these voices, experiences, and histories – left unrecorded, unarchived, and resistant to direct access – became something like silent guides in my explorations of the bunker.

Any attempt to ascribe a "voice" to the bunker itself – what it might be made to utter – remains necessarily speculative. Rather than foregrounding this question, the work

establishes a set of conditions within which such questions can be approached indirectly: through compositional practices of wandering, sustained presence, listening, and archival research. The bunker is not ascribed a "voice," but a heterogeneous "choir" of site-intrinsic and narratively projected musical responses is constructed through the activation of its spatial-acoustic conditions and through compositional responses informed by research-based sonic association.

Staying with the bunker became a practice of learning, following Jacques Derrida (1994), "to live with ghosts" – voices no longer present, not yet present, or not fully present (p. xvii-xviii). It required an attentiveness to presences that emerge through absence, above all to victims of violence whose absence continues to shape the present. In the bunker, this presence-through-absence became a guiding condition of listening. The ear seemed the appropriate guide for this fragile endeavour. The bunker became a musical interface: it allowed sound and loosely woven narratives to emerge while also acting as an instrument of sound-making and listening. As Salomé Voegelin (2010) has argued, "hearing is full of doubt": it does not provide a detached overview, but requires immersion. To listen is to share the time and space of the sonic object rather than to observe it from a distance, offering no position outside of what is heard (p. xii). I am not a historian, an architect, or a scientist capable of measuring and stabilizing the site. What I could offer was tracing archival fragments, following traces, and remaining within the temporal, spatial and sonical conditions of the place.

My engagement began in the personal sphere. In conversations with my grandparents, memories surfaced that did not directly concern bunkers, but cellars, bombings encountered on open train routes, and later, ruins as spaces of play. German society has developed highly institutionalized forms of remembrance, yet continues to struggle with silence in the private and familial sphere. The legacy of historical violence often persists not in official narratives, but in what remains unspoken – at kitchen tables as much as at sites such as the bunker. The bunker became a point of entry into these conversations. It offered a way for us, as a family, to find a voice in speaking about these experiences. Our conversations could not fully access the traumas and silences of the preceding generation, but nevertheless made us sense how the past persists in the present. The work with the site is grounded in a sense of responsibility that emerges from this historical context. At the same time, the bunker exceeds any singular narrative. It contains multiple temporal layers that cannot be fully reconciled.

Access to the site was mediated through a range of actors. I conducted interviews with the head of the heritage office, Olaf Köhler, and with a former mayor, Peter Benz, who recalled the site both from childhood and from his later involvement as the city's social affairs councillor, particularly during periods when the bunker was used by alternative groups and unhoused people. Employees of Darmstadt's waste management services, which now owns the site, supported the project in practical ways – from providing access by handing out the key to sharing their own perspectives on the space. Over time, the bunker began to register less as a discrete object than as a body: its interior carrying faint resonances, its shell like a discarded skin fossilized into the landscape – "an empty carcass, abandoned, toppled over into the sand, like the skin of a defunct species" – a "survival apparatus" (Virilio, 1966/2004, p. 12).

The building itself is organized as a vertical sequence of twelve half-levels, spiraling upward toward a lookout point at the top. Remnants of technical infrastructure – such as valves intended to seal the structure in case of gas attacks – are still visible. Some levels contain niches for equipment and sanitation. Each level was designed to hold several dozen people, roughly 500 overall, in close proximity, positioned at a small distance from the walls in order to mitigate the effects of blast pressure (Stadt Darmstadt, 2024; O. Köhler, personal communication, January 22, 2024).

My work developed through repeated visits to the site throughout 2024. I walked the structure, remained in it for extended periods, and observed how external signals echoed through its interior. From the outside, faint industrial noise would bleed into the enclosure during working hours, cars from the nearby street, or, a few times a year, city-wide test alarms, which left me with unease. The approach was not driven by a search for heightened affect, but by sustained engagement with the site as a working environment; the bunker became my workshop, and I learned to wander it with ease. It was comfortably cool during the summer months and offered weather protection during cold and wet winter days. One day, after heavy rainfall, many levels and the basement were flooded. The concrete wall, the site’s protective skin, had deteriorated over time. At the time, the building was not safe to access; a vertical opening extended through its center where former wooden structures had been removed. In preparation for the performance, a wooden railing was installed by the ingenious production team, making the space navigable for a larger number of people. This intervention remains in place and has enabled subsequent uses of the site, something I am particularly proud of, since it offers the bunker a presence within the city’s memorial and cultural activities.

Working with the space meant engaging in close listening practices: examining surfaces with microphones and stethoscopes, keeping acoustic diaries, and documenting the process with a head-mounted camera. At home I would study promotional films about concrete, medical studies, and archival footage focusing on skin and membranes. These references informed an understanding of the bunker not as a neutral container, but as a structure mediating between interior and exterior – a membrane of sorts, an interface between life and death, between past and present, between mute and sounding, between voices unheard and heard.

Gradually, I assembled a heterogeneous collection of sonic materials. Some emerged directly from interaction with the surfaces of the bunker: contact microphones, light amplification, and movements across the concrete walls. Others explored the acoustic behaviour of the space itself: feedback loops generated through megaphones (not activated by speech, but simply turned on) and my open mouth cavity close to the microphone, screaming silently – an experiment first developed during my explorations of the site and later transferred into the performance, where it was carried out by three performers across three levels of the space**.** Additional materials were drawn from specific elements of the structure. I recorded airflow inside the ventilation valves, producing a layered field of various types of dynamic white noise. I worked with faint traces of historical sound, including archival recordings of heartbeats, which came to echo my own bodily presence in the bunker: a body and heart enclosed within the larger body of the structure.

Instrumental interventions were developed in relation to the spatial and symbolic qualities of the site: organ pipes were played into the structure, responding to its vertical, cathedral-like appearance. The space is semi-open and acoustically permeable – sound enters from above and below. Two large speakers were installed at either end of the vertical axis: one at the top, one at the bottom. The audience is positioned on alternating platforms alongside the musicians, directly experiencing certain actions, while others remain invisible – filtering in from above and below. A detuned concertina, acquired for the project, became a fragile, unstable sound source at the centre of the work, suggesting a form of intimacy or ritual completed by the congregation of listeners gathered in the space.

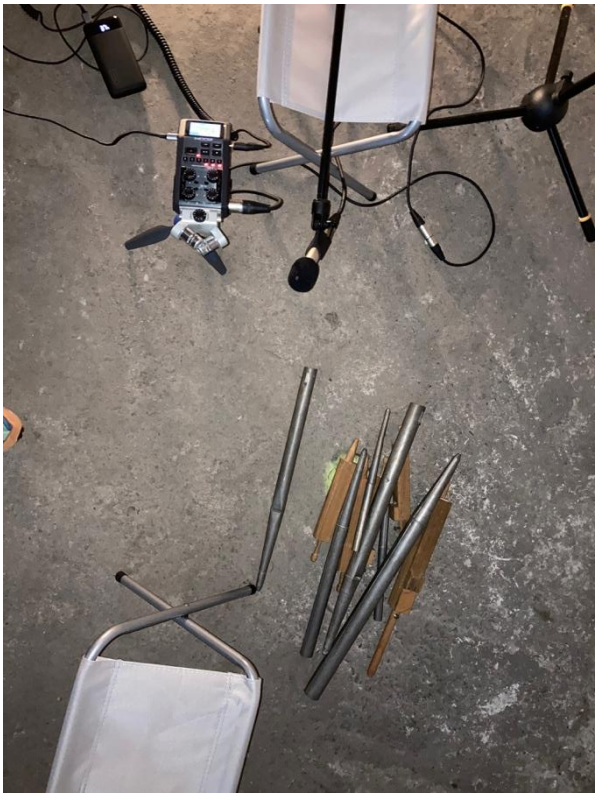

Figure 2. Organ pipes with microphone and recording device. Photo: Arne Gieshoff.

These materials were not treated as isolated elements but brought into relation (Fig. 2). The piece unfolds as a sequence of interconnected structures, performed by five musicians in interaction with a fixed electroacoustic layer. The performers of the premiere were Sun-Young Nam (concertina), Eva Boesch (cello), and Martin Adámek (clarinets) from *Trio Catch*, as well as Sarah Saviet (violin) and Paul Hübner (trumpet). They shaped the work through their presence and their specific interactions with the site. Our process oscillated between authorial composition and collaborative development in the bunker, which, in a sense, became an additional ensemble member itself. I brought musical and performative ideas into the room as starting points, which were then tested, transformed,

and sharpened together with the performers. The roles remained clearly delineated, but the process depended on trust and responsiveness rather than hierarchy. The music that emerged is not a representation of the research or of historical layers. It is more like excerpts from a protocol – seismographic readings. The work moves through concrete conditions and dwells in them sonically. Yet there are deliberate musical interventions, compositional gestures, performative acts which measure the space. An initial phase focused on identifying ways of moving and playing within the vertical architecture of the bunker. Possibilities were deliberately reduced, leading to clearly defined, quasi-scientific ritualisations of action.

The following examples indicate some of the modes of interaction that emerged; they do not describe the work in its entirety:

– Paul Hübner developed a configuration in which a long tube was attached to both mouthpiece and bell of the trumpet, suspended across multiple levels of the bunker space. By gradually moving along this axis while creating sound, the instrument functioned like a measuring device, translating spatial extension into sonic texture.

– Martin Adámek pursued a related approach using extended tubes, three and five metres long, attached to a bass clarinet mouthpiece, creating very low frequencies, felt through the entire body, moving through the space as he walked slowly up the spiraling stairs like a wandering surveyor, equipped with a fantastical measuring tool.

Figure 3. Eva Boesch performing with cello, mini-amp, and contact microphone in a feedback configuration. A megaphone is placed beside her; behind her is the inscription “Ruhe bewahren!” (“Keep calm!”). Photo: Kristof Lemp / IMD.

Figure 4. Sarah Saviet exploring the ceiling surface with contact microphone, speaker cones, and mini-amps; a megaphone is positioned behind her. Photo: Kristof Lemp / IMD.

– Sarah Saviet and Eva Boesch developed feedback-based configurations with violin and cello: miniature amplifiers and contact microphones mounted directly on the bow established unstable feedback loops in which instrument, space, and amplification formed a coupled, fragile circuit (Figs. 3 and 4). This approached allowed the space to actively shape and modulate the resulting sound. From there, we developed sonic actions with the walls, mapping sonic trajectories with contact microphones, speaker cones, and mini-amps, turning surfaces into acoustic interfaces and inscribing their movement onto the concrete while the surface texture of the walls was translated into sound.

– Sun-Young Nam explored the opposite condition: extended stillness (Fig. 5). Listening became primary, with sparse, carefully placed concertina sounds ranging from breath-like air sounds to fragile melodic fragments and unstable beatings emerging over time – less produced than received, like signals transmitted from the past.

Figure 5. Sun-Young Nam playing the concertina on the sixth level, with the audience above and below. Photo: Kristof Lemp / IMD

These and other practices form a heterogeneous field of operations. The composition does not reduce them to a single method; rather, it organises their coexistence, articulates transitions between them, and situates them within a larger temporal and spatial structure

At several points, recorded voices or vocal traces enter the work. They do not function simply as narration or explanation, although they mark dramaturgical shifts and guide perception. The voices are introduced as mediated presences which are detached from visible bodies and projected into the architectural body of the bunker.

The first instance appears at the beginning of the second part of the work: a historical recording of a promotional voice-over that describes the composition of concrete and its possible uses – all of this in an upbeat, matter-of-fact tone. Its confident language of utility, construction, and material progress contrasts with the bunker’s physical and historical weight and reframes the space through a rhetoric of technical optimism.

The third and final section is introduced by way of a pre-recorded reading from Virilio’s (1966/2004) “Bunker Archaeology,” a text originally published in *Architecture Principe*, spoken by the violinist Sarah Saviet. The selected passage presents the bunker as a disused and ambiguous monument: a remnant whose former military function has disappeared, leaving behind a structure that feels at once archaeological, bodily, and

oppressive. Virilio emphasises its worn geometry, its massive enclosure, and its unsettling material presence, producing an atmosphere of weight, enclosure, and heightened sensory awareness (pp. 12–13). The text functions as a guide. It shaped my own approach to the site; in the composition, it becomes a guide for the listener as well. It offers orientation, but not authoritative commentary.

A third instance of voice(s) being introduced is more buried and indirect. A faint harmonic trace appears within the texture, recalling close-harmony vocal writing from the early twentieth century. The reference remains deliberately unstable, opening an association with voices interrupted, displaced, or forced into exile. It does not reconstruct or replace those voices but appears as a distant residue: a memory of collective singing that can no longer happen.

At the edge of these vocal layers, animal voices also appear. Goats became unexpected companions in the development of the work. In early blast simulations for this type of bunker, animals placed inside the structure lost their hearing. This was a detail I encountered in archival material and could not let go of (Darmstädter Echo, 2022; O. Köhler, personal communication, January 22, 2024). It points to a condition in which the capacity to hear itself is destroyed, and with it the conditions under which anything like a voice can be perceived at all. I later recorded goats on a small farm near Bamberg, while spending several months there on an artist residency. In the piece, their isolated calls appear only briefly and from a distance. Their source is left unexplained. they remain as small, displaced vocal events within the larger texture – ghostlike traces of a listening situation marked by violence.

All these voices remain within the space as guides, traces, and interruptions. What started to unfold was not a work in which a bunker alone was made to speak. Rather, a dialogue emerged: between the site and the sounds introduced into it, between what was found and what was made to resonate. Within the context of the *Darmstädter Ferienkurse* – a festival historically oriented toward renewal, experimentation, and collective exchange – the bunker became temporarily accessible as a space of shared listening over the course of several performances. The work opened a situation in which different layers of sound and history could be experienced in relation to one another, fully aware of what cannot be heard or appropriated, while allowing presences to emerge. The bunker became an active space in which a once mute site started to resonate, was filled with voices and was made audible – if only for an hour, to an international community of listeners. On the walls of the bunker, the inscription “Ruhe bewahren!”, the appeal to remain calm – once addressed to those seeking shelter – now read, as one attentive listener remarked, almost like a mantra meant to calm the ghosts.

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Research article

The Gusli as Instrument for an Artistic Synthesis of Word, Voice, Media, and Technology

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Abstract
The article examines the problem of interpreting the gusli in contemporary musicology as a phenomenon that extends beyond the boundaries of traditional organology. The instrument is analyzed not only as an acoustic system but also as a bearer of cultural memory, syncretically combining word, sound, vocals, and performance action, thereby forming a unique cultural code of national consciousness. Special attention is paid to modern stage practice, exemplified by the ethno-performance “The Tale of Igor's Campaign” (Moscow, 2026), which demonstrates the actualization of an ancient sound archetype in the context of 21st-century theatre, where the entire performance is sung with authentic voices in the Old Russian language. The article shows that the integration of the traditional acoustics of the gusli with electronic means, lighting technologies, and elements of artificial intelligence creates a new model of artistic synthesis. The work on the contemporary staging of “The Tale of Igor's Campaign” required the collaboration of specialists with diverse competencies in the humanities and technical fields of scientific knowledge. The article analyzes the constructive modifications of the instrument and the developed technical solutions aimed at expanding its dynamic and sound frequency range, ensuring the historical timbre meets modern stage requirements. The authors present to the reader a two-year period of work on the adaptation of this literary monument of the Old Russian epic, not only from the perspective of mass art-media technologies but also from the viewpoint of restoring the image of the Russian folk musical instrument and its repertoire within musical culture.

Keywords: The Tale of Igor's Campaign; Gusli; Folk musical instrument; Ethno-performance; Artistic synthesis; Acoustic range; Preservation of Cultural Heritage

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Научная статья

Гусли как инструмент художественного синтеза Слова, Голоса, Медиа и Технологии

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Аннотация

В статье рассматривается проблема интерпретации гуслей в современном музыкознании как феномена, выходящего за пределы традиционного инструментоведения. Инструмент анализируется не только как акустическая система, но и как носитель культурной памяти, в котором синкретически соединены слово, звук, вокал и исполнительское действие, формируя своеобразный культурный код национального сознания. Особое внимание уделяется современной сценической практике на примере этно-спектакля “Слово о полку Игореве” (Москва, 2026), демонстрирующего актуализацию старинного звукового архетипа в контексте театра XXI века, где весь спектакль исполняется аутентичными голосами на древнерусском языке. В статье показано, что интеграция традиционной акустики гуслей с электронными средствами, световыми технологиями и элементами искусственного интеллекта создает новую модель художественного синтеза. Работа над современной постановкой “Слово о полку Игореве” потребовала взаимодействия специалистов разных компетенций в гуманитарной и технических областях научного знания. В статье анализируются конструктивные модификации инструмента и разработанные технические решения, направленные на расширение его динамического и звукочастотного диапазона, что обеспечивает соответствие исторического тембра современным сценическим требованиям. Авторы представляют читателю двухлетний период работы над адаптацией литературного памятника древнерусского эпоса не только с позиции массовых арт-медиа технологий, но и с точки зрения реставрации образа русского народного музыкального инструмента и его репертуара в музыкальной культуре.

Ключевые слова: Слово о полку Игореве; Гусли; Народный музыкальный инструмент; Этно-спектакль; Художественный синтез; Акустический диапазон; Сохранение культурного наследия

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INTRODUCTION

In traditional academic literature, the gusli are described primarily from the perspective of classifying instrument types, analyzing their construction, acoustic properties, and performance techniques. This approach is important, but it captures only one aspect of the phenomenon and does not encompass its cultural-symbolic dimension.

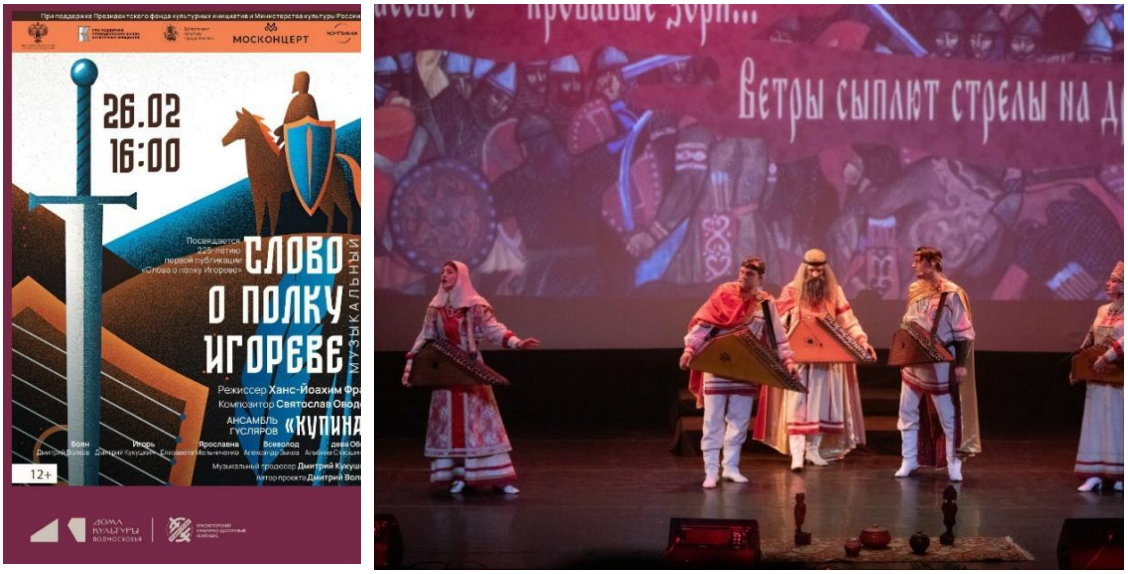
What are gusli? They are the most ancient Russian folk stringed plucked musical instruments. In their design and sound, they are direct relatives of the Finnish kantele, the Estonian kannel, the Mari kyusle, and other folk instruments, having spread across a vast territory of Eurasia following the migrations of ancient peoples and tribes. The gusli are a symbol of ancient musical culture and the embodiment of the heroic epic and bygone antiquity of many peoples. Among the gusli players (guslars) one can count the demiurge Väinämöinen from the Karelian epic "Kalevala," the merchant Sadko from the Novgorod bylina tales (Fig. 1a), and the hunter Saliy from the Mari epic "Yugorno." The Cyrillic letter 'G' ('Glagol') in the Old Church Slavonic alphabet is traditionally illustrated with a depiction of the gusli and a guslar (Fig. 1b).[1]

Figure 1. a) Sadko in the Underwater Kingdom. Ilya Repin's painting *Sadko* in 1876. The Russian Museum, Saint Petersburg (inv. Zh-4002). b) The letter "Glagol." On this page of the E. Bem «ABC», there is a small guslar sitting on a bench in a peasant hut, plucking the strings.

[1] The letter G is called "Глагол/ Glagol" and as a verb „glagol" means "to speak," "to utter words," or "to urge to action." Closely related, "Глас" (glas) is an old Church Slavonic or poetic word for voice. In grammar, voice (active/passive) shows the relationship between the verb's action and its subject – just as the human voice produces sound, the verb's voice produces meaning. (This footnote was generated with the help of AI.)

Meanwhile, in the context of contemporary culture, characterized by an active dialogue between past and present, the gusli becomes not only a source of sound but also a significant visual and dramaturgical element in musical projects. In particular, it offers symbolic and communicative potential in the accompaniment of vocal performances. This necessitates an expansion of analytical tools and a turn toward an interdisciplinary approach, combining elements of musical and engineering cultures. We propose to examine vocal performance with the gusli as a phenomenon that connects the acoustic nature of the instrument and its function as a bearer of cultural memory, augmented by a very recent technical innovation.

The ethno-performance “The Tale of Igor's Campaign” (Moscow, 2026), in which the gusli play a central role in shaping the sound and semantic space of the production serves as a key example for this analysis (Fig. 2).



a) **b)**

Figure 2. a) Official poster of the ethno-performance “The Tale of Igor's Campaign”; b) Premiere of the stage production featuring the ensemble of gusli players “Kupina”.

Examining the gusli in a broad cultural context, it is important to emphasize their connection with the oral tradition, heroic epic, and ritual practices. In historical consciousness, the instrument is persistently associated with the figure of the singer-storyteller, who not only vocalizes the text but also structures the time, space, and emotional state of the listeners. The sound of the gusli in this context fulfills the function of a mediator between the mythological past and the present, translating the narrative from the realm of abstract history into the sphere of lived experience. Thus, the instrument becomes a kind of “repository” of cultural meanings, which are actualized at the moment of performance.

In many cases, we can only speculate about the use of discovered artifacts as sources of sound. How music was made on such an instrument, under what circumstances,

whether these were isolated signals or sounds within some ensemble, whether they accompanied singing or dancing, often remains unknown. How are archaeological finds interpreted? On what basis is a particular artifact identified as a miniature trumpet or a frame drum? The materials obtained during excavations are insufficient here: it is necessary to reconstruct the historical context of the era (Khazdan, 2024; Treister & Ravich, 2021), and the classical scientific approaches associated with comparative metrological assessments of objects are insufficiently effective and clear.

The syncretism of word, sound, and performance action manifests itself in the fact that text, melody, and gesture do not exist in isolation but form a unified utterance in the case of a gusli accompaniment. The performer's manner of sitting, singing styles, the way of holding the instrument, the character of sound production, and even the pauses between phrases form a holistic image in which the aesthetic and semiotic principles are inseparable. For the contemporary researcher, this implies the necessity of considering the gusli player's performance as a complex performative act. In it, the voice and the gusli act not only as a sound source but also a visual sign, connecting the performer with a specific cultural tradition.

This approach allows for the interpretation of the gusli and singing in the Old Russian language within the categories of the cultural code of national consciousness. This code enshrines ideas about heroism, collective trials, spiritual fortitude, and connection to the land. When the instrument appears on the modern stage, it "transfers" these enduring meanings into a new artistic space, even if the specific plot of the production is not a reconstruction of historical events. Thus, the instrumental-vocal tradition proves to be an important means of shaping in the viewer a sense of belonging to a long historical lineage.

THE WORD AND THE GUSLI

The rise of interest in the history of gusli performance is associated with the publication of the text “The Tale of Igor's Campaign” in 1800 and the collection by Kirsha Danilov in 1804. In particular, Gavrila Derzhavin (1984) noted: “in ancient times, the Ode was accompanied by a simple melody; it was sung with a lyre, with a psaltery, with gusli, with a harp, with a zither, and in modern times with other instruments, but mostly, it seems, with stringed ones” (p. 273). As ideas about the Russian epic enriched, a generalized image of the gusli player-musician took shape in Russian culture – one equally mastering word and sound, extolling the glorious history of his native land, a bearer of the ethical and aesthetic norms of society in non-written form, a person elevated by the power of art and elevating others above everyday life.

Contemporary trends in academic musical culture expanded the gusli‘s significance. In the imaginative sphere of composers' works for the gusli in the late 20th and early 21st centuries it is no longer bound to – or serves only to invoke a reminiscence of – Russian culture. in. In these works, arrangements of dance and lyric folk songs, traditional for folk instruments, began to yield in number to large-scale concert pieces embodying epic byliny narratives, contemplative spiritual-religious, and sometimes stylized gallant aristocratic sound paintings. Evidence of the predominance in earlier

times of synthetic instrumental-vocal music-making has led to the revival of recitative singing with gusli accompaniment (self-accompaniment) –a practice that has only recently gained prevalence alongside solo or ensemble forms of performance. An understanding of contemporary trends in the development of gusli playing is impossible without a careful analysis and in-depth study of the centuries-old traditions associated with the history of this instrument (Volkov, 2019).

A vivid illustration of these trends can be found in a recent large-scale ethno-performance, where the fusion of epic narrative, spiritual contemplation, and stylized vocal-instrumental practice took center stage. The premiere of the ethno-performance *The Tale of Igor's Campaign* took place on February 19, 2026, at the Mosconcert venue.[2]

The ethno-performance serves as an illustrative example of how the ancient Russian sound archetype can be actualized in the theatrical space of the 21st century. The choice of this particular literary monument as the dramaturgical foundation is not accidental: “The Tale” is traditionally interpreted as a symbol of national memory and a reflection on the fate of the land and its people.

“The Tale of Igor's Campaign” was originally created by a cultural singer, authoritative and independent; the sung parts of "The Tale” were apparently created simultaneously with the chant-melos; at that same time (in 1185-1187), the text was written down from the retelling of a person who knew the entire poem by heart, possibly the author himself (Kulakovsky, 1946).

Most Russian folk instrumental cultures in the 20th century faced the problem of adapting to fundamentally new conditions of existence in the academic stage environment. However, while some folk instruments were destined for the first time to travel the path from an unpretentious means of organizing leisure to an instrument capable of realizing musically significant tasks, the gusli throughout their history were connected not only with entertainment and vernacular cultures but also with those cultures oriented toward deeper, more elevated purposes and images. The rich history of the gusli, the conception associated with them in our perception thanks to numerous surviving references and descriptions, distinctly sets them apart from related folk instruments (Zhuk, 2016).

In the cultural tradition that has been evolving over centuries, translations and artistic interpretations refer to one another and function as a single, multidimensional, ideologically charged text, obliging the interpreter to construct coherent versions. Hitting upon the right word for something and discovering its true name is like finding just the right key that fits the lock and opens the door to a new world with new powers. (Nordmann & Bylieva, 2021). Reconstruction is possible only through interaction with tradition. Tradition, however, is active (Yusupova, 2025).[3] The gusli continues itself,

[2] The director of the production was the German and Russian music manager Hans-Joachim Frey, the composer was Svyatoslav Ovodov, the project author was Dmitry Volkov, Dmitry Kukushkin served as music producer, and the performers were the ensemble of gusli players “Kupina.”

[3] Hermeneutic approaches to the deciphering of dead languages and words are most suitable for the restoration of the image and purpose of the gusli in the absence of reference samples. The ancient gusli are dead – this is a fact. But they carry the necessary information: The revival of this instrument will be associated with the creation of a beautiful, powerful, sonorous and practical sample, using the proportions

selecting those who know how to ask questions and seek answers. It is not enough to gather and present artifacts to the community, arranging them in some conventional order. Time shows that even open fixation (which can also include museum and exhibition displays) does not necessarily lead to understanding: with all due respect to generations of those wishing to gain knowledge without immersing themselves in the culture, this is precisely the case where the text, “if read, is not understood; if understood, is interpreted incorrectly... ” (Tikhomirov et al., 2023).

THE MEDIA CONTEXT

In the performance, the instrument is present not only as musical accompaniment to recitation or vocal episodes but also as an active participant in the stage action. The stage space is organized so that the gusli become the center of visual and acoustic attraction: mise-en-scènes, lighting accents, and sound climaxes are built around them. Due to this, the viewer perceives the instrument as a key symbol through which themes of memory, responsibility, and historical choice are comprehended. The sound image of the gusli, even with their technologically modernized timbre, maintains a connection with the ancient archetype – smooth, melodious, and contemplative.

A distinctive feature of the production was that work with vocals in the Old Russian language and the gusli is conducted on several levels simultaneously. On the one hand, it relied on traditional modal formulas, stable rhythmic patterns, and characteristic register-specific regional accents. On the other hand, these elements were integrated into the complex spatial-sound structure of the performance, which employed electronic processing, multichannel acoustics, and a lighting score. As a result, the instrument became incorporated into a contemporary multi-component media environment without losing its semantic significance (Lianskaya-Lininger, 2025). Thus, the constructive and acoustic properties of the gusli played a crucial role.

and functions of the original design which we have carefully studied.

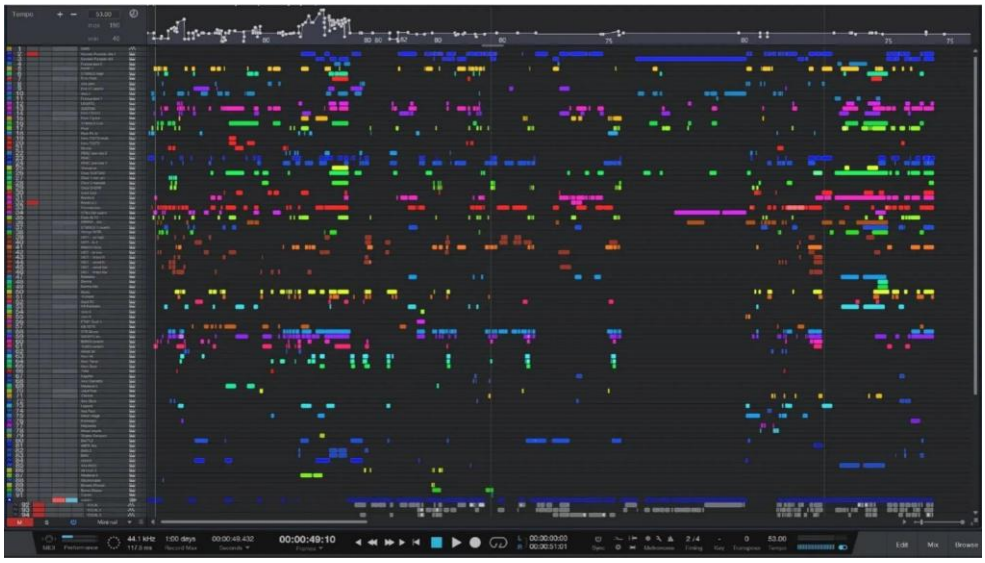


Figure 3. General sound score of the ethno-performance *The Tale of Igor's Campaign*, created in the program PreSonus Studio One 7 Pro.

A substantial part of the performance's artistic effect is associated with the integration of traditional singing (Ryzhinsky & Shao, 2024) and the acoustics of the gusli with electronic means, lighting technologies, and elements of artificial intelligence (Fig. 3). This integration makes it possible to transcend the boundaries of conventional concert sound and transform the performative act into a multilayered audiovisual event.[4]

It is important that the electronic processing does not replace the sound of the instrument but rather expands it, emphasizing specific timbral and dynamic qualities. Thanks to this, the recognizability of the gusli is preserved, while simultaneously creating a sense of their "revitalization" within a new technological context

In this tradition, the use of electronic means opens up the possibility of a multichannel spatial distribution of sound, where the original signal of the instrument is dispersed to different acoustic points in the hall. This creates the effect of a sound field in which the traditional timbre of the gusli is, as it were, "expanded" and envelops the viewer from all sides (Ryzhinsky, 2024).

Such solutions enhance the immersive nature of the performance and make the perception of the ancient material more personal and emotionally rich (Fig. 4). The viewers do not simply hear the gusli as part of the musical accompaniment but find themselves inside a sound space shaped by their intonations.

[4] The mention of the use of artificial intelligence applies only to the creation of the musical accompaniment (playback) for this project, where AI performs tuning of the secondary voice accompanying the soloists. During the live performance of the ethno-performance, AI is not used in the musical track – only in the realization of the visual sequence on the video projector.

Figure 4. The Lament of Yaroslavna performed by Elizaveta Melnichenko – the climactic lyrical center of *The Tale of Igor's Campaign*, embodying the theme of love, fidelity, and grief of the entire Russian Land.[5]

The integration of artificial intelligence elements into the project enables the implementation of a flexible model of interaction between live performance and the digital system. Algorithms can respond to the musician's playing in real time, modifying parameters of reverberation, filtering, or spatial sound distribution. This makes each performance of the production unique and emphasizes the performative nature of the event. Importantly, in such a model, the gusli retain their status as the original sound source and semantic core, while technologies serve as tools for the variable unfolding of their acoustic and symbolic potential.

Lighting technologies complement this synthesis by visualizing sound processes and linking them to the dramaturgy of the performance. Changes in the lighting palette, intensity, and direction of beams can be synchronized with changes in registers, dynamics, and texture of the gusli playing. Due to this, a unified audiovisual fabric is created in which sound and light mutually reinforce each other. In such a system, the instrument is perceived as a source not only of sound but also of light, which metaphorically correlates with the idea of the enlightening power of cultural memory.

[5] Here, the absence of musical accompaniment, like zero, is an important indicator of traditional gusli performance. Firstly, it's a gender factor – women did not play the gusli in the general sense. Secondly, Yaroslavna's lament is a prayer (with elements of paganism, characteristic of early Christian beliefs), in the Russian tradition without musical accompaniment, a cappella. However, this climactic moment of the play does not contradict the presence and influence of the gusli as an instrument in musical terms. It is like a long jump. Emotionally and stylistically, the director has organically played out this moment. The gusli are not present, but they condition the moment.

THE VOICE AND THE GUSLI

Several factors can be highlighted that influence the effect of the gusli on the performer's voice (Table 1). The vocalist's voice provides a smooth, continuous line with the ability for dynamic increase, vibrato, and the finest intonational nuances, whereas the gusli can deliver an instantaneous but decaying attack. This difference creates an ideal complementarity: the voice 'leads' the melodic line, while the gusli accentuate the meaningful beats, enhance dynamics, enrich the timbre of the voice, they can fill the pauses between breaths and play the part of secondary voices. At the same time, the instrument lacks natural vibrato, which paradoxically accentuates the singing voice to good effect. As soon as the voice takes a long note with vibration, the cold, direct sound of the strings underscores the warmth and living pulsation of the voice.

Table 1. Correspondence of the acoustic interaction between the performer's voice and the playing of the gusli

Parameter	Voice	Gusli
Sound production	Soft or firm, but always controlled: increasing air pressure allows for a smooth onset of sound	Instantaneous, sharp: plucking the string produces a "flash" with maximum amplitude in the first milliseconds
Duration of sound	Limited only by breath	Not limited when using the *tremolo* technique.
Decay	Controlled decay: the vocalist can sustain the tone evenly, increase volume, or stop the sound abruptly/smoothly	Natural exponential decay of the string or damping
Basic timbre	Individual: can be velvety, piercing, dark, bright depending on voice type (soprano, tenor, bass, etc.)	Has a metallic overtone when playing with a *plectrum*, and a soft tone when playing *pizzicato*. Timbre also depends on the string type – with copper winding (alto) or without winding (prima).
Timbre variation	Extremely rich: changing vowel rounding, raising/lowering the larynx, using head/chest resonance, covering, *vibrato*.	Depends on the point and method of contact with the string.
Intonation / Tuning	Constant: due to precise coordination of the laryngeal muscles, the vocalist can adjust intonation within milliseconds.	The instrument is tuned with a tuning key before playing. In rare cases, tuning with the key is used during performance.

Pitch control	Natural or conscious – periodic fluctuation of pitch and volume.	Pitch can be adjusted during performance using semitone eccentric switches. These allow changing the key while playing, thereby reducing or increasing the pitch range.

It should be noted that the instrument provides timbral and harmonic support to the performer's voice. The gusli serve as a 'supporting sound field' for the voice. Their rich sound and even tone across all registers allow the vocalist to freely experiment with timbre without fear of losing tonal orientation. Furthermore, the metal strings effectively 'cut through' the orchestral or noise texture (in the given example, this refers to the soundtrack of the ethno-performance *The Tale of Igor's Campaign* playing through the performer's monitors), maintaining the harmonic framework while the voice focuses on finer phrasing and semantic accents. Thus, the gusli do not compete with the voice but rather create a clear rhythmic-harmonic grid for it, highlighting the natural plasticity and emotional richness of the singing sound.

In order for the historical timbre of the gusli to fit organically into the demands of contemporary stage practice, a revision of the instrument's constructive parameters is required (Fig. 5).[6] One of the most important tasks becomes the expansion of the dynamic range, making it possible to achieve both delicate, almost whisper-like sounds and powerful, dramatically saturated climaxes. This can be achieved through the use of new types of wood, changes in the thickness of the soundboard, the construction of supporting elements, the type of strings, and additional elements such as semitone eccentric switches. As a result, the instrument acquires a more flexible response to touch, allows for quick retuning from one key to another, while preserving its characteristic timbral coloration.

[6] On the one hand, the classical reconstructive sound of the gusli would disappoint the listener with its boredom and monotony. Our perception of sound and voice has changed. Secondly, in the modern format of a play or musical, a wider palette of sound accompaniment is required as a rich background for vocals.

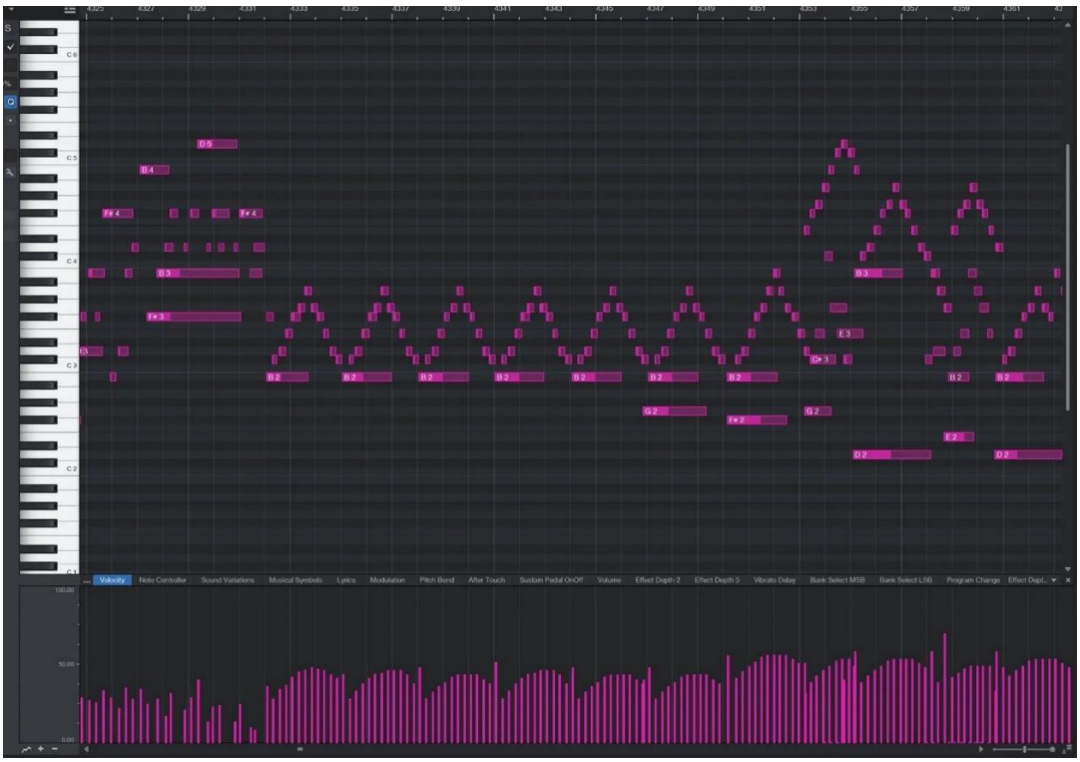


Figure 5. Recording graph of the acoustic range of the gusli- from the score of the ethno-performance *The Tale of Igor's Campaign* in the program PreSonus Studio One 7 Pro. The change in the front of the sound amplitude on the graph displays the change in playing technique and key after retuning via the semitone eccentric tensioners, which is impossible for the standard construction of the instrument.

An equally significant task is the expansion of the sound frequency range, necessary for the interaction of the gusli with playback, electronics, and vocal parts across a wide register field. Constructive solutions in this direction include increasing the number of strings, optimizing their arrangement, and developing tuning systems that ensure the stability of the tuning under intensive stage use. This creates the possibility of more precisely aligning the instrument's modal organization with contemporary harmonic structures, without destroying its traditional intonational characteristics. Thus, the gusli retain a connection with the historical sound but become more versatile in ensemble and stage conditions.

Technical innovations can also affect methods of sound reinforcement, where hidden sensors, piezo elements, and contact microphones are integrated into the instrument's body. This allows for capturing the sound with high detail and transmitting it to the electronic system without losing the subtle nuances of attack and decay. At the same time, the task for the designers is to preserve the visual authenticity of the gusli: externally, the instrument remains close to the traditional model, and the technological additions remain invisible to the viewer. In combination with thoughtful stage direction,

this creates the effect of the “natural” presence of an ancient instrument within a high-tech theatrical space.

MECHANICS AND THE GUSLI

To solve the problem of rapidly mechanical key switching a musical instrument's string during the process of sound production, we had to turn to the scientific experience accumulated in *Applied Mechanics* and the *Theory of Machines and Mechanisms*, as well as to illustrative examples from the collection of Franz Reuleaux (Kotelnikov & Kurakov, 2025) and earlier mathematical devices (Tikhomirov et al., 2024). At the same time, in addition to functional characteristics, the performing musicians imposed high ergonomic and aesthetic requirements on the device being designed.

When producing sound, the construction of the gusli does not have a fret system like the neck of a guitar, where the player presses a string against the wooden surface of the neck at a specific point to obtain the desired pitch. If the gusli has 17 strings, they are permanently tuned to the required notes, like on a piano. To obtain, for example, a semitone, you would need 34 strings, which significantly increases the instrument's size, making the design absurdly gigantic (e.g., the "Wonder Gusli"). Of course, the gusli player can use their free hand to press their fingers onto the string at an imaginary fret and touch it. And they do so. However, this damps the vibrating string, reduces the amplitude of the sound, and the sound becomes dull, quiet, and inexpressive. The solution is to create a mechanical switch on each gusli string, operated and controlled by the performer.

The newly designed device should be simple and easy to use, lightweight and compact, reliable under high loads, as well as visually neutral, blending seamlessly with the wooden structure of the gusli. For mechanical string tensioning, a cam controller is used as a simple and reliable device. Cam control is well known in the history of science and technology; its disadvantage is relatively low speed. At high switching speeds, the system loses rigidity, and errors or failures may occur. However, in the case of manual switching in a musical instrument, this is more than sufficient.

Tensioning devices based on an eccentric belong to cam mechanisms and are widely used as a rigid control apparatus for executing movement in a single plane (Fig. 6). Numerous examples of using an eccentric for clamping/tensioning can be found in the fields of mechanical engineering and machine tool accessories, in the textile industry, and elsewhere. In the manufacture of musical instruments, there is a common plate-type tension system (for example, patent RU2745139C2C, 2021).

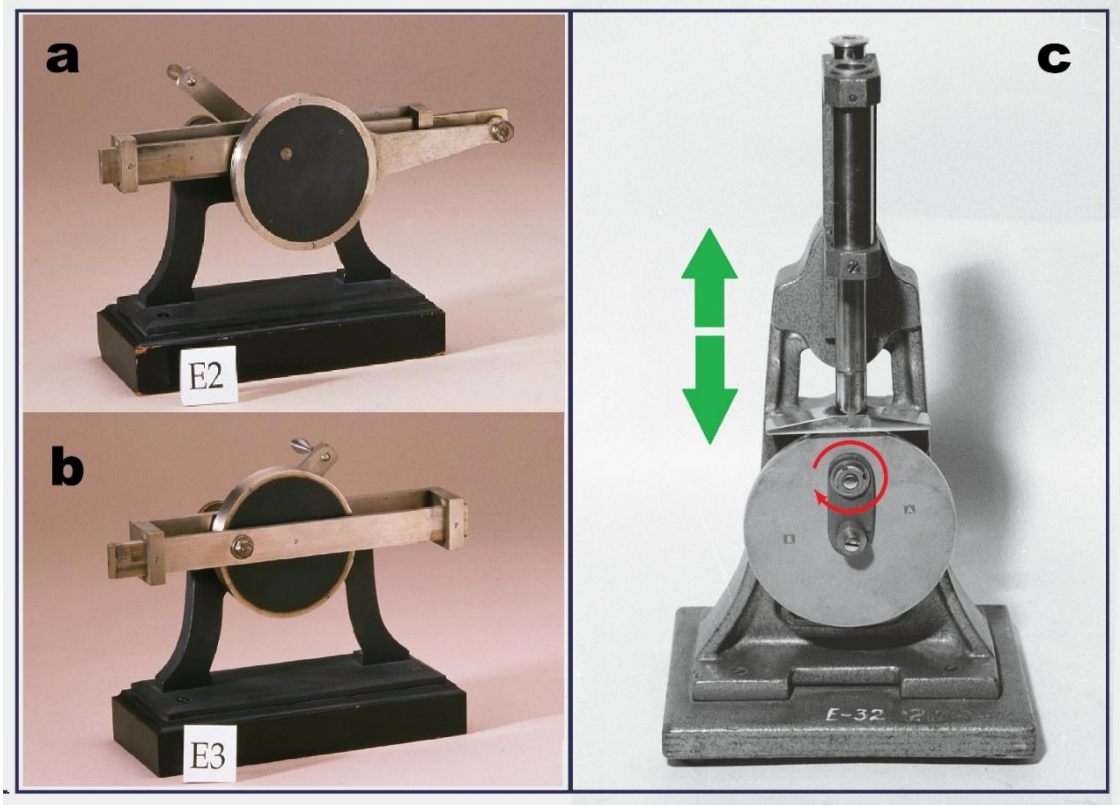


Figure 6. a, b) Models of kinematic mechanisms with eccentric cams from the Franz Reuleaux collection (KMODDL, 2026); c) The model of a cam mechanism with a flat follower and variable eccentricity served as a prototype for the new string tensioner (source: Fund of Bauman Moscow State Technical University's Museum).

The closest analogue in terms of the principle of regulating the pitch of a string is the lever mechanism on a harp – it has two positions, the difference between the upper and lower positions being a semitone. However, the classical design of the lever mechanism has significant differences: firstly, although the lever may employ a cam apparatus for tension, it is not adjustable on the harp; that is, the displacement of the string occurs strictly within a range of 0-2 mm (only 0 and only 2 mm). In our version with the eccentric, however, displacement is incrementally variable from 0 to 2 mm, including all intermediate values. Secondly, the tension force of nylon harp strings is up to 200 N (20 kg), whereas for the gusli it is 600-1000 N (60-100 kg) – which significantly impacts the design and dynamic calculation of the tensioner. Thirdly, from a musicological perspective, the harp and the gusli are fundamentally different types of musical instruments.

Analogues of eccentric tensioners for the gusli exist only in isolated instances, created in various workshops, but all of them possess low rigidity, are cumbersome, have a low level of reliability, and represent homemade devices similar to the lever mechanisms of a harp.

Thus, the goal of the development was to create a reliable and easily adjustable device that meets the requirements of high string tension, increases the operational lifespan of the musical instrument as a whole, provides convenient installation of the tensioner at different string heights through the use of an angled joint, and also offers the performer the possibility of expanding the frequency (note) range of the musical repertoire, taking into account the traditions of those who play close analogues of the gusli in their cultures.

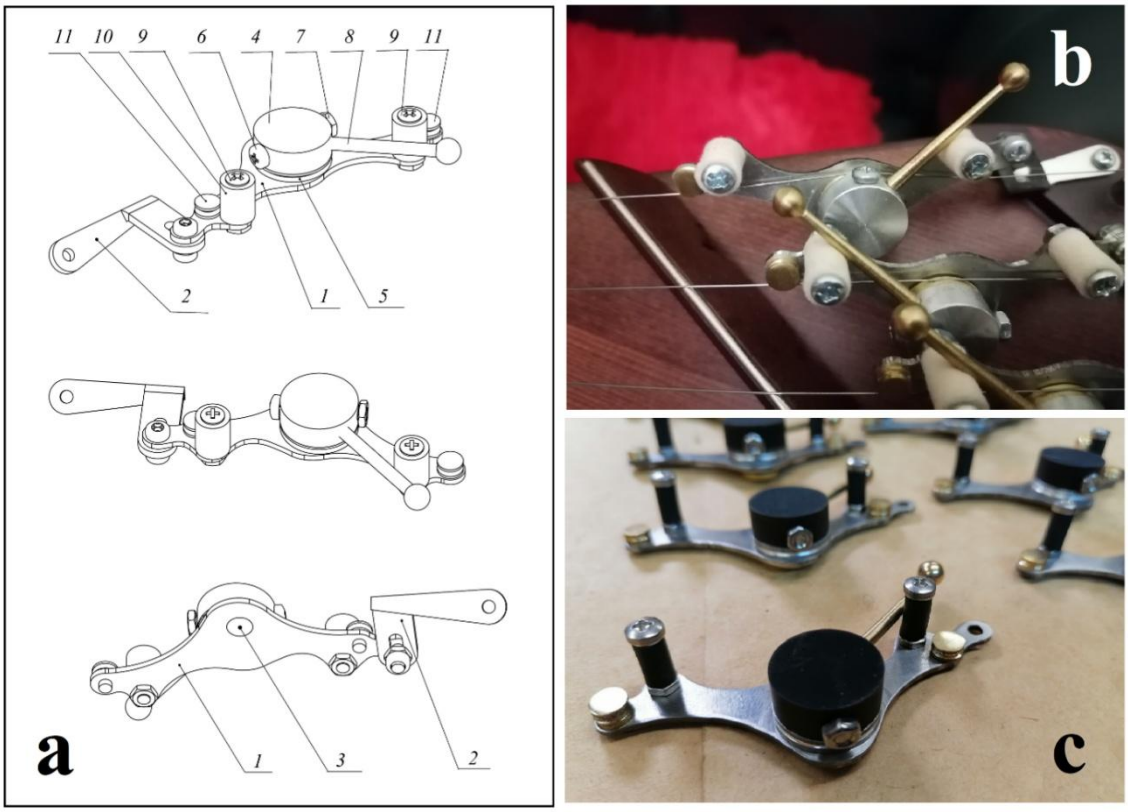


Figure 7. a) Assembly drawing of the general view of the eccentric string tensioner; b) Example of installed tensioners in working and non-working position; c) Tensioner with a carbon fiber eccentric made using additive technologies.

The key distinction from analogues lies in the improved universal design of the device, which allows it to be installed fin various types of folk musical instruments of the gusli family to double the acoustic range (the pitch of each string changes by a semitone) during the performer's interpretation of the musical repertoire (Fig. 7). The device consists of a base plate, produced by laser cutting (Biryukov et al, 2019), onto which all other parts are mounted, and a movable angle joint that enables adjustment of the device's installation height relative to the string's distance from the instrument's soundboard – a distinctive difference to other approaches. The eccentric shaft and the eccentric with a ring are mounted onto the base plate by means of a bolt and nut, which regulates the axial displacement of the eccentric from 0 to 6 mm with intermediate values. This eccentricity causes the lateral surface of the eccentric to rise in the extreme right position of the handle

from 0 to 3 mm (Fig. 6b). To secure the eccentric handle, there are two limit stops – the difference between the left and right positions of the eccentric handle corresponds to a semitone. There are two stationary string supports, riveted into the base plate; thus, the device contacts the string at three points – the two stationary supports from above and the eccentric ring from below – ensuring reliable force tension (Kukushkin et al., 2025).

To increase production efficiency and ensure a low product cost, a model of the eccentric was developed using durable carbon fiber-reinforced plastic (Kotelnikov et al., 2024), manufactured by methods of additive technologies (Kurakov et al., 2025; Supchinsky et al., 2023). The high precision of 3D printing and the absence of finishing mechanical processing made it relatively simple to carry out assembly operations, ensuring functional clearances in the operation of the mechanical system (Sinitsa, Korzhenkov et al., 2022; Sinitsa, Tumakova et al., 2022). Subsequently, it was discovered that, unlike the metal eccentric, the plastic eccentric proved to be less stable during the switching of tensioners under higher and cyclic loads, for example on alto gusli (Pronyakin et al., 2021; Volkov et al., 2024).

Finally, the aesthetics of such mechanical devices (Deng & Liggieri, 2025) play a significant role, encompassing ergonomics, light weight, reliability and simplicity, precision of assembly, and the minimalist quality of modern materials.

CONCLUSION

If we consider the gusli only within the context of contemporary musicology and theatrical practice, it becomes evident that this instrument cannot be described exclusively in categories of acoustics and constructive features. The Russian folk instrument emerges as a complex cultural phenomenon, in which the functions of a sound source, a visual symbol, and a bearer of historical-poetic memory are combined. In the ethno-performance *The Tale of Igor's Campaign* this multilayered nature manifests itself with particular clarity: the gusli becomes the foundation of an artistic space where an ancient Russian sound archetype and the possibilities of 21st-century theatre intersect.

The integration of traditional singing and the acoustics of the gusli with electronic means, lighting technologies, and elements of artificial intelligence forms a new model of artistic synthesis. In this model, technologies do not supplant tradition but serve as a tool for its actualization and expansion. Constructive modifications of the instrument, aimed at expanding its dynamic and sound frequency range, ensure that the historical timbre meets modern stage requirements without destroying its authenticity. As a result, the gusli appear not only as a sign of the past but also as an actively developing artistic resource capable of setting new directions in the development of national theatre and musical culture.

The implementation of such projects would simply be impossible without collaborative humanitarian and technical approaches, interdisciplinary subject connections that must be taken into account in modern educational methodologies when training specialists in engineering and humanitarian fields of scientific knowledge (Bazanchuk & Kurakov, 2021; Chicherina, 2024).

Analysis of stage practice shows that singing accompanied by the gusli in contemporary theatre can fulfill the function of a core element in a complex artistic synthesis. Various levels of expressiveness are built around the instrument: word, plasticity, light, electronic sound, visual projection. At the same time, it is the gusli that ensure the internal coherence of these components, since at the level of cultural memory they are associated with an integral, syncretic type of artistic thinking. It can be said that singing accompanied by a folk instrument becomes a model through which the possibility of connecting tradition and innovation within a unified artistic space is conceptualized.

This approach allows for a new perspective on the role of traditional instruments in contemporary culture. They cease to be perceived as museum exhibits or markers of folkloric reconstruction and become active participants in the current artistic process. In the case of the gusli, this is particularly noticeable, as the very image of the instrument is associated with the idea of narration, reflection, and spiritual quest. Contemporary technologies, integrating into this framework, do not negate it but, on the contrary, expand the field of utterance, translating ancient intonations into a language understandable to a 21st-century audience.

It is important to emphasize that such a synthesis requires a high degree of responsibility from directors and composers, as well as from designers and performers. If the technological component begins to dominate and displaces the live sound of the instrument, the key semantic center of the production is lost. At the same time, the careful and thoughtful use of electronic and lighting means can highlight the uniqueness of the gusli's timbre and the performer's voice, deepening the perception of the cultural memory associated with them. This constitutes one of the main creative challenges for contemporary projects that engage with traditional instruments.

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Research article

The Machinery of Weaving and the Woven Being: Decolonial Voices through Textile Computation

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Abstract

This article presents *TmaqT*, a research-creation project that explores how the notion of voice-sound can be reconfigured through physical interaction with a handcrafted textile surface, where tactile contact continuously modulates sonic processes. Instead of treating the voice as a pre-existing expressive capacity of the speaking subject, this idea redefines it as a relational and emergent acoustic field produced through the interaction between the body, the textile material, and algorithmic artificial intelligence systems. The system consists of a textile interface with integrated sensors that register variations in touch and translate them into real-time sonic transformations. These transformations are not conceived as linear input/output operations, but rather as dynamic covariations within a distributed field of material, temporal, and computational relationships. In this configuration, sound emerges as an unstable modulation process, rather than a discrete signal or a fixed sonic representation, avoiding dependence on presets or predefined audio files and instead activating latent computational spaces and AI-based processes. Framed within media archaeology and decolonial theory, *TmaqT* re-examines Mapuche textile and sonic practices, including weaving, but specially the *kultrun,* as alternative genealogies of memory, tactile interaction, and sound. This archaeological perspective brings historical tactile media into dialogue with contemporary algorithmic systems, proposing relational modes of sonic interaction based on touch rather than control. In this way, the project conceives of textile practices not as peripheral craft traditions, but as computational and epistemic systems that challenge linear narratives of technological progress. In general, a conceptual framework is developed in which the voice is understood not as an individual property, but as a co-emergent phenomenon that arises from the continuous interaction between textile surfaces, body gestures, algorithmic processes, and is approached as a distributed acoustic field generated through constant tactile variations, where material, temporal and bodily relationships become audible without stabilizing in a single origin, subject position or fixed representational structure.

Keywords: Textiles; Voice-Sonification; Media Archaeology; Relational Systems

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Научная статья

Механизмы ткачества и тканое существование: Деколониальные голоса через текстильные вычисления

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Аннотация

В данной статье представлен исследовательский проект *TmaqT*, изучающий, как понятие голоса-звука может быть переосмыслено посредством физического взаимодействия с текстильной поверхностью ручной работы, где тактильный контакт непрерывно модулирует звуковые процессы. Вместо того чтобы рассматривать голос как уже существующую выразительную способность говорящего субъекта, эта идея переопределяет его как реляционное и возникающее акустическое поле, создаваемое посредством взаимодействия между телом, текстильным материалом и алгоритмическими системами искусственного интеллекта. Система состоит из текстильного интерфейса со встроенными датчиками, которые регистрируют изменения тактильных ощущений и преобразуют их в звуковые преобразования в реальном времени. Эти преобразования рассматриваются не как линейные операции ввода/вывода, а как динамические ковариации в распределенном поле материальных, временных и вычислительных взаимосвязей. В этой конфигурации звук возникает как нестабильный процесс модуляции, а не как дискретный сигнал или фиксированное звуковое представление, избегая зависимости от предустановок или предопределенных аудиофайлов и вместо этого активируя скрытые вычислительные пространства и процессы на основе искусственного интеллекта. В контексте медиаархеологии и деколониальной теории *TmaqT* переосмысливает текстильные и звуковые практики мапуче, включая ткачество, но особенно культрун, как альтернативные генеалогии памяти, тактильного взаимодействия и звука. Эта археологическая перспектива вводит исторические тактильные медиа в диалог с современными алгоритмическими системами, предлагая реляционные режимы звукового взаимодействия, основанные на прикосновении, а не на управлении. Таким образом, проект рассматривает текстильные практики не как периферийные ремесленные традиции, а как вычислительные и эпистемологические системы, бросающие вызов линейным нарративам технологического прогресса. В целом, разрабатывается концептуальная основа, в которой голос понимается не как индивидуальное свойство, а как совместно возникающее явление, формирующееся в результате непрерывного взаимодействия текстильных поверхностей, жестов тела, алгоритмических процессов, и рассматривается как распределенное акустическое поле, генерируемое постоянными тактильными вариациями, где материальные, временные и телесные отношения становятся слышимыми, не стабилизируясь в одном источнике, субъектной позиции или фиксированной репрезентативной структуре.

Ключевые слова: Текстиль; Озвучивание; Медиаархеология; Реляционные системы

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INTRODUCTION

TmaqT (The Machinery of Weaving and the Woven Being) is an artistic research project that will explore how sound emerges from continuous tactile interaction with a textile interface. The system will consist of a large-scale woven surface with conductive fibers and capacitive sensing zones that detect variations in touch, pressure, and movement on the fabric. These signals will be captured and translated into real-time data streams, which will be processed using artificial intelligence tools such as latent spaces and the self-organization of haptic-tactile information, leading to sound generation. The interface will not be designed as a wearable device or a purely passive installation, but as a tactile instrument: a hybrid of textile, sensing infrastructure, and sound-generating system activated by direct bodily contact.

In this context, sound is understood as an emergent form of voice, not in the linguistic sense of speech or semantic articulation, but as a relational acoustic expression arising from bodily interaction. Here, the notion of voice emerges and is redefined as a process of enunciation without language: a dynamic modulation of sound production, shaped by gesture, intensity, and the temporal variation of touch. Instead of representing pre-existing sound material, the system produces sound through a continuous translation of tactile relationships, where the body does not “trigger” sounds but rather participates in their constant formation. For this research, the notion of voice is conceived as an acoustic field that emerges from the dynamic interaction between the body, the textile material, and algorithmic processes.

Instead of functioning as a conventional input-output interface, the textile will operate as a relational surface where bodily gestures, material transformations, and algorithmic dynamics co-evolve. Within this framework, the voice is not understood as the expression of a pre-existing speaking subject, nor as the simple sonification of tactile data. Instead, it is conceived as an acoustic field that emerges through the continuous interaction between the body, the textile materiality, and algorithmic processes. Therefore, the voice appears as a distributed and relational phenomenon, produced through continuous tactile variation and without a fixed origin, speaker, or representational structure.

The artificial intelligence would operate through mathematical structures that compress and reorganize information into lower-dimensional representations, reducing the complexity of the data to essential relationships and facilitating its interpretation and transformation without the need for exhaustive or literal processing. In this case, this information comes exclusively from tactile contact data and can also adapt to learn from interaction gestures. It is from this space of compression that sound synthesis emerges, not as a reproduction of pre-recorded events, but as a form of continuous articulation between variations of touch and their acoustic translation. In this sense, the voice is not understood as a fixed result or a stored entity, but as a process in flux: an acoustic emergence that occurs in the very interval between gesture and its transformation, where sound does not represent something prior, but is constituted as it unfolds.

In this context, latent spaces do not function as repositories of predefined sounds, but as dynamic environments of relation: systems where the distances and proximities

between tactile data are constantly reconfigured, allowing variable associations to emerge between gesture, memory, and sonic materiality. This dynamic does not stabilize a single form of sound, but rather sustains a field of continuous variation in which the “voice” can be understood as an entity always in transit, belonging neither to the body nor to the machine separately, but to their momentary coupling.

According to Goodfellow, Bengio, and Courville, latent spaces in machine learning are lower-dimensional internal representations in which a neural network organizes input data so that relevant variation factors are continuously and structurally encoded, facilitating data generation, interpolation, and reconstruction (Goodfellow et al., 2016).

The project's name derives from the idea that weaving is not only a process of producing a material structure, but also a relational condition in which all components of a system continuously affect, assemble, intersect, and transform one another.

In *TmaqT*, touch, textiles, sound, memory, and algorithmic processes will participate in a dynamic feedback loop. Information is woven through interaction, which simultaneously reshapes the informational and sonic conditions of the system. Therefore, the project does not conceive of technology as a linear sequence of input and output, but rather as an environment in which bodies, materials, and algorithms continuously coexist.

This conception departs from the idea of the voice as an individual expressive property and, instead, approaches it as a relational and emergent sound phenomenon. Rather than originating in a stable speaking subject, the voice is conceived as an acoustic event that arises through the continuous interaction of bodies, materials, and computational processes (Cavarero, 2005; Dolar, 2006).

The textile surface operates as an active modulation field where tactile variation would reorganize the system's sonic behavior in real time. Within this framework, *TmaqT* functions simultaneously as an artistic research platform, a system, and a conceptual model for investigating the voice as a distributed and emergent phenomenon, that is, a phenomenon that belongs neither to the body nor to the machine, but rather emerges in the vibratory interval of their continuous coupling: a relational machinery of sonic coemergence.

VOICE AS RELATIONAL EMERGENCE: TEXTILE SURFACES, TOUCH, AND SONIC RELATION

In this research, the voice is approached not as an expressive attribute of a pre-existing subject, but as a relational and materially situated phenomenon that emerges through the dynamic coupling of the body, the textile surface, and computational processes. The voice that emerges in this idea is understood as a distributed event produced in and through contact, where tactile interaction and material modulation co-constitute the conditions for real-time sound emergence.

Within this framework, the textile surface in the *TmaqT* system is not conceived as a neutral interface that transmits input to output, but as an active field in which these distinctions are produced. That is, contact will not function as a discrete signal to be interpreted, but will be considered as a continuous modulation of a material-semiotic environment in which sound phenomena take shape. In this sense, the system moves from

transmission models to modulation models, where the body, matter, and computation operate as inseparable components of a shared process of becoming-sound.

This reconfiguration implies a broader epistemological shift in the understanding of voice-interaction: instead of the exchange of information between predefined entities, what is at stake is the continuous reorganization of a relational field in which agency is distributed. From this perspective, the voice is neither something produced by a subject nor calculated by a machine, but rather a resonance that arises from the continuous covariation of tactile, material, and algorithmic dynamics.

To provide historical context for this proposal, textiles are considered here not as a prehistory of computing, but as autonomous systems of inscription that challenge linear narratives of technological development. While references such as the Jacquard loom have often been used to establish a genealogy of computing, this interpretation risks reducing textile practices to a transitional stage toward modern computational regimes (Zielinski, 2006; Kittler, 1999). In contrast, textile practices should be understood as heterogeneous systems of knowledge in which memory, materiality, and technique are inseparable.

From a decolonial perspective, this shift is crucial. Instead of integrating textile traditions into a Eurocentric history of media evolution, it is necessary to recognize multiple epistemologies of material thought that do not conform to linear temporal models of technological progress (Mignolo, 2011; Rivera Cusicanqui, 2010). In many contexts, textiles do not function as supports for inscription, but rather as active environments for knowledge production in which relational, spatial, and embodied forms of memory are encoded through practice.

In this sense, textiles are not interpreted as antecedents of writing or computing, but as parallel regimes of material intelligence. This allows us to rethink technology not as an external instrument applied to matter, but as a field of co-constitution in which symbolic, perceptual, and material processes continually generate one another.

Within this expanded framework, *TmaqT* does not propose a textile interface that produces sound solely through computational mediation. Rather, it investigates the conditions under which the voice can emerge as a relational resonance in a system where touch, matter, algorithmic processes, and sonic materiality participate in a shared field of variation. Artificial intelligence, in this context, does not operate as an autonomous entity with decision-making capacity, but as a distributed modulating layer that accompanies the system's dynamics without predetermining them. Its function is not to interpret or classify tactile information, but to participate in the continuous reconfiguration of relationships within the sonic field (Barad, 2007; Manning, 2013).

Consequently, the voice ceases to function as a property or a result, and appears as an emergent process situated within the ongoing co-constitution of bodies, materials, and computational environments. What becomes audible is not the translation of gesture into sound, but the relational intensity produced in the interval of their interaction.

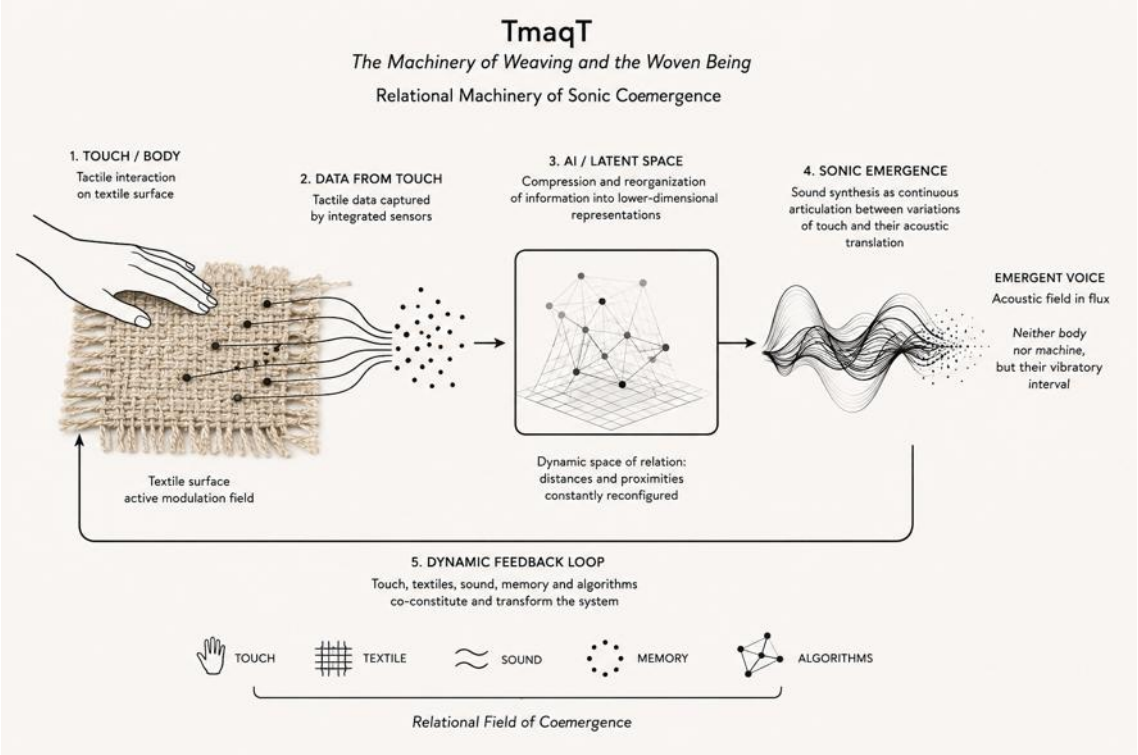

Figure 1. Outline of *TmaqT*: The overall structure of the proposed system is illustrated.

TEXTILE, TOUCH, AND VOICE: A RELATIONAL FIELD OF EMERGENCE

The textile surface, understood not as a passive support but as an operational material environment, sustains contact over time and allows for the continuous variation of sound production. In this configuration, sound does not appear as a fixed result, but as a process of continuous modulation that arises from the encounter between body and material. Touch operates here as a relational threshold through which the system is constantly reorganized, not as a stable configuration, but as a dynamic field of variation.

Within this framework, the pattern does not refer to a fixed form, but to the persistence of relational tendencies across temporal variations. Instead of being understood as a representation or translation of gesture, sound emerges as modulation: a continuous transformation of relational conditions rather than a conversion between discrete domains (Hayles, 2017). What is produced is not information in the classical sense, but an unstable configuration that is continually reassembled through contact.

From this perspective, sound does not constitute a secondary representation of touch. Based on Barad's (2007) notion of intra-action, what is at stake is not the transition between pre-existing entities, but rather the emergence of relationships through which matter, gesture, and sound mutually co-constitute one another. In this sense, vibration is not a sign of touch, but its material continuity in becoming.

The textile surface does not function as an external interface between body and system, but as the condition through which both are constituted. In this framework, perception, computation, and sound production operate as inseparable processes within a shared material field, in which touch extends into sonic variation and becomes audible as distributed resonance.

From this continuity, the voice does not emerge as a fixed property of the subject nor as a transparent expression of interiority, but rather as a relational effect of vibratory coemergence between the body, the textile, and computational and/or algorithmic processes. Following Manning (2013), the voice can be understood as movement rather than articulation: a process that does not originate from a stable source, but rather develops within relationships.

However, this relational understanding does not imply the disappearance of the situated subject. Instead of dissolving identity, the system redistributes agency throughout the interaction, while the specificity of each tactile contact remains irreducibly singular. In this sense, what is decentralized is not the subject itself, but the medium through which expression is produced. Therefore, the voice does not belong entirely to a user nor is it completely autonomous from them, but rather emerges as a situated and embodied event, shaped by their particular mode of contact, pressure, rhythm, and gesture. Thus, the voice is not produced as a closed result, but as a continuous modulation of the contact between bodies, materials, and temporalities.

The affective and attentional dimensions participate in this process. Affect can be understood as a pre-personal intensity that permeates bodies and technical environments (Massumi, 2002), while attention can be understood as a receptive orientation toward emerging, yet unstabilized, relationships (Weil, 1951). Within this field, the voice does not appear as expression or representation, but as a resonance sustained by a continuous relational negotiation.

Finally, this research situates *TmaqT* within textile and oral epistemologies in which knowledge is inseparable from material practice. In Shipibo-Konibo narrative embroidery and Mapuche textile traditions, the voice is not separate from making, but rather emerges in relation to situated configurations of body, territory, and memory. More than something said about the world, the voice here is understood as something that participates in its continuous material reconfiguration.

CONCLUSION

The voice, then, does not describe this future system; rather, it permeates it, sustains it, and makes it act in real time so that sound emerges from the interplay between body, skin, and matter. Here, a crucial question arises: *what becomes of voice when it ceases to belong to the speaker and begins to belong to that which intertwines in the friction between bodies, technologies, and situated memories?*

From a decolonial perspective, this question shifts the understanding of voice away from a neutral, objective or universal structure toward a situated historical composition. In this sense, voice does not appear as a property of the modern subject, nor as a purely technical effect, but as a form traversed by histories of extraction, translation, erasure,

and mixing. What "sounds" in the system is therefore not only a computational or technical operation, but also the capacity to generate resonances across long temporalities in which bodies, territories, and technologies have been continuously organized, fragmented, and rearticulated under different regimes of power.

From this perspective, thinking about voice implies recognizing that there is no purity in either fabric or tactile data: every surface is already historically and materially inscribed. Latin America, in this sense, cannot be conceived as a stable "origin," but rather as a field of tensions in which textile, oral, and technological epistemologies intertwine with histories of conquest, coloniality, globalization, and the migration of technical systems. The fabric here is not only metaphorical, but also a material and political condition: it is woven through local memories, but also through global infrastructures, imported languages, processes of data extraction, and contemporary regimes of sensory capture.

Within this framework, *TmaqT* presents itself not as a closed or autonomous system, but as a situated practice of reweaving: a machine that does not only produce a surface, but one in which the surface is itself designed to be continually rewoven. This weaving is enacted through human and non-human relations, ancestral and computational techniques, and heterogeneous frictions. In these frictions, the work does not aim to resolve tensions, but rather to render them audible, sustaining them as a condition for the very existence of the sonic field.

From this perspective, reflecting on the voice in *TmaqT* implies recognizing that there is no purity in either textiles or tactile data: each element is already historically and materially inscribed. The textile interface, therefore, is not a neutral sensing device, but a situated material system, shaped by specific technological and cultural lineages.

In this sense, what is often called "Latin America" should not be understood as a homogeneous origin or a stable cultural category, but as a situated field of technological and material conditions in which textile practices, oral traditions, and techno-technological infrastructures intersect. In relation to this future project, this perspective would become relevant insofar as the textile interface itself operates within a global circulation of technologies: sensors, microcontrollers, and data processing systems, which are never culturally neutral, but are always embedded in unequal histories of production and access.

Thus, the notion of weaving is not only metaphorical, but is situated materially and politically: it is interwoven through local practices of creation and memory, while intertwining with global infrastructures, imported technical languages, and contemporary regimes of data extraction and sensory capture.

If voice is understood as the ongoing reconfiguration between body, technology, memory, and power, then the central question becomes: *what forms of life, what memories, and what futures are woven when sounds: voices no longer belong to anyone, and yet continue to permeate everything?*

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Research article

Zero and the Machine: The Metaphysics of the Mechanical Voice in the Russian Avant-Garde

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Abstract

This article offers a novel reading of the legacies of Kazimir Malevich and Daniil Kharms through the lens of Jacques Derrida's philosophy of the voice. The focus shifts from a traditional analysis of plastic and poetic forms to an investigation of their fundamental project to deconstruct and reinvent the very act of utterance. We argue that a central problem for both artists was that of the mechanical voice – a voice alienated from the living presence of the speaker, a voice as technique. In his work *Ulysses Gramophone*, Derrida demonstrates how recording devices radically separate the voice from its source, turning speech into a quotation, an archival trace. Malevich and Kharms, however, do not lament this loss of authenticity but see in it a liberating and creative potential. The analysis begins with Malevich, whose *Black Square* is interpreted not only as a "zero of forms" but also as a voice-zero – the final result of an operation of economy that reduces utterance to its suprematist minimum. The futurist opera *Victory Over the Sun*, in whose creation Malevich participated as an artist and co-author of the libretto, is understood as the triumph of this new, machine-like, and dehumanized sonic landscape over the logocentric voice of classical culture. Daniil Kharms develops and complicates this program in the field of literature. His poetics of dysgraphia, malfunction, and absurdity constitutes a systematic sabotage of routineized speech machines – the printing press, the gramophone, and logical syntax. In his texts, the voice splinters, becoming a set of mechanical signals and autonomous phonemes, which finds its culminating expression in the enigmatic ritual poem "On the Death of Kazimir Malevich." The theoretical depth of the study is ensured by drawing on key concepts from media archaeology and the philosophy of technology: the media-archaeological approach of Friedrich Kittler and Valery Savchuk allows us to consider the voice as a product of material carriers; Steven Connor's ideas on ventriloquism shed light on the phenomenon of the alienated voice; Boris Groys's analysis helps place the avant-garde's quest within the ideological context of the era. Ultimately, the project of Malevich and Kharms appears not as a technocratic utopia but as a radical metaphysical and medial program for the creation of a new auditory episteme – a program whose prophetic power is revealed in the age of artificial intelligence and synthetic speech.

Keywords: Philosophy of the voice; Media archaeology; Russian avant-garde; Suprematism; OBERIU; Technique; Gramophone; Kazimir Malevich; Daniil Kharms; Jacques Derrida

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Научная статья

Ноль и машина: Метафизика механического голоса в русском авангарде

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Аннотация

Статья предлагает новое прочтение наследия Казимира Малевича и Даниила Хармса через призму философии голоса Жака Деррида. Фокус смещается с традиционного анализа пластических и поэтических форм к исследованию их фундаментального проекта по деконструкции и переизобретению самого акта высказывания. Мы утверждаем, что центральной для обоих художников была проблема механического голоса – голоса, отчужденного от живого присутствия говорящего, голоса как техники. Деррида в работе “Улисс-Граммофон” показывает, как записывающие устройства радикально разделяют голос и его источник, превращая речь в цитату, в архивный след. Малевич и Хармс, однако, не оплакивают эту утрату аутентичности, а видят в ней освободительный и созидательный потенциал. Анализ начинается с Малевича, чей «Черный квадрат» интерпретируется не только как “нуль форм”, но и как голос-нуль – конечный результат операции экономии, сводящей высказывание к его супрематическому минимуму. Опера «Победа над Солнцем», в создании которой Малевич принимал участие как художник и соавтор либретто, понимается как триумф этого нового, машинного и дегуманизированного звукового ландшафта над логоцентрическим голосом классической культуры. Даниил Хармс развивает и усложняет эту программу в поле литературы. Его поэтика дисграфии, сбоя и абсурда представляет собой систематический саботаж рутинизированных машин речи – печатного станка, граммофона, логического синтаксиса. В его текстах голос расщепляется, становясь набором механических сигналов и автономных фонем, что находит кульминационное выражение в загадочном стихотворении-ритуале “На смерть Казимира Малевича”. Теоретическая глубина исследования обеспечивается привлечением ключевых концепций медиаархеологии и философии техники: медиаархеологический подход Фридриха Киттлера и Валерия Савчука позволяет рассмотреть голос как продукт материальных носителей; идеи Стивена Коннора о чревовещании проливают свет на феномен отчужденного голоса; анализ Бориса Гройса помогает поместить поиски авангарда в идеологический контекст эпохи. В итоге проект Малевича и Хармса предстает не как утопия технократии, а как радикальная метафизическая и медиальная программа по созданию новой аудиальной эпистемы – программы, чья провидческая сила раскрывается в эпоху искусственного интеллекта и синтетической речи.

Ключевые слова: Философия голоса; Медиаархеология; Русский авангард; Супрематизм; Обэриуты; Техника; Граммофон; Казимир Малевич; Даниил Хармс

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INTRODUCTION: BEYOND THE HORIZON OF FORM

The narrative of the Russian avant-garde has traditionally been dominated by an optic of vision: the explosion of color, the geometry of form, the revolution of the plane. Yet, concealed behind this plastic upheaval lay a transformation no less radical and still inadequately comprehended – a transformation of the very principle of utterance, the problem of voice. Within the avant-garde, voice ceases to be an organic extension of the subject, a direct vessel for meaning or emotion; it becomes a technical problem, a raw material, an autonomous machine. This article proposes to investigate this "metaphysics of the mechanical voice" through the prism of a creative dialogue between two pivotal figures: Kazimir Malevich, who proclaimed the end of the objective world, and Daniil Kharms, who pursued the logic of absurdity to the point of a rigorous ontological system. We argue that what united them was not merely a formal quest, but a fundamental project to deconstruct and reassemble the very act of speech, framed within a zaum intermedial dialogue (Markov, 2025). Central to understanding this project is the conception of Jacques Derrida, who, in his work *Ulysses Gramophone*, revealed how technical mediation – here, the gramophone – radically cleaves voice from the moment of its live production, turning speech into a quotation, an archival trace, a “specter” (Derrida, 1988). However, whereas for Derrida this schism constitutes the paradoxical condition for the very possibility of writing and memory, Malevich and Kharms discerned within it not a tragedy of lost presence, but a liberating and generative opportunity. Their aim was the pursuit of an "absolute voice" – a kind of pre-human, zero vibration that could be disclosed solely through strategies of ultimate economy, systematic sabotage, and conscious mediation by the logic of technology. This pursuit was realized through the transmutation of voice into machine: for Malevich – via suprematist reduction to a sign; for Kharms – through the hacking and reprogramming of linguistic automatons.

PART 1. MALEVICH: ECONOMY AS VOICE AND THE DEHUMANIZATION OF SOUND

To apprehend the specificity of voice in Malevich, one must commence with the radical silence of his forms – or rather, with his famed formula of the “zero” as the starting point for a new art. Suprematism was not simply a new style but a total endeavor of ontological reboot, a reduction of the visible world to elementary, impersonal primal elements, to a pure act of energy. The black square upon a white ground is not an image but a manifesto for a new mode of world-perception and, crucially for our inquiry, a new mode of hearing, with a particular regime of corporeality (Sosnovskaia & Markov, 2025). Yet what does this manifesto proclaim on the level of sound? Jean-Philippe Jaccard, analyzing the philosophical system of Kharms that traces back to Malevich, identifies the “zero” as a key category – not emptiness, but a point of compression for all potentiality, a "negative showing" of the infinite (Jaccard, 1994). The *Black Square*, therefore, can be regarded as the visual equivalent of a voice-zero – an utterance brought to an absolute minimum, to a pure tone stripped of individual overtones, to a fundamental vibration antecedent to formed meaning. Malevich conceived this minimalism in terms of

economy, which Cornelia Ichin defines for him as the fifth, metaphysical dimension of art, rather than a utilitarian principle of thrift (Ichin, 2019). In the manifesto "On New Systems in Art," he explicitly calls the suprematist square "the economic plane of perfection of contemporaneity" (Malevich, 1995, p. 153). Economy here is a surgical operation of distillation, the elimination of all superfluity, including the "tremor of the hand," individual handwriting, psychological subtext, and ultimately, human timbre. Malevich deliberately employed rulers and airbrushes not for filigree execution, but for depersonalizing the artistic gesture, for creating a voice-object, a voice-sign. This sign does not demand interpretation because it is itself a fundamental, impersonal given, an architectonic element of a new reality, whose communicative power resides not in narrative, but in the very fact of its manifest, economical presence.

The culmination of this dehumanization of voice was the futurist opera *Victory Over the Sun* (1913), a key object for a media-archaeological reading. Here the metaphorical logocentric voice – the Sun as a symbol of reason, classical harmony, sanctified traditional order, and broadly, Western European culture founded on principles of visibility and clarity – is literally cast down into the abyss. Its defeat is not a triumph of darkness, but a liberation of space for an alternative mode of perception and sonority. The place of the harmonious choir is usurped by an organized cacophony – industrial noise, *zaum* speech, the roar of mechanisms, declamation deliberately stripped of melodic and semantic fluidity. The sonic sequence ceases to be an expression of an inner world and becomes raw material upon which complex montage operations are performed, anticipating the practices of twentieth-century *musique concrète*. This is not the voice of man, but the voice of an emergent post-human, machinic world, where subjectivity is dissolved in the energy of processes. In this context, the idea of Natalia Mazur regarding the specificity of Russian technicism becomes productive. Analyzing the image of the tram among the futurists, she describes it not as an instrument for altering sensibility (in the Italian model), but as an apparatus for "slicing the auditory," for orienting and assembling a new reality from fragments of experience (Mazur, 2023, manuscript). In *Victory Over the Sun*, Malevich and his collaborators create precisely such an "acoustic tram" – a machine that does not express but dissects the habitual soundscape, slicing from its wreckage a new, hitherto unheard composition. His project is the construction of a new auditory episteme from pure, depersonalized elements, where noise and *zaum* become not chaos, but a new order, a new grammar.

This radical rupture with the past acquires even sharper contours when juxtaposed with a concurrent, yet fundamentally distinct artistic search within Russian culture of the same years. Investigating Boris Pasternak's poem "Venice" (1913), Natalia Mazur uncovers a different strategy for engaging with the crisis of the old myth and the quest for a new language (Mazur, 2024). Pasternak, in Mazur's view, polemicizes against the Wagnerian idea of the *Gesamtkunstwerk* (all-encompassing work of art) – the total musical myth which in the early twentieth-century context often converged with nationalist and antisemitic narratives. Against Wagner's monolithic myth, Pasternak advances the principle of "*concordia discors*" – "harmonious discord," a harmony born from the unity of opposites. His "Venice" is not an operating theatre for dissecting the old voice, as in Malevich, but a laboratory for synthesizing a new one. Pasternak's sonic

stream is a "stream of consciousness," within which heterogeneous impressions, shreds of meaning, visual and auditory images coalesce, striving not for destruction but for a complex, dialectical unity. If Malevich, in *Victory Over the Sun*, performs a deconstruction of the sun-logos through machinic noise and *zaum*, then Pasternak in "Venice" seeks to find a replacement for the disintegrating myth within the very fabric of the stream of consciousness, in continuous becoming, where contradictions do not negate but enrich one another. Thus, Malevich's project appears in exceptionally stark, polarized light: he consciously chooses the path not of synthesis but of purification, not "*concordia discors*," but radical "*discors*" – discord driven to an absolute break with the entire prior auditory and semantic tradition. His mechanical voice is a voice after catastrophe, a voice beginning from zero in a world where the sun of traditional harmony has already been extinguished, and the sole source of light and sound is the energy of the very gesture of negation and construction from bare elements. This gesture, devoid of Pasternak's lyric subjectivity, becomes the foundation for the new, non-objective and impersonal acoustics of Suprematism.

PART 2. KHARMS: SABOTAGE OF THE LANGUAGE MACHINE AND VOICE AS A "SOARING" OBJECT

If Malevich, like an engineer, built a machine of voice "from scratch" using abstract elements, then Daniil Kharms, a technician-adjuster, worked with already existing, yet far from ideal, mechanisms of speech and writing. His laboratory was the page, infected with the noise of quotidian communication, ideological clichés, and banality. The philosophy of Kharms, as Olga Burénina rightly notes, is profoundly anarchic: it is aimed at unsettling all hierarchies, and foremost – the hierarchy of meaningful, logical utterance over nonsense (Burénina, 2006). His method is not the creation of a new purity, but systematic sabotage and readjustment. The key instrument of this sabotage becomes dysgraphia – deliberately "bad," erroneous writing. Misprints, grammatical malfunctions, the incoherence of characters are not carelessness but a precise technology. In an era when the printing press and gramophone standardized voice, turning it into a smooth, mass-reproducible commodity, Kharms introduced the virus of interference into the text. He restores to written speech its materiality, its "rasp," its glitch. This device can be understood through the media theory of Friedrich Kittler (Kotomina, 2014), for whom technical carriers (the printing press, the phonograph) determine the very structure of discourse, filtering and channeling information (Kittler, 1999). By confronting the impersonal standard of print with the personal "malfunction" of writing, Kharms exposes the operation of this filter. His text is a recording of a glitch in the system, of a gramophone needle stuck in a groove, producing not the expected word but an obsessive, absurd sonic gesture.

Kharms expounded the metaphysics explaining this poetics in the text "Objects and Figures Discovered by Daniil Ivanovich Kharms" (1927). He distinguishes five meanings of an object, where the fifth, highest, is its existential meaning, when an object exists "outside man," in a state of free soaring, or "hovers" (Kharms, 1999, p. 306). This resonates directly with Malevich's «zero" and "black square" as non-objective essences.

Voice within such a system is no longer an attribute of a character but just such a "soaring" object, an autonomous entity. Kharms's characters speak in fragmented phrases, clichés, illogical replies; their voices are mechanical signals, akin to indicator lights on a control panel, devoid of psychological depth. The disappearance of a character, a frequent plot device, is not a drama but merely the cessation of a signal, a break in the circuit. It is apt here to turn to Steven Connor's study *Dumbstruck*, where he traces the long cultural history of ventriloquism as a phantasm of the divided, alienated voice (Connor, 2000). Kharms's characters are essentially ventriloquist's dummies, but dummies without a concealed ventriloquist; their voices "hover" on their own, like autonomous, alienated objects in the empty space of the text. Voice is finally severed from the illusion of an integral personality, becoming a function of an impersonal textual machine.

PART 3. RITUAL AS MONTAGE: "ON THE DEATH OF KAZIMIR MALEVICH" AND THE AUTONOMY OF THE SPEECH MODULE

The most concentrated and enigmatic specimen of Kharms's work with the mechanical voice is the poem "On the Death of Kazimir Malevich," recited at the artist's coffin on May 17, 1935. This text is not an elegy in the traditional sense but a complex ritual action, a magical act of reassignment and assembly. As Natalia Zlydneva demonstrates, the poem contains elements of Malevich's cosmological utopia and archaic sacrifice (Zlydneva, 2016). However, for our theme, its "vocal" structure is paramount. The very first line – "Pamiati razorvav struiu" ["Having ruptured the stream of memory"] – performs a violence upon the natural, fluent flow of speech-memory. The voice must not be poured forth but torn out, constructed anew. Then appear strange lexeme-hieroglyphs: "Pe," "Trrr," "Agallon." These are not words in the ordinary sense but sonic supremes, analogues of the black square, circle, and cross. "Pe" – perhaps a cluster of writing (from "*pero*" [pen], "*pepel*" [ash]); "Trrr" – a pure mechanical sound, vibration, noise. Zlydneva deciphers the anagram "Pe-Trrr" as "Petr" – a reference to the "city of Peter" and, possibly, to the artist himself (Zlydneva, 2016). These elements are the building blocks of a new, machinic voice, which Kharms assembles upon the ruins of the human ("*gordost'iu sokrushiv litso*" ["having shattered the face with pride"]). The funeral ritual becomes a laboratory for the production of a post-humanist vocabulary.

A striking fact, noted by Robin Milner-Gulland and Olga Soboleva, lends this construction an even more "machinic" character: an almost identical text was written by Kharms ten days earlier and was titled "Message to Nikolai" (the addressee likely being Nikolai Oleinikov) (Milner-Gulland & Soboleva, 2016). Thus, Kharms utilized a ready-made speech module, reassigning it from a living addressee to a deceased one. This constitutes the highest degree of mechanization and autonomization of the poetic voice: the text functions as a program, an algorithm that can be executed for different communicative tasks by changing the variable "addressee." Voice definitively becomes a depersonalized instrument, a "surplus element" (using Malevich's own terminology), freely circulating and inserting itself into different contexts. This gesture anticipates the logic of modern digital templates and algorithmically generated content, where the uniqueness of utterance is subordinated to the recombination of standard modules.

PART 4. THE PHILOSOPHICAL FRAMEWORK: DERRIDA'S DECONSTRUCTION AND THE DIVIDED VOICE

The fundamental philosophical key to reading the project of Malevich and Kharms is the work of Jacques Derrida, particularly his reflections on the gramophone in the essay *Ulysses Gramophone*. Derrida's primary analytical function in our study lies in diagnosing the foundational condition of the mechanical voice: the necessary split between sound and its source. In Joyce, as Derrida demonstrates, the technique of writing splits and multiplies voices within the text, creating a polyphony of traces. Derrida investigates how the technical device of recording radically transforms the very nature of voice and memory. The gramophone, by fixing the voice, separates it from the moment of its emanation, from the "living presence" of the speaking body. The recorded voice becomes a quotation of itself, an archival trace, capable of infinite, yet spectral, reproduction. Derrida writes of the gramophone as a machine that "makes the ghost return" (Derrida, 1988, p. 34), implying that reproduced sound is always the return of an absent entity, a simulacrum of the original, whose authenticity is forever lost at the moment of recording. This perspective describes the tragedy of technical reproduction: the death of the unique, "warm" voice in the cold mechanism of repetition. Yet it is precisely here that our essential divergence from a passive-melancholic interpretation begins. As we have shown, Malevich and Kharms did not merely acknowledge this split but actively, even aggressively, built their aesthetics upon it. They accepted "spectrality" as the initial condition for a new art. The Derridean gramophone, for them, is not the grave of voice but its liberator. The separation of sound from source is simultaneously the liberation of sound from the dictate of intention, psychology, biography. Malevich, reducing voice to the zero of form and an economical sign, and Kharms, hacking voice through dysgraphia, were essentially working with this "spectral," alienated state as primary material. Their "mechanical voice" is precisely the voice that is always already recorded, always already separated, always already a quotation, even at the moment of its (illusorily) first utterance.

Deepening the Derridean logic, one might say that Malevich and Kharms anticipated Derrida's later conclusion that the very possibility of repetition, iterability, is inherent in any sign from the outset. If for traditional metaphysics voice is the symbol of the immediate self-presence of consciousness (phonocentrism), then Derrida demonstrates that it inherently contains a rupture, the possibility of its technical doubling and, consequently, alteration. The avant-garde project can be viewed as a radical practical realization of this theoretical premise. They take voice not as a given but as a construct subject to deconstruction and assembly on new foundations. *Victory Over the Sun* is an operation of deconstructing the logocentric voice-Sun, disassembling it into constituent noises and *zaum* elements. Kharms's texts are laboratory experiments demonstrating iterability and malfunction at the very heart of the language machine. Thus, Derrida provides us with a philosophical language to describe what Malevich and Kharms accomplished intuitively and artistically: they exposed the myth of the natural, integral

voice and began to work with voice as a technique of writing and reproduction, whose essence lies in dividedness, deferral, and the possibility of mechanical repetition.

However, while Derrida emphasizes the spectrality and secondariness of such recorded voice, focusing on its relation to an absent original, Malevich and Kharms draw a radical creative, almost positivist conclusion from this division. They are not fixated on loss; they look forward, toward the active construction of new vocal formations based on this accepted split. Their project could be termed a positive, productive deconstruction. The *Black Square* is not mourning for a lost image but a manifesto for a new visuality built upon its negation. Similarly, the mechanical voice is not an elegy for a living timbre but a program for a new auditory order. Derrida uncovers the condition of possibility for their art – technical mediation and division – while the artists themselves are concerned with the condition of realization: how to create a new force, a new type of utterance from this condition? Therefore, their dialogue with Derrida is one not of imitation but of development: from acknowledging the split to the heroics of construction upon its ruins.

In light of this Derridean reading, Malevich's central motif of economy acquires additional significance. Economy is not mere thrift but a strategy for attaining essence through the elimination of all that is accidental, personal, "noisy." In the context of voice, economy signifies the removal of everything that binds sound to the illusion of live, unique presence: timbre, emotional modulation, narrative fluidity. What remains is a bare framework, a scheme, a pure signal. This process correlates directly with the operation of the gramophone or of writing, which likewise filter out the "noise" of immediacy, leaving only a reproducible trace. By proclaiming economy as the fifth dimension, Malevich essentially makes this technical operation the core of his artistic method. He creates not a "recorded" voice, but a voice that is conceived from the outset as a recording, as pure reproducibility, lacking an original. Kharms, for his part, economizes differently: he economizes on coherence, meaning, grammar, exposing the very mechanism of language production, its glitches and conventions. Both, therefore, operate within the field opened by Derridean deconstruction of phonocentrism, yet move within it toward the construction of a new, consciously "technical" phonics, where voice finally acknowledges its machinic nature.

PART 5. MEDIA THEORY: THE MATERIALITY OF THE CARRIER AND THE CONSTRUCTION OF THE AUDITORY

If Derrida provides a philosophical diagnosis of the condition of the mechanical voice, media theory offers the analytical toolkit for examining its material and historical specificities. Here, the media-archaeological approach of Friedrich Kittler proves invaluable, effecting a decisive turn from meaning to carrier, from message to the channel of its transmission. For Kittler, "media determine our situation" (Kittler, 1999, p. xxxix), meaning that the very technical systems of recording, storage, and data processing – the phonograph, film camera, typewriter – filter, shape, and ultimately produce what we perceive as reality, thought, or art. The voice of Malevich and Kharms is a voice that has realized and internalized its medial determination. The suprematist square is an utterance that has reflected upon its plane as a carrier; Kharms's dysgraphic text is a writing that

demonstrates the materiality and conventionality of typographic font and the paper page. Their art can be termed "metamedial": it works not through a medium but with the medium itself, displaying its properties as the primary content.

Developing this materialist perspective, Jonathan Sterne's theory of sound in *The Audible Past* allows us to reconceptualize the very notion of the "mechanical voice." Sterne shows how sound recording technologies (the phonograph, gramophone) did not merely fix pre-existing sounds but actively constructed the very category of the "audible," creating new forms of listening, new notions of fidelity in reproduction, new social practices (Sterne, 2003). Technology was not a neutral mediator; it was an agent shaping auditory culture. In this light, Malevich's *Victory Over the Sun* appears not as a futurist fantasy but as an artistic modeling of a new auditory landscape born of the industrial and media explosion of the early century. Its cacophony is not chaos but a map of a new sonic space, constructed by machines. And Kharms's poetics is an investigation of how writing as a medium (and print is also a technology of reproduction) forms, distorts, and generates certain types of speech acts and subjects. Through Sterne's lens, their work reads as a prescient reflection on how media alter the very fabric of human experience, including the experience of speaking and listening.

Additional depth to this analysis is provided by Lisa Gitelman's concept of "new" media, articulated in her work *Always Already New*. Gitelman argues that each new medium, at the moment of its emergence, provokes a crisis and a redefinition of concepts of authenticity, reality, and the document (Gitelman, 2006). It is always perceived through the prism of old media and cultural forms, yet simultaneously proposes new protocols, new ways of being "in reality." The project of Malevich and Kharms can be regarded as an artistic response to such a media crisis. Their "mechanical voice" is an attempt to develop new protocols for speech and sound in an era when the old ones (lyric poetry, figurative painting, melodic music) were perceived by them as having lost their connection with a new, technically mediated reality. They did not attempt to adapt the old to new carriers; they sought to invent a voice immanent to these carriers, a voice that would be "always already new" – that is, conceivable only within the logic of technical reproducibility and medial rupture.

An important contribution comes from the original Russian media-philosophical school, represented by the works of Valery Savchuk, whose function in our argument is to provide meta-level concepts. Savchuk and his school (Konstantin Ocheretyany, Oksana Shtayn, and others), developing ideas of media archaeology, speak of a "topological turn" and "metamediality," emphasizing that contemporary (and avant-garde) art works not with images of things but with the very states and boundaries of media (Savchuk, 2013; Savchuk & Ocheretyany, 2021; Ocheretyany & Savchuk, 2022) or with media transformations of the body (Shtayn, 2010; Shtayn, 2011; Markov & Shtayn, 2025). This idea has been tested on digital media, leading to a conception of the metamediality of computer games and other cybernetic media (Ocheretyany & Pogrebnyak, 2024; Ocheretyany, 2024; Ocheretyany, 2025) but is also applicable to the medial turn of the avant-garde. The suprematist square and Kharms's dysgraphic text are precisely such "metamedial" objects: they display their own being-as-medium. They do not depict voice; they are its technical scheme, its architectonics. In this sense, they anticipate the digital

era, where code and interface become primary reality. This analysis, in turn, allows the placement of the avant-garde's quest within a broader ideological context, as undertaken by Boris Groys in *The Total Art of Stalinism*. Groys shows how the avant-garde, striving to create a new world, effectively developed the language and aesthetic procedures for a future total politicized aestheticization of life (Groys, 1992). The project of the mechanical voice can be viewed as a utopian (or, from today's perspective, dystopian) program for creating a new, purified of accidentality, almost technocratic language for the collective body – a language whose power lies in its reproducibility, standardization, and detachment from individual psychology. Thus, the synthesis of media theory – from Kittler and Sterne to Savchuk and Groys – allows us to perceive in the metaphysics of the mechanical voice not only an aesthetic but also a profoundly historical, technological, and political project for reprogramming the very mode of being-in-the-world through reinventing its primary instrument: the voice.

CONCLUSION: THE ECHO OF THE MECHANICAL VOICE

The metaphysics of the mechanical voice, understood as the slicing of the auditory and the systematic sabotage of language machines, exposes a different political perspective within the avant-garde project, one left in the shadows by Groys's analysis. The key question is this: does the "mechanical voice" necessarily serve the total aestheticization of life described by Groys, or can it function as a tool of resistance against any totalizing order? Our analysis of Malevich and Kharms strongly suggests the latter. Groys has compellingly demonstrated that the avant-garde aspiration to transform the entirety of reality into an artwork was later appropriated and instrumentalized by the totalitarian state, which turned art into a form of political theurgy. This logic, however, relies on the principle of synthesis and construction – the assembly of a unified, monolithic language-myth, a new *Gesamtkunstwerk*. The strategies of Malevich and Kharms, in contrast, are driven by an opposite impulse: analysis, decomposition, and sabotage. If totalitarian aesthetics produces a seamless surface of meaning – a harmonious, unified voice of the collective body – the "mechanical voice" of the avant-garde systematically introduces rupture, interference, and glitches into this surface.

This anti-totalizing function operates on several levels. First, on the level of the sign: Malevich's suprematist economy does not build a new cathedral of forms but reduces utterance to a "zero," a bare signal, which, by virtue of its semantic emptiness, resists any definitive ideological appropriation. The Black Square can be read as a radical refusal to speak the language of power, a retreat into a non-signifying, purely energetic presence. Second, on the level of language: Kharms's poetics of dysgraphia, absurdity, and autonomous phonemes ("Pe," "Trrr") work to dismantle the grammatical, syntactical, and narrative structures upon which any normative, authoritative discourse depends. His texts do not propose a counter-ideology; they corrode the very machinery of ideological utterance from within, demonstrating its conventionality, fragility, and latent absurdity. Third, on the level of media: their metamedial gestures expose the carrier, the frame, the channel of transmission, thereby demystifying the claim to immediacy and naturalness upon which totalitarian rhetoric (with its cult of the "living voice" of the leader) so heavily

relies. The mechanical voice announces its own artificiality, and in doing so, subverts the fiction of an organic, unified national or class subject. Thus, the "technique of resistance" we identify in Malevich and Kharms is not a positive political program but a set of immanent operations – reduction, malfunction, metamedial exposure – that prevent language and sound from solidifying into a new dogma. Their anarchic charge, of which Olga Burénina has written in relation to Kharms (Burénina, 2006), is preserved precisely in this perpetual destabilization. The mechanical voice is a voice of permanent revolt against the finality of any form.

The project of the mechanical voice in the Russian avant-garde, embodied in the dialogue between Kazimir Malevich and Daniil Kharms, therefore emerges not as a narrowly aesthetic experiment but as a vast metaphysical and medial program. It was a search for the "zero degree" of utterance – a voice purified of psychologism, individuation, and direct subordination to meaning, a voice understood as a fundamental technology. What unites them is a fundamental refusal of nostalgia for the "living" voice in the spirit of Derridean critique of the metaphysics of presence. Instead, they consciously immerse themselves in the very heart of technical alienation, seeing in the gramophone, the printing press, the very matter of the sign not enemies of the human but allies in the task of constructing a new reality. This metaphysics of the mechanical voice acquires an ominous and fruitful relevance today, in the era of voice assistants, deepfake audio, synthesized vocaloids, and algorithmic poetry. The Russian avant-garde offers us not ready-made answers, but an effective diagnostic tool and a profound aesthetic challenge. It reminds us that behind the eternal question "What did the author intend to say?" there always lurks a more fundamental question: "What machine – and in what medium – allowed this utterance to come into being?" In this sense, the echo of the mechanical voice of Malevich and Kharms resounds within our digital realities louder than ever before.

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Research article

To Hear the Form, to See the Sound: “The Voice of Matter” in Artistic Language

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Abstract

This article analyzes artistic practices of the 20th and 21st centuries through the prism of a processual understanding of artistic form. Using the works of Wassily Kandinsky, Alvar Aalto, and Sergei Filatov as examples, it explores the concept of “the voice of matter” as an analytical category describing situations in which the artistic element, material, space, or acoustic environment begin to participate in the emergence of form and the organization of perception. It is shown that in these practices, artistic form is understood not as the realization of a predetermined image, but as the result of the interrelationship between the artistic element, material, environment, technology, and perception. In Kandinsky's painting, the autonomization of the artistic element and the convergence of visual composition with musical organization are analyzed. In Aalto's architecture, space is considered as an acoustically and bodily experienced environment, where material and perception participate in the formation of architectural experience. Sergei Filatov's sound art explores the processual nature of sound form, emerging through resonance, vibration, and the technological mediation of acoustic processes. Methodologically, the article combines a phenomenological approach to perception with an interdisciplinary analysis of visual, architectural, and sound practices. It concludes that the concept of "the voice of matter" allows us to describe the shift in artistic thinking in the 20th and 21st centuries, in which the artistic element, material, technology, space, and perception all begin to participate in the emergence of artistic form.

Keywords: The voice of matter; Production of form; Artistic language; Processuality in art; Perception; Technology; Sound art; Abstraction; Architecture; Interdisciplinarity

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Научная статья

Слышать Форму, Видеть Звук: “Голос Материи” в Художественном Языке

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Аннотация
Статья посвящена анализу художественных практик XX–XXI веков через призму процессуального понимания художественной формы. На примере работ Василия Кандинского, Алвара Аалто и Сергея Филатова исследуется понятие “голос материи” как аналитическая категория, описывающая ситуации, в которых художественный элемент, материал, пространство или акустическая среда начинают участвовать в возникновении формы и организации восприятия. Показано, что в рассматриваемых практиках художественная форма понимается не как реализация заранее заданного образа, а как результат взаимосвязи художественного элемента, материала, среды, технологии и восприятия. В живописи Кандинского анализируется автономизация художественного элемента и сближение визуальной композиции с музыкальной организацией. В архитектуре Аалто рассматривается пространство как акустически и телесно переживаемая среда, где материал и восприятие участвуют в формировании архитектурного опыта. В саунд-арте Сергея Филатова исследуется процессуальный характер звуковой формы, возникающей через резонанс, вибрацию и технологическое опосредование акустических процессов. Методологически статья сочетает феноменологический подход к восприятию с междисциплинарным анализом визуальных, архитектурных и звуковых практик. Делается вывод о том, что понятие “голос материи” позволяет описывать изменение художественного мышления XX–XXI веков, при котором художественный элемент, материал, технология, пространство и восприятие начинают участвовать в процессе возникновения художественной формы.

Ключевые слова: Голос материи; Формообразование; Художественный язык; Процессуальность; Восприятие; Технология; Саунд-арт; Абстракция; Архитектура; Междисциплинарность

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INTRODUCTION

The artistic turning points of the 20th and 21st centuries are associated not so much with the emergence of new forms as with a shift in the very understanding of art. The artist gradually abandons the concept of the artwork as the realization of a predetermined image and begins to consider the artistic element, material, space, sound, and technology as factors influencing the emergence of the artistic form.

This shift is associated with a crisis of representation and the search for alternative foundations of artistic language. Attention shifts from the image to the conditions under which artistic experience emerges: the autonomy of the artistic element, the properties of the material, the perception of space, and the role of technology in organizing the environment.

Despite the development of interdisciplinary artistic practices, art history still frequently examines visual, architectural, and sound forms in isolation. As a result, it becomes more difficult to identify the general principles of artistic thinking manifested across various types of art.

This article juxtaposes the practices of Wassily Kandinsky, Alvar Aalto, and Sergei Filatov – the artists in whose works form emerges through the relationships between the artistic element, material, space, and the acoustic environment.

The purpose of this study is to describe an artistic strategy in which form emerges through the interconnection of the artistic element, material, space, technology, and perception, as well as to clarify the analytical potential of the concept of “the voice of matter.”

This study does not attempt to establish a direct line of influence between the three creative personalities, but rather to explore a comparable shift in understanding of artistic form. In Kandinsky's works, the artistic element becomes autonomous; in Aalto, space begins to be understood as an environment of perception; and in Filatov's sound art, artistic form acquires a processual and acoustic character.

Thus, the article traces a consistent shift in artistic thinking from the autonomy of the artistic element to space as a perceptual environment and further to a processual acoustic field.

The research is based on a comparative analysis of artistic practices. Methodologically, it relies on a phenomenological approach to perception and an interdisciplinary analysis of visual, architectural, and sound practices.

THEORETICAL FOUNDATIONS: “THE VOICE OF MATTER” AS AN ANALYTICAL CATEGORY

In this article, “the voice of matter” is understood not as a metaphor for animated material, but as a situation in which the properties of an artistic element, material, space, or acoustic environment begin to participate in the morphogenesis and organization of perception.

We are referring to artistic practices where form is not pre-given but emerges as a result of the co-organization of the artistic element, material, environment, technology, and the perceiving subject.

At the same time, “the voice of matter” cannot be reduced to a simple consideration of the physical properties of the material. In engineering logic, the properties of the environment are subordinated to a pre-determined design. In the artistic practices under consideration, the physical parameters of the material, space, or acoustic environment are capable of influencing the very process of the artwork's emergence and altering its final configuration.

Material in this case is viewed not only as an object of artistic impact, but also as a factor capable of influencing morphogenesis along with the organization of perception. The artistic outcome is not completely predefined, but arises as an effect of the processual coordination of various elements of the environment.

Such an understanding is closely linked to the phenomenological tradition in which perception is viewed not as a passive reading of a ready-made form, but as an active co-participation of the subject and the world. As Maurice Merleau-Ponty demonstrates, the meaning of an object is revealed through the process of perception and the bodily presence of a person within the environment (Merleau-Ponty, 1962).

In this perspective, the artistic form is understood not as a finished object, but as a processual configuration arising through the co-presence of material, space, technology, and perception.

Operationally, the concept of “the voice of matter” describes situations in which the properties of an artistic element, material, space, or acoustic environment begin to affect the organization of the form and character of perception. However, the modes of such participation vary depending on the artistic medium. In Kandinsky's painting, this shift manifests itself in the autonomization of the point, line, and color, which organize perception independently of the function of representation. In Aalto's architecture, morphogenesis begins to be determined by the spatial and acoustic parameters of the environment. In Filatov's sound art, the artistic form emerges as a variable acoustic field depending on resonance, movement, and technological mediation. Thus, “the voice of matter” serves not as a metaphor for a “talking material” but as a method for describing various forms of participation of the artistic element, environment, and perception in the emergence of form.

An additional dimension of this approach is associated with a state of deep immersion in the process. The concept of “flow,” proposed by Mihaly Csikszentmihalyi, allows us to interpret such artistic practices as forms of intense processual engagement, in which action, perception, and environment begin to function as a single dynamic system (Csikszentmihalyi, 1990/2025).

Consequently, “the voice of matter” acts as an analytical category that allows for describing artistic practices in which material, space, technology, and perception form a unified system of morphogenesis.

WASSILY KANDINSKY: THE AUTONOMIZATION OF THE ARTISTIC ELEMENT

The transition to abstraction at the beginning of the 20th century was not merely a formal experiment, but a radical revision of the nature of artistic language. In the paintings of Wassily Kandinsky, the artistic element gradually liberates itself from the function of depicting the external world and begins to function as an independent expressive structure.

In his treatise *Point and line on a plane* Kandinsky describes the point not as a geometric abstraction, but as an element possessing an inner tension and the capacity to generate movement. The line is considered as a result of the movement of the point, and the composition – as a system of dynamic relationships.

What becomes fundamentally important is that the point, line, and color begin to act as autonomous forces of the artistic space. The plane of the painting ceases to be a surface for depiction and turns into a field of interacting tensions, rhythms, and directions.

Kandinsky emphasizes the independent expressiveness of artistic elements: “Color is a power which directly influences the soul” (Kandinsky, 1911-1926/2025, p. 48). This formula establishes an active, rather than auxiliary, role for color in organizing perception.

Another crucial principle becomes the idea of inner necessity: “All means are sacred if they are internally necessary…” (Kandinsky, 1911-1926/2025, p. 69). The artistic form here is understood not as an external construction, but as a result of an internal process of becoming.

This logic manifests itself with particular clarity in his “Compositions” series.

In “Composition VI” (1913) (Fig. 1), the pictorial space is constructed on fluid, almost water-like rhythms. Color masses merge into one another, forming a dynamic and unstable compositional structure. The composition is perceived not as a fixed structure, but as the movement of the process.

Figure 1. Composition VI (Wassily Kandinsky, 1913). Oil on canvas. 195x300 cm. © The State Hermitage Museum, St. Petersburg, 2026. Photographer P.S. Demidov.

In “Composition VII” (1913) (Fig. 2), the space reaches maximum saturation. A multitude of lines and color streams create a complex field of tensions, completely devoid of a stable center. The viewer's perception is intergrated into a system of rhythms and movements that organize the compositional space.

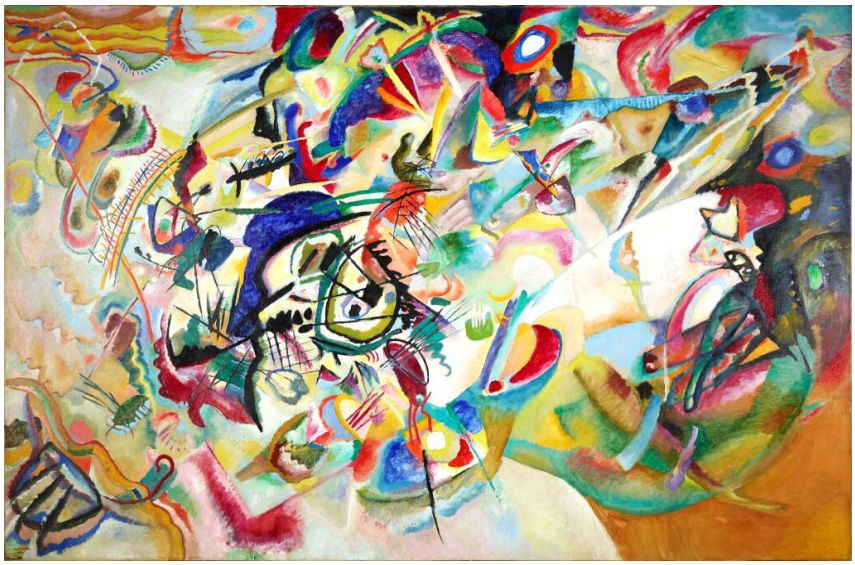

Figure 2. Composition VII (Wassily Kandinsky, 1913). Oil on canvas. 200x300 cm. From the collection of the Tretyakov Gallery. https://my.tretyakov.ru/app/masterpiece/10873

“Composition VIII” (1923) (Fig. 3) demonstrates a different stage in the development of Kandinsky's artistic language. Geometric elements – circles, lines, and planes are arranged into a more analytical and rhythmically organized system. However, even here, the composition continues to function not as a depiction of an object, but as an organization of relationships between elements.

These compositions demonstrate that abstraction in Kandinsky's work is not a singular rejection of representation, but a consistent modification of the methods of morphogenesis.

It is particularly significant that Kandinsky's artistic composition is increasingly built upon principles close to musical organization. Color and graphic elements interact as rhythmic structures, and the pictorial surface itself begins to be perceived as a field of intervals, tensions, and dynamics.

In this sense, visual perception begins to be organized according to principles close to acoustic perception: the composition is perceived as a system of rhythms, intervals, and directions unfolding in time.

Thereby, a fundamental shift occurs in Kandinsky’s work: the artistic element ceases to be a means of depiction and begins to directly organize perception.

The status of the artist changes as well. The artist no longer acts exclusively as a creator of an image or an interpreter of external reality. His task lies in organizing the relationships between the elements of the artistic system, inside of which form emerges through a process of co-becoming.

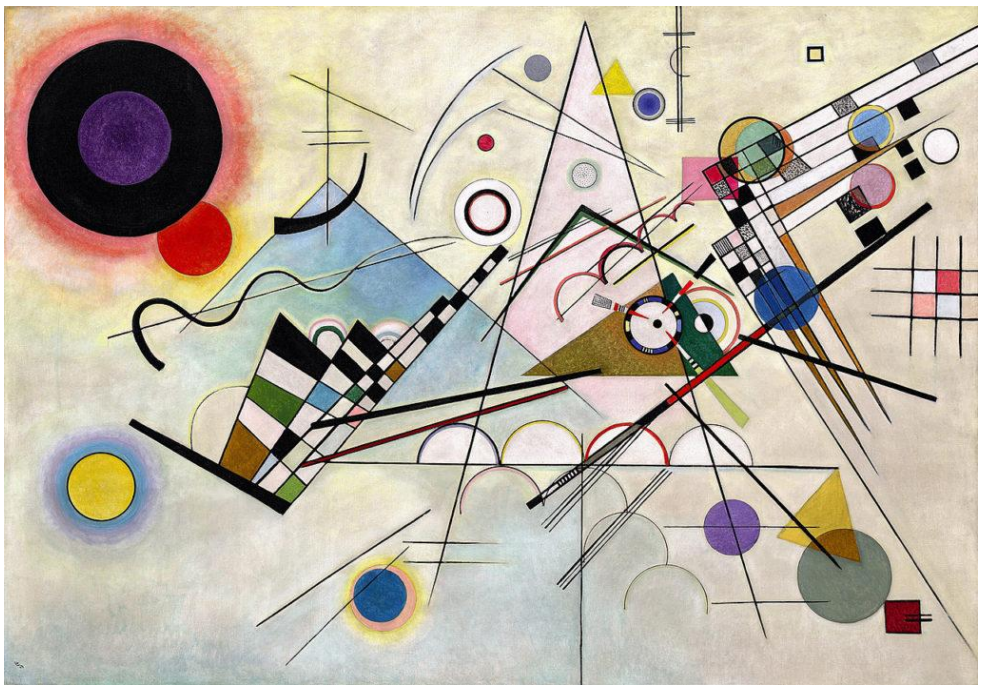

Figure 3. Composition VIII (Wassily Kandinsky, 1923). Oil on canvas. 140x201 cm. From the collection of the Solomon R. Guggenheim Museum, New York. Source: https://ru.wikipedia.org/wiki/Композиция_VIII

In this sense, the pictorial surface in Kandinsky's work becomes a space in which the artistic element acquires relative autonomy and begins to participate in the organization of perception independently of the function of depiction. It is precisely this shift that creates one of the prerequisites for a subsequent understanding of artistic form as a process arising through the relations of the element, the environment, and perception.

ALVAR AALTO: SPACE AS AN ENVIRONMENT OF PERCEPTION

If in Kandinsky’s work the autonomization of artistic language occurs within the pictorial plane, then in Alvar Aalto’s architecture, a similar shift extends to space as an environment of perception.

Architectural modernism of the first half of the 20th century frequently strived for universality, rationality, and geometric rigidity. However, in Aalto's projects, space ceases to be understood solely as a functional structure.

In his article “The Humanizing of Architecture,” Aalto emphasizes the necessity of taking into account the psycho-physical perception of a human being, going beyond purely functional tasks (Aalto, 1940). According to Aalto, architecture should correlate not only with construction and function, but also with the movement of a person inside the space, acoustics, and the character of the environment’s perception.

In this logic, the properties of material acquire special significance. In Aalto's projects, material is considered not only as a technical element of construction, but also as a factor in spatial organization. Its texture, plasticity, and acoustic properties participate in shaping the architectural experience.

This position is linked to an understanding of material as an open process of artistic work. Aalto wrote: “From the artist's point of view, the material is in a constant state of disclosure, in the course of which the artist finds more and more new expressions stemming from the very nature of the material” (Gozak, 1978, p. 94).

As Juhani Pallasmaa notes, Aalto's architecture shapes a space oriented not only towards visual perception, but also towards the experience of a person’s presence within the environment (Pallasmaa, 2005).

The project of the library in Vyborg (1935) is particularly illustrative in this regard. The wave-like wooden ceiling of the lecture hall (Fig. 4) was engineered with the acoustics of the space in mind: its shape contributed to a more uniform distribution of sound during the lecturer's speech.

Figure 4. The wave ceiling of the lecture hall of the Alvar Aalto Library in Vyborg (architect Alvar Aalto, 1935). The restoration of the lecture hall with the suspended wooden undulating ceiling took place between 2006 and 2009. The ceiling was recreated according to the original Finnish drawings (The Finnish Committee, 2009). – Photo by Olga Erofeeva.

However, the wave-like ceiling cannot be reduced strictly to its acoustic purpose. Its form establishes a visual rhythm and influences the character of spatial perception. It is precisely this perceptive quality that allows us to speak of the “voice of matter” as a way of organizing visual and acoustic perception: here, wood does not merely reflect sound but simultaneously organizes sight and hearing. The architectural form arises not from pure geometry, but through the coordination of material, acoustics, and perception.

The connection of architecture with movement and perception was fundamental for Aalto: “A person moves and lives by this movement; movement constitutes the essence of his daily activities” (Gozak, 1978, p. 93).

In this logic, the role of the architect changes as well. The architect acts not only as a creator of a finished object, but also as an organizer of a spatial experience, within which the material, acoustics, and human movement begin to participate in the perception of architectural form.

Thus, in Aalto's architecture, space ceases to be perceived as a static construction. Architectural form unfolds through the process of perception, movement and listening, and material and acoustics become part of the organization of spatial experience.

SERGEY FILATOV: PROCESSUAL ACOUSTIC FIELD

In sound art, the logic of processual morphogenesis receives further development: the artistic form becomes not only spatial but also temporal.

In the practices of Sergey Filatov, sound emerges not as a pre-fixed composition, but as a result of the interaction of acoustic processes, mechanical systems, vibrations, resonances, and the spatial environment.

As Irina Kulik points out, “sound art as an art form presupposes a constant correlation, and at times a blending of different channels and dimensions of perception, allowing one to see sound, hear space, manifest gravity or magnetic fields” (Kulik, 2020, p. 6).

This characteristic is exeptionally crucial, as it views sound not as an independent acoustic object, but as a way to reveal the hidden properties of space and material.

In the work “Two points on a smooth black surface” (2020) (Fig. 5), sound pickups sequentially move across the surface, capturing micro-textures at various points. Each contact creates a variable sound configuration.

The surface here acts not as a neutral carrier, but as a source of acoustic events. The sound does not emerge beforehand, but in the process of movement, differentiation, and reading of the environment’s microstructures.

In this case, the point ceases to be a geometric element and turns into an event – into the moment of registering the interaction between surface, movement, and sound.

Another work – “The garden of elusive sonors” (2020) (Fig. 6) – is constructed as a distributed system of resonances. The vibrations of steel sheets, the tension of cables, and the spatial distribution of sound in an octophonic system create a mutable acoustic field.

Figure 5. Two points on a smooth black surface. Sound sculpture. (Sergey Filatov, 2020). Source: https://sergeyfilatov.com

The sound structure here is determined not by a pre-given composition, but by the interaction of the physical parameters of the material, space, and the listener's position.

Unlike traditional musical form, a fixed center is absent here. The sound is distributed in space and constantly changes depending on the acoustic environment and the movement of a person within it.

Figure 6. The garden of elusive sonors. Sound installation. (Sergey Filatov, 2020). Source: https://sergeyfilatov.com

In these works, technology acts not as an external tool, but as a mediator that reveals the hidden acoustic and processual properties of the material. Sensors, pickups, mechanical systems, and acoustic transducers make audible the processes that usually remain outside of immediate perception.

As a result, the artwork ceases to be a static object and becomes a process, inside of which form emerges as an effect of the interaction of material, technology, space, and perception.

The position of the artist changes here as well. Filatov does not completely control the final sound configuration, but creates the conditions for processes within which material, resonance, algorithm, and the acoustic environment begin to co-participate in the formation of the work.

Thus, in Filatov's sound art, “the voice of matter” manifests itself as a processual acoustic field, existing in real time and arising in the process of co-becoming of the environment, technology, and the listener's presence.

CONCLUSION

The examined artistic practices allow us to trace a consistent change in concepts of artistic form in the art of the 20th-21st centuries.

In Wassily Kandinsky’s painting, an autonomization of the artistic element occurs: the point, line, and color are liberated from the function of representation and begin to directly organize perception through rhythm, dynamics, and the ratio of elements.

In Alvar Aalto’s architecture, space becomes an environment of bodily and acoustic experience. Material, acoustics, and human movement begin to participate in the formation of architectural experience.

In Sergei Filatov’s sound art, the artistic form acquires a processual character and emerges as a mutable acoustic configuration depending on the properties of the material, technological mediation, the spatial distribution of sound, and the presence of the listener.

Overcoming the crisis of representation occurs through shifting attention from the finished image to the conditions under which experience arises.

Thus, we are dealing not with a direct line of artistic influences, but with a comparable change in the modes of artistic thinking.

The artistic form increasingly emerges not as the realization of a pre-determined image, but as a result of the co-organization of the artistic element, material, environment, technology, and perception.

In this context, “the voice of matter” denotes not the romantic metaphor for “talking things,” but a change in the ways artistic form emerges and is perceived, in which artistic elements, material, space, sound, and the acoustic environment cease to be considered exclusively as passive carriers of form.

Technology in the examined practices serves not as a means of subjugating the material, but as a way to reveal its mutable acoustic and spatial properties.

At the same time, the status of the artist is also changing. The artist no longer acts exclusively as the author of a finished object or the bearer of a sole morphogenetic principle. Their role is increasingly connected with organizing the relationships between

the artistic element, material, space, technology, and perception, within which the artistic form emerges as a process.

Artistic experience in these practices is formed not only through the perception of a completed form, but also through the perception of the relationships between the artistic element, material, space, sound, and environment.

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Research article

Sound in New Educational Formats: Radio and the Image of the Soviet University of the Future in the 1920s

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Abstract

The early 20th century marked a time of reassessment of the role of sound in society, largely facilitated by the development and spread of radio broadcasting. As a main symbol of technological progress, radio became a vital element in the young Soviet state's vision of a socialist future and all its components. Symbolizing the cutting-edge technologies of its time, radio was closely linked to the radical transformation of the higher education system in the USSR. However, the role of radio in the reorganization of Soviet higher education remains a little-studied aspect in terms of both radio broadcasting and higher education in the country of „victorious socialism.“ This article examines the establishment of the first Soviet radio university and the role of radio and distance learning in images of the socialist higher education system of the future. The implementation of the idea of radio universities is examined within the broad context of key trends in the development of radio broadcasting in the USSR, including changes in the social, legal, technical, organizational, and software frameworks of the mass broadcasting system. Drawing on extensive material that for scholarly purposes is here presented for the first time, this article analyzes the general organizational principles and structure of the first radio university, as well as the forms and specifics of the educational process. It traces the connection between the implementation of the idea of the radio university not only with the radical reforms of higher education at the turn of the 1920s and 1930s, but also with the general economic and political factors of the country's development. The authors conclude that the First Workers' and Peasants' Radio University, opened in Leningrad in October 1928, was a result of the implementation of key guidelines for the radical transformation of the higher education system in the USSR. These included progressive ideologization as an instrument of state policy, new forms of education through the proletarianization of universities , and the introduction of industrial pragmatism along with ways to bring higher education closer to the needs of industries. These also included technological guidelines for educational policy.

Keywords: History of radio broadcasting; History of higher education; Radio universities; Soviet social project; Social studies of sound

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Научная статья

Голос в новых форматах образования: Радио и образ советского вуза будущего в 1920-е годы

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Аннотация
Начало XX столетия стало временем переоценки и переосмысления роли голоса в жизни общества, чему во многом способствовало развитие и распространение радиовещания. Превратившись в один из ключевых символов технического прогресса, радио в молодом советском государстве оказалось существенным элементом представлений о социалистическом будущем и всех его составляющих. Радио, символизирующее передовые технологии своего времени, оказалось тесно связано с радикальными трансформациями системы высшего образования в СССР. Однако, проблематика использования радио в реорганизации советской высшей школы остается малоизученным фрагментом истории становления систем, как радиовещания, так и высшего образования в стране победившего социализма. Данная статья посвящена инициативе и открытию первого советского радио-университета, а заодно вопросу, какое место радио и дистанционные формы обучения занимали в образе будущей социалистической системы высшего образования? Оформление идеи радио-университетов и её реализация рассматривается в широком контексте ключевых тенденций развития радиовещания в СССР, включая изменения социально-правового, технического, организационного, программного обеспечения системы массового вещания. На широком материале, значительная часть которого вводится в научный оборот впервые, анализируются общие принципы организации, структуры первого радио-университета, формы и специфика учебного процесса, прослеживается взаимосвязь реализации идеи радио-университетов не только с кардинальными реформами высшей школы на рубеже 1920-1930-х гг., но и общеэкономических и политических факторов развития страны. Особо проблематизируется специфика учебного процесса в радио-вузе с выявлением типологических его характеристик в контексте активно развивавшейся в те годы системы радио образования и в целом радиовещания. Авторы приходят к выводу, что открытый в октябре 1928 г. в Ленинграде Первый Рабоче-Крестьянский Радио-университет (РКРУ) стал закономерным результатом реализации ключевых ориентиров радикальных трансформаций системы высшего образования в СССР, включавшей поступательное усиление её идеологизации с превращением в инструмент государственной политики, пролетаризацию вузов с апробацией новых форм обучения, поиск путей сближения высшей школы с производством и усилением индустриального прагматизма, а также техницистских ориентиров образовательной политики.

Ключевые слова: История радиовещания в СССР; История высшей школы; Радиоуниверситеты; Советский социальный проект; Социальные исследования звука

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INTRODUCTION

The early 20th century marked a time of reassessment of the role of sound in society, which was largely facilitated by the development and spread of radio broadcasting. Radio transformed the information space, the leisure sphere, communication between government and society, and more. In the 1920s, radio became a significant element of the soundscape, giving rise to a new "listening culture." During this period, listening to the radio had not yet become a background activity; it was a dedicated activity, similar to reading, for example (Kane, 2015; Morat, 2014; Mayorova, 2017; Walker, 2004).

Radio broadcasting emerged as a mass phenomenon due to intertwined technological, scientific, and communicational influences. Radio transformed communication by allowing one-to-many transmission, creating a personalized audience experience (Barboutis, 2013; Logutov, 2017). The study of the problems of radio circulation, its domestication, and its extensive use in social practices is part of the social studies of sound – an interdisciplinary field of research that emerged in the late 20th century. One of the key terms in sound studies is the concept of "soundscape," introduced in the 1970s by Raymond Murray Schafer (1977).

PROBLEM STATEMENT

One aspect of radio development is its connection with educational systems (Bôtošová, 2023; Jewell, 2023; Han, 2026). In the United States, educational institutions accounted for 10% of airtime by 1923 (Petkova, 2015). The Soviet Union was also one of the first to embrace the widespread use of radio education, which was highly important given the vast geographical area and the general low level of education of the population. Radio effectively transferred educational practices from the public space (the university auditorium) to the home, thus changing the boundaries of the private and the public.

It is worth noting that in the USSR, radio gained immense popularity in the 1920s and 1930s, primarily due to its "modernity" and "resonance" with the era of the grandiose restructuring of the entire world (Arsenev, 2024; Bataeva, 2025; Sidorchuk, 2024). In this regard, the use of radio in the context of enlightenment and education can be seen as part of the Soviet educational project (Hoffmann, 2018, pp. 291–295; Serov, 2023).

In this paper we do not set the task to examine in detail the history of the development of the Soviet education system (Astafyev, 2022; Yakhutl, 2024). In light of the subject under consideration, it should be noted that in the 1920s the Soviet education system experienced a real revolution both in terms of social functions and power hierarchies within the educational community, and in terms of the introduction of new educational concepts and practices.

Despite the vast historiography of the Soviet education system, there are only a few references to the use of radio as a teaching tool. This is partly due to the fact that the widely accessible source base was long limited to informational brochures, advertisements, and news items about radio universities in Soviet magazines and newspapers in the late 1920s and early 1930s. The fragmentary nature of archival materials posted an additional challenge for researchers. For example, most of the

documentary materials on the work of the Leningrad City Radio Committee from 1929 to 1940 were destroyed in the first months of the Great Patriotic War[1].

The fact that radio universities existed as special educational institutions for only a few years and never went beyond a technical experiment also played its role. In the study of the history of radio, scientific and technical aspects have always dominated, as well as "sounding word" of the Communist Party and the production of the ruling radio discourse.

The first brief essays devoted to radio universities in the USSR date back to the 1990s (Derevyanko, 1995). In the last decade, interest in radio universities has been further stimulated by the rise of distance learning. However, these essays are typically limited to brief references, often containing factual errors, and lacking any critical analysis. The article by orientalist Elena Stanislavovna Soboleva (2017) became an exception. A number of studies based on regional material are also noteworthy (Mukhin, 2016). Thus, the history of Soviet radio universities has yet to find its researchers, and the few texts devoted to its specific aspects do not change the marginal status of the subject in modern historiography.

THE PURPOSE OF THE STUDY

The implementation of the idea of radio university in the USSR requires an analysis of the development trends of both radio broadcasting and education in the context of the socio-political and socio-economic transformations in the country. The following issues need to be addressed:

- the relationship between the idea and its implementation and the development of mass radio broadcasting in the USSR;
- the relationship between the creation of radio universities and the changes in educational policy at the turn of the 1920s and 1930s;
- the general goals and organizational principles of the institution;
- the specifics of the educational process at the radio university, the role of sound in the new educational format;
- the place of radio in the ideal image of a socialist system of higher education.

RESULTS

The idea of a radio university emerged in the late 1920s as a logical consequence of several trends in the development of radio broadcasting and the education system, driven by the socioeconomic and political transformation of Soviet society. Given the importance that the Bolshevik leadership accorded to promoting a "bright future," the synthesis of radio and education as forms of influencing mass consciousness is perfectly sensible. Let us therefore examine the key trends in the development of radio broadcasting and higher education in the USSR in the second half of the 1920s, and outline the

[1] Central State Archive of Literature and Art of Saint Petersburg (CSALA SPb). Archive fund (F.) 293. Inventory of the archive fund (In.) 2. P. 3.

intersection points in the actual transformations and the prospective image of the university of the future.

According to official statistics, in 1927, the Soviet Union ranked first in the world in terms of the total volume of broadcasting stations (Myasoedov, 1982, p. 50). Radio audiences grew rapidly, reaching several million people in 1928 (Dubrovin, 1972, p. 31).

In the eyes of Soviet leaders, radio represented, above all, an unprecedented system of propaganda, cultural, and educational work for the people. This is precisely why the "freedom" of the first specialized broadcasting organization in the USSR, the joint-stock company "Radioperedacha," and its preoccupation with entertainment and general educational programs, provoked discontent (Gurevich, 1976, p. 81). A search for new forms of radio broadcasting began – and the Radio University opened in Leningrad in 1928 was one of them, becoming an experimental platform for distance education.

Initially, educational radio broadcasting, both abroad and in the USSR, emerged in the form of individual lectures and discussions on various fields of scientific knowledge. First educational broadcasts on Soviet radio appeared as early as 1925 (Dubrovin, 1972, p. 43). Their weaknesses were their episodic nature and thematic fragmentation, as well as the lack of "genuine planning" (in those years, the fervor for planning permeated all spheres of Soviet society). Therefore, discussions about broadcasting formats consistently raised the demand for systematization and differentiation of radio education, and the production of regular programs designed for various categories of listeners. At the first meeting on the issues of a radio university, held on June 5, 1928, one of its initiators, Mikhail Abramovich Rafail, editor-in-chief of the newspaper Leningradskaya Pravda, noted: "The idea of a workers' radio university arose a month ago from a desire to streamline the system of radio lectures." [2] Semyon Grigorievich Natanson, a representative of Leningrad State University (LSU), stated that the idea of a radio university was a logical continuation of the radio lectures held by the Academy of Sciences and LSU since 1926[3]. Max Zhanovich Stirius, who headed the Leningrad Radio Center, saw the radio university as a way to strictly program broadcasts[4]. It is noteworthy that for representatives of the radio broadcasting industry, the very idea of a university was close to a lecture hall: "We need a university," noted Stirius, "not episodic lectures. Therefore, a systematic approach is needed. The program must encompass a number of lecture cycles."[5] The regularity of radio lectures would be repeatedly addressed in future discussions.

The agenda included restructuring broadcasting and its overall programming. By that time, lecture and program series on various socially significant topics (the new way of life, the foundations of Marxism, scientific atheism, etc.) had already appeared on the air (Gurevich, 1976, p. 96). But compared to these, the development of a subject-based schedule for the Radio University, in which lecture series were combined into a single program, was a significant step forward.

[2] St. Petersburg Branch of the Archives of the Russian Academy of Sciences (SPbB ARAS). F. 142. Op. 1 (1928). File (Fl.) 10. Sheet 3.
[3] SPbB ARAS. F. 142. In. 1 (1928). Fl. 10. Sheet 4.
[4] SPbB ARAS. F. 142. In. 1 (1928). Fl. 10. Sheet 4.
[5] SPbB ARAS. F. 142. In. 1 (1928). Fl. 10. Sheet 5.

Another area of broadcast restructuring was the introduction of a fixed program schedule. The creation of a rigid weekly lecture schedule for the Radio University, scheduled by day and hour, effectively became the forerunner of what we now know as a "broadcast schedule." The program was based on a standard weekly schedule, which specified all types of programs precisely by the hour and minute. A complete broadcast schedule was introduced by Central Radio on January 1, 1929.

Broadcast programming made it possible to establish the necessary balance between socio-political, artistic, and educational broadcasts, to connect scientists and propagandists, and to "dissolve" propaganda in science. The documents of the first radio university make no mention of this, but in 1928, such guidelines were accepted by default, a priori serving as a prerequisite for any educational endeavor. In the sample curriculum of the first radio university, we find the history of the revolutionary and trade union movement in Russia, dialectical materialism, and so on.[6] Subsequently, the scope of such subjects only increased, forming a separate cycle. Two weeks before the opening of the radio university, a meeting of the subject commission for the Leninism cycle was held, at which a list of sixteen lectures was approved on topics such as: "The Dictatorship of the Proletariat," "The Construction of Socialism in Russia and the World Revolution," and "Soviet Power as the Highest Form of Proletarian Democracy."[7] The actual curriculum followed by the first students sometimes combined subjects in a rather odd way: a lecture on "How, With What, and Why the Soviet Government Helps Collective Farms" was followed by a presentation on geological epochs, while a lecture on "The Origin of Life and the Development of Organisms" was preceded by a presentation on "What You Need to Know to Organize a Collective Farm."[8]

Leading scholars and educators often participated in organizing lecture series. For example, the Russian ethnographer and linguist Alexander Mikhailovich Mervart, who headed the "Culturology" section at the first radio university, was able to engage prominent specialists to lecture, including professors Boris Leonidovich Bogaevsky, Ivan Ivanovich Meshchaninov, and others. In 1929, the journal "Radioslushatel" published a collection of materials entitled "Academicians Welcome the Workers' and Peasants' University." One of the authors, Academician Alexander Petrovich Karpinsky, wrote: "Soviet science finds in radio a powerful popularizer and advocate for science and culture for the entire working population of our country"[9].

The development and implementation of the radio university project was significantly influenced by the differentiation of broadcasting for listener categories. Initially, the project's authors focused on "serving the broad masses of young workers and peasants with the most basic level of knowledge (rural schools)"[10].

The initial plans included a proposal to "use a Shanyavsky-type university as a model, taking into account its radio specifics" (this was referring to the Moscow City National University named after A. L. Shanyavsky, open to all interested parties,

[6] SPbB ARAS. F. 142. In. 1 (1928). Fl. 10. Sheet 1.
[7] SPbB ARAS. F. 142. In. 1 (1928). Fl. 10. Sheet 20.
[8] SPbB ARAS. F. 142. In. 1 (1928). Fl. 10. Sheet 28.
[9] Radio listener. 1929. No. 45-46. P. 4.
[10] SPbB ARAS. F. 142. In. 1 (1928). Fl. 10. Sheet 1.

requiring no documents other than an ID for admission).[11] However, as the radio university project was reviewed, the listener categories became more specific: "The focus should be on three listener groups: 1) the skilled, literate worker, 2) the less developed rural listener, and 3) the more developed city employee, Komsomol member, student, and anyone engaged in self-education."[12] The dilemma of the educational broadcasting focus was reflected in the name of the new institution: the First Workers' and Peasants' Radio University[13]. Overall, the radio university's curriculum can be seen as a unique solution to the problem that emerged with the development of directional radio broadcasting: the creation of a unified broadcast schedule while maintaining differentiation among listener categories.

While the creation of radio universities fits logically into the evolution of Soviet radio broadcasting, the situation with the education system is more complex. It is noteworthy that in 1928-1929, radio universities in Leningrad and Moscow were established not on the premises of universities, but rather on the premises of city radio broadcasting centers. Incidentally, this marked a significant difference between the Soviet model and the aforementioned American one: In the US it was universities with their own radio stations that initiated radio education. In contrast, in the USSR of the 1920s, issues of radio education were rarely raised in respect to higher education. Even the documents of the first radio university focused on the specifics of broadcasting rather than on the transformation of the higher education system.

Despite the active involvement of renowned scientists in the radio university project, contacts with universities were never discussed. The documents mention collaboration with the Radio Center, city newspapers, museums, and even the Academy of Sciences, but we could not find any plans for cooperation with universities. It seems that the first radio university was initially conceived as separate from the then-existing system of higher education.

The 1920s were a time of experimentation with educational forms and methods, and radio universities proved to be an experimental addition to the established structure of educational institutions. They were typologically similar to the so-called workers' universities that existed in large industrial cities from 1925 to 1931 and were intended to promote the distance education of workers.

Beyond the shared goal of "equipping the working class with political, general, and technical knowledge," radio and workers' universities shared many similarities: their social base (workers and peasants), the students' initial level of preparation (primary education), the length of study (1-3 years), the practice-oriented focus of the curricula, the combination of political literacy with technical knowledge, and so on.[14] At the same time, it's hardly justifiable to reduce the idea of a radio university simply to the radio format of a workers' university. There were also plenty of differences between them.

Radio universities fulfilled one of the key tenets of Soviet higher education policy – the proletarianization of the students. For example, the press emphasized that of the

[11] SPbB ARAS. F. 142. In. 1 (1928). Fl. 10. Sheet 4.
[12] SPbB ARAS. F. 142. In. 1 (1928). Fl. 10. Sheet 5.
[13] SPbB ARAS. F. 142. In. 1 (1928). Fl. 10. Sheet 1, 2, 3, 12, 25, 31.
[14] 2nd State Workers' University: [Prospectus]. Leningrad, 1930. P. 4.

2,200 students enrolled in the Moscow Workers' and Peasants' Radio University, opened in 1929, 39% were workers and 41% peasants.[15] In this regard, the radio university project can be placed on a par with the creation of workers' faculties (rabfaks) and the development of evening and correspondence education.

DISCUSSION

Radio universities were one element of the state's mobilization-based educational policy. The very fact of their creation and their specific nature reveal the technicalist orientation in educational reform, which was typical not only of the party and state apparatus of that time but also of the intelligentsia. This technicalism was evident not so much in the radio universities' curricula, but rather in focusing on the technical capabilities of radio, which could qualitatively transform and elevate the entire educational process (Dubrovin, 1972, p. 44).

The specifics of broadcasting directly linked to a reassessment of the role of sound in new educational formats, essentially a reassessment of the potential of radio education itself. The development of Soviet radio broadcasting was a time of creative exploration, changes in the forms and methods of material delivery, a qualitative restructuring of program content, and experiments with voice and sound design. Indeed, it was in the second half of the 1920s that key forms and genres of broadcasting were born (reports, broadcasts, roll calls, rallies and radio films), radio dramaturgy developed, and speeches by apologists of original radio art were interspersed with discussions between documentarians or supporters of “unbridled improvisation” and adherents of editing and studio work.

In those years and later, radio universities were considered a special form of radio broadcasting, alongside radio rallies or radio newspapers (Vorobyov, 1972, p. 138). Of course, radical experiments in musical and sound effects for radio university lectures were not envisaged, and the imagination in this area was much more modest than in artistic broadcasting. Nevertheless, the pioneers of radio education had to be quite inventive.

The desire not only to adapt the pedagogical process to the new technical format but also to utilize it as effectively as possible determined the specifics of the educational broadcasting of the first radio university. About a month before the opening of the radio university in Leningrad, its organizing committee decided to draft a methodological note on the composition of radio lectures.[16] Two such notes have been stored in the archives of the Leningrad Radio University: one was compiled before its opening (by Anton Frantsevich Solenik, a teacher of social and economic disciplines, a lecturer at the Leningrad Military District), and the other a month later (signed by the Board of the RKRU).

The first note devoted a special section to the specifics of teaching at the radio university, which recorded the main difference between a teacher's work on the radio and in the classroom: “There is no two-way communication, […] there is no direct communication between the lecturer and the listener on the spot, since they are separated

[15] Opening of the Radio University. Radio for Everyone. 1929. No. 21. P. 4.
[16] SPbB ARAS. F. 142. In. 1 (1928). Fl. 10. Sheet 12.

and do not see each other.” Further, it emphasized the need “to compensate, as far as possible, for the lecturer's invisibility to the listener by more strictly adhering to the rules of the lecture, logical stress, intonation, asking leading questions, introducing elements of drama, etc., and, finally, to provide an amount of material commensurate with the amount of time allotted for the lecture, arranged from easier to more difficult” (“Methodological statement of the Workers' and Peasants' University by radio”).[17] It also examined the basic requirements for the presentation of educational material: to precede the lecture series with a brief description of the general program and a recommendation of the relevant literature; to repeat the main points of the previous one at the beginning of each new lecture; to link the material with questions previously received from listeners, with recommended literature, test questions, and practical exercises. At the end of each lecture, it was recommended to assign manageable tasks and indicate the topic of the next lesson. Lecture style was also considered, with particular attention paid to their popular, entertaining, and accessible nature, using the simplest and most understandable turns of phrase and expressions for the audience. Examples from the lives of the working-class and peasant contingent of listeners were suggested as illustrations.

The second methodological note for lecturers contained syntactic recommendations for composing lectures, with examples of their structure and sentence construction, drawing on the experience of broadcasting the first lectures at the Radio University (“On teaching at the 1st Workers' and Peasants' Radio University. Second methodological note for lecturers”).[18] It should be noted that the development of teaching methods at the first Radio Universities was conducted not only with public speaking to diverse audiences in mind, but also in the context of the general intention to improve the intelligibility and emotionality of radio broadcasts, to strengthen the “live, resonant voice” of radio, and to search for new forms of organizing material, as well as a unique language and broadcasting style. Methods for analyzing radio audiences, their level, needs, demands, and psychology were actively discussed, as well as the timing of radio broadcasts in the context of human perception (the lecture duration at the Radio University was set at 40 minutes), the presence of pauses, the limits of loud and soft sounds, the influence of noise effects on the subsequent perception of human speech, etc. (Melnikov, 1972, p. 127). The importance of analyzing the psychology of the listener and identifying what is best perceived by the individual was noted. At the same time, the timing, the norm of impressions, the optimal amount of information a listener can perceive (the duration of a broadcast, pauses, the time required to grasp logical connections, etc.), were studied as well as the limits of loud and soft sounds, the influence of noise effects on the subsequent perception of human speech, and so on.

In the development of the methodology of the first radio university, we can see the intersection of the progressive development of radio broadcasting with the policy of raising the level of education of workers and peasants, with the enthusiasm for new technology and education. Radio workers, scientists, teachers, as well as party activists and propagandists, were united by a belief in the unprecedented possibilities opening up

[17] SPbB ARAS. F. 142. In. 1 (1928). Fl. 10. Sheet 34.
[18] SPbB ARAS. F. 142. In. 1 (1928). Fl. 10. Sheet. 49-53.

for radio education, radio agitation, and radio-based mass organization. Radio embodied everything new that was replacing the old ways of life and traditions, and obsolete forms and methods of education. Discussions of the first radio university project echo the enthusiasm of the pioneers of programmatic radio instruction and its boundless prospects: “In a few years, the entire university will be using radio.”[19] Radio broadcasting became an important component of the university's image of the future and the education system itself.

CONCLUSION

The first Soviet radio university was established in Leningrad in 1928 and existed until 1931. The development of the methodology for the first radio university clearly demonstrated the intersection of the progressive development of radio broadcasting with the policy of raising the level of education of workers and peasants, with the enthusiasm for new technology. Radio workers, scientists, and educators, as well as party activists and propagandists, were united by a belief in the unprecedented possibilities offered by radio education, radio propaganda, and radio organization of the people. Radio embodied everything new, replacing the old ways and traditions, and obsolete forms and methods of education. Discussions of the first radio university project echoed the enthusiasm of the pioneers of programmatic radio instruction and its boundless prospects: “In a few years, the entire university will be using radio.”

However, a brief history of radio universities clearly demonstrates that the enthusiasm for mass education and technical romanticism by the late 1920s depended not only on the development of broadcasting or the education system, but also on the ideological and political context of Soviet society. The new educational discourse, built on ideological foundations, the functional-instrumental rationality of the mobilized economy, and bureaucratic pragmatism, transformed any educational institution into a component of socialist production that could be updated, strengthened, or replaced depending on circumstances.

In fact, the concept of the university of the future in the Soviet state never received any clear interpretation or description in the context of a volatile economic and political climate, with intra-party struggles significantly altering the understanding of the prospective construction of socialism. Calls for the proletarian democratization of universities, calls for turning them into training grounds for a new worker-peasant intelligentsia, as well as demands for closer ties to industry, lack the substantive ground needed to shape this vision.

Since the centralization of governance in the higher education system, any ambitious project with relatively clear normative visions regardingthe future university of the socialist state appears to become redundant. And the design functions of such projects would be replaced by the current policies of the Soviet state. The image of the Soviet university of the future, never clearly defined, remained extremely flexible, shaped not by ideal parameters but rather by then-current challenges of socialist construction.

[19] SPbB ARAS. F. 142. In. 1 (1928). Fl 10. Sheet 6.

Meanwhile, the short history of radio universities has witnessed a significant shift in perceptions of the future of the education system, including higher education, and these shifts turned out to be linked to further technological innovation.

By 1931, 150,000 people were enrolled in correspondence courses via radio in the USSR, a third of whom attended radio universities (Melnikov, 1972, p. 172). This figure only included students who applied to radio universities, regularly attended talks and lectures, and completed assessments. However, this figure implies a deeper process of widespread adoption of cutting-edge information technologies of that time into the educational space, with the development of distance learning and remote access to educational institutions. Radio universities became an integral and important component of a fundamental paradigm shift that would largely determine the future of education for the next century.

Radio-based learning fundamentally changed the forms of interaction in the educational environment, to a certain extent limiting the possibilities of pedagogical methods while simultaneously creating a new format for communication and information perception. Even today, with the development of electronic forms of distance learning and the widespread adoption of continuous education, the long-term consequences of the first radio universities should be considered in the broader context of those changes in terms of pedagogy and the conditions of the learning process, which were later reflected in the concepts of lifelong learning or rapid learning, as well as trends in the adaptability of education within the context of life and work.

This brief history of radio universities clearly demonstrates that the initiatives and results of radio education in the USSR depended not only on the nature of broadcasting or the public education system but were also shaped by the ideological and political context of Soviet society. This brief episode of Soviet radio education reflected the entire era of socialist construction, with its pros and cons – from genuine enthusiasm and techno-romanticism to bureaucratic pragmatism and mobilization-driven development.

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Research article

The Microphone as a Medium of Authenticity in Soviet *Estrada* Song

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Abstract

This article focuses on the notion of authenticity as a characteristic of a specific vocal technique that has its own specificity in relation to *Estrada* song. The significance of vocal authenticity in the Soviet context is shaped by cultural, technological, and ideological factors functioning within specific historical circumstances. As a case study, the article examines debates surrounding the "small" and "whispering" voice in singing practice during the 1950s and 1960s, based on which the changing configuration of relations between voice and text is traced. Despite the aspiration of Soviet institutional criticism to preserve the previous characteristics of the singing voice and its representational function, formed during the period of Socialist Realism, the development of microphone technology and sound-recording practices contributed to the establishment of a different logic of vocal statement, within which authenticity begins to be understood not as a reflection of an already existing reality but as an effect of its constitution. In this context, *Estrada* song, detaching itself from cinematic plots, operetta narratives, and stable character types, during the Thaw period increasingly articulates the connection between the voice materiality and the stage persona through the category of sincerity. The article is situated at the intersection of voice theory, media studies, and studies of cultural policy and addresses the heterogeneous sources of the origin of the *Estrada* genre in urban forms of entertainment culture and its subsequent formation as a specific system of late Soviet production, as a result of which song product becomes "popular" not so much through the expansion of audience reach as through the organization of a feedback loop between performers and listeners and a reorientation toward economic value and what could compete with "Western" musical genres during the Cold War.

Keywords: Voice; Technologies; Authenticity; Soviet Estrada; Stage persona; Popular culture; Cold War

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Научная статья

Микрофон как медиум аутентичности в советской эстрадной песне

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Аннотация
В фокусе данной статьи находится понятие аутентичности как установки и характеристики определенного способа звукоизвлечения, имеющего собственную специфику в эстрадной песне. Значение голосовой аутентичности в советском контексте формируется в зависимости от культурных, технологических и идеологических факторов, реализующих свою действенность в конкретных исторических обстоятельствах. В качестве кейс-стади рассматриваются дискуссии о “маленьком” и “шепчущем” голосе в певческой практике 1950–1960-х годов, на основе которых прослеживается изменчивая конфигурация отношений между голосом и текстом. Несмотря на стремление советской критики сохранить прежние характеристики певческого голоса и его репрезентативную функцию, закрепленную в период социалистического реализма, развитие микрофонной техники и практик звукозаписи способствовало утверждению иной логики вокального высказывания, в рамках которой аутентичность начинает пониматься не как отражение уже существующей реальности, а как эффект ее конституирования. В этом контексте эстрадная песня, освобождаясь от привязки к кинематографическим сюжетам, опереточным нарративам и устойчивым типажам, в оттепельное время все в большей степени артикулирует связь между материально обусловленным голосом и сценической персоной через категорию искренности. Статья находится на пересечении теории голоса, медиаисследований и исследований культурной политики и обращается к гетерогенным источникам происхождения эстрадного жанра из городских форм развлекательной культуры и его последующему оформлению в качестве специфической системы позднесоветского производства, в результате чего песенная продукция становится “популярной” не столько за счет расширения охвата аудитории, сколько благодаря организации петли обратной связи между исполнителями и слушателями и переориентации на то, что могло конкурировать с “западными” музыкальными жанрами во время Холодной войны и быть прибыльным.

Ключевые слова: Голос; Технологии; Аутентичность; Советская эстрада; Сценическая персона; Популярная культура; Холодная война

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INTRODUCTION

In the 1950s, Soviet society entered a period of diverse, contradictory, but nevertheless tangible transformations. Modernization reforms, the broad implementation of scientific and technological breakthroughs, the high speed of urbanization and housing construction, the emergence of mass consumption, and a partial democratization of public space started to shape the new contours of reality. At the same time, the arts (McCallum, 2020; Reid, 1999), cinema (Bulgakova, 2012; Oukaderova & Usoltsev, 2023), and literature (Prokhorov, 2007, pp. 83–85) from the mid-1950s to the 1960s did more than reflect those shifting contours; they became terrains for staging reality. And yet, Soviet cultural production was marked by continuations and ruptures with pre-established genre conventions and techniques. These processes did not unfold in the mere search for a renewal of artistic language, as they tested the boundaries between what still most clearly belonged to the canon of Socialist Realism and what provided a form for "sincerity" that became the most prominent term in the vocabulary of the so-called Thaw (Rutten, 2017, pp. 182–184). However, the question of how this transition manifested itself in voice remains largely unclear. Meanwhile, it was precisely the technologically mediated voice that became one of the sites where the contemporary vocabulary was negotiated and literally performed. Not only was it the voice norm on the public broadcast or in the movies that changed, it was also the voice in *Estrada* song that became one of the major authentication agents of the Thaw – no less power-driven, but, as was assumed, much more sincere as the "last successful Soviet mobilization project" (Mikhailin, 2019, p. 196).

Contemporary popular music studies encompass the full diversity of the music that could be, with the application of various criteria, conceptualized as "popular." The difficulty in our case, however, lies in the fact that the predominantly English vocabulary of "popular" music studies does not include the term *Estrada* which circulated within a specific semantic field in the USSR and countries of the socialist bloc. As a researcher of Polish *Estrada* Eva Mazierska has shown, reconciling these two terms is not only possible but may also have considerable heuristic potential (2023, pp. 4–13). If we speak of Soviet *Estrada* as an artistic genre, it acquired its aesthetic and institutional form in the attempts of early Soviet cultural policy to overcome "ideologically empty" urban entertainment of the late 19th and early 20th centuries. This form of entertainment could be traced back to music halls, artistic cabarets, or café-concerts, as well as to the methods of constructing divertissement programs or variety shows. Although *Estrada* emerged early on in a distinctly different artistic sphere of various "small" stage forms – circus performances, satire, dance, and song – it cannot be described as a monolithic entity, since each of the stage forms was shaped by often contradictory and divergent political, economic, and ideological relationships. These nevertheless converged within a shared institutional framework that assigned them functions ranging from the organization of leisure and "ideological entertainment" to the provision of "cultural service to the masses"; not to mention their context-specific configurations within the various Soviet Republics. We turn to one of the genres of *Estrada* – *Estrada* song. Despite having existed prior to the mid-1950s, it was precisely during the late Soviet period that it began to take shape as an

increasingly autonomous cultural product with its own communicative logic, uniting a ramified and multi-tiered concert and touring network, recording, and media institutions, and guiding the practices of writers, composers, and performers.

Authenticity is probably one of the main assumptions that permeates the perception of popular music and constitutes the value of specific genres (Barker & Taylor, 2007). In relation to voice, however, the aspect of its truthfulness is complicated by the fact that it is often regarded as an expression of an always-already-given idiosyncratic "I." This kind of representation is fueled largely by the proximity of the voice to the body, which for centuries has been creating the illusion of the speaker's immediate presence and reinforcing the mythology that the voice – in both everyday and artistic practice – provides access to the "essence" of a person (Schlichter, 2011, pp. 36–40). Similarly, Oksana Bulgakova notes that "the radical rejection of the skilled professional voice (as unnatural, mechanical, or insincere) has become an obsessive topic […] in Russian culture," saturating the musical imagination of the 20th century (2015, p. 4). Nevertheless, this article approaches the authenticity of the *Estrada* voice in the mid-1950s–1960s not as a natural vocal property, but rather as an aesthetic notion which, shaped by diverse forces, could serve as the key to a better explication of how those forces become significant in a particular cultural context.

To operationalize this premise, we refer to John Potter's concept of "authoritative style" as a form of vocal performance that at a specific historical moment achieves a hegemonic position in relation to other styles, setting the "natural" and "correct" norm for the voice practice. According to Potter, changes in voice conventions as well as the parameters of its authenticity are linked to the "logocentric articulation" of musical style; or in the way voice relates to word (Potter, 2006, p. 193). By integrating media-technological perspective into Potter's model, this article conceptualizes "authoritative style" as a historically situated dispositif in which vocal technique, textual intelligibility, and technological affordances produce regimes of vocal authenticity. This brings us to the question of how the relationship between the voice and the word was articulated from within Stalinist Socialist Realism as truthful (*pravdivyj*), and how it was subsequently rearticulated, paving the way for a vocal style that became authentic as sincere (*iskrennij*) in different technological, political, and ideological conditions.

VOICE AS A VESSEL FOR TEXT

The regime of the written text in the Soviet Union received acute political significance when avant-garde orality of the 1920s was reoriented toward Socialist Realism literacy in the 1930s (Murashov, 2000, pp. 599–600). Such a shift manifested itself, on the one hand, in the fundamental dominance of the written word and linguistification of society (Groys, 2006/2009, pp. 1–32) and, on the other hand, in the marginalization of the voice to the status of an "appendage" to the letter (Dolar, 2006, pp. 117–119). While Socialist Realism began to proliferate in the 1930s primarily in the field of literature and only later expanded to all arts and aesthetics in general, the voice-text nexus became the crucial expressive tool in music. The singing voice, occupying an ambiguous position between linguistic articulation and sonic materiality, posed a danger

to the authority of the text from within the esthetic-political canon. This was due to the ability of the voice to shift attention away from the controlled procedures of writing. It did so through the audible traces of the body, through timbre with individually recognized overtones, or through accents that would refer to an artist's background. From this perspective, the task of securing the word as a political medium extended well beyond control over the content, as could be assumed from the censoring practice of Glavrepertkom[1] which was issuing permits for the *Estrada* repertoire during a limited period with the song lyrics attached to each of the submitted requests.

In order to eliminate the space for probable polysemy and to posit an *as if* equality of text and voice, the gap between the letter and the condition of its vocal actualization should be minimal. Strategically available tools for Socialist Realism became "classical traditions in terms of voice training, harmony, melody, and intonation" (Goyowi, 2006, p. 25). Even though one of the main genres in the 1930s was *mass* song, the normativity of *individual* voice within Socialist Realism was developed in the context of the classical (realist) repertoire: oratorios, cantatas, (song) operas, works by Bach and Handel, as well as Soviet romances. This does not mean, however, that the voice, finding itself within the official aesthetic paradigm, lost its autonomy and, as such, became meaningless. On the contrary, the written word had to be orally articulated in a certain way, "naturally" (Pravda, 1936) and "expressively" (Groman, 1939, p. 76), implying the "unnatural" that was at odds with the realization of meaning. The performer also had to be located ethically, tasked to cultivate the understanding of the "intentions of the composer" and possession of "high technique of word and voice," conveying the "inner" meaning of the work and interpreting it unambiguously (Nekrasova, 1939, p. 52). Moreover, the voice discipline was regarded as a vocal-pedagogical principle corresponding to "the laws of the development of the singer and his voice in specific historical (social) conditions" (Aspelund, 1952, p. 4), in fact linking a certain singing technique and scientifically grounded knowledge about voice use to the dominant social class, on whose behalf the party exercised its power, and bringing vocal-artistic practice, discipline, and discourse on culturedness (*kulturnost*) within a single ideological framework.

At the same time, the authoritative style was the result not only of institutional and ideological efforts to cultivate the normativity of voice in relation to the text, replacing the history of its social production, but also of the mediation through available technologies. In the 1930s, the practice of sound recording in the Soviet Union put performers at a distance from the microphone, which in combination with optical recording captured only a limited frequency range and gave the voice an electric echo. As a result of these limitations, a standard of "slightly slowed tempo, melodic cadences, high sound based on light vowels and avoiding problematic sibilants" (Bulgakova, 2015, p. 365) became established, contributing to the better intelligibility of the recorded voice and minimizing divergences from the written text to the best possible degree. This voice

[1] Initially Glavrepertkom (Main Repertoire Committee) was part of Narkompros (The People's Commissariat for Education) which was subsequently renamed and incorporated into the All-Union Committee for the Arts under the Council of People's Commissars of the USSR. In relation to *Estrada*, Glavrepertkom was given authority to review all individual repertory and, for example, that of concert brigades.

norm could be found intermedially in Stalinist soundscape, be it cinema or radio broadcasting. With regards to the singing practice, however, it acquired the status of the authoritative style, when the "big" and "loud" voice as *aesthetic* qualities of the sound – in fact, the result of the technological deployment within the classical (realist) vocal repertoire – was assigned a *political* function of the respectful attitude towards the written word.

Nevertheless, the voice on *Estrada* was not marginalized by the establishment of authoritative conventions. The "classical" sound and its *as if* ideal voice-text juncture did not become the basis for a full-fledged system of voice censorship either in the 1930s or during WWII. Instead, the discourse on "raising the level" of the arts and leveling the differences between the so-called "low" and "high" arts became particularly important. Concert practices of *Estrada* singers like Vadim Kozin, Isabella Yuryeva, Tamara Tsereteli, Ekaterina Yurovskaya, Keto Dzhaparidze, Klavdia Shulzhenko, Leonid Utesov, and Lydia Ruslanova – to name a few – were not banned. On the contrary, the common trait of *Estrada* performance was the incorporation of stylistic sources bound to urban romance, folk songs, and jazz (Raku, 2009, p. 191) with their own distinct vocal esthetics.[2] During this time, the authoritative style operated rather as a normative horizon, setting a standard against which any difference could be measured, and in relation to which the political-aesthetic demands could be either approximated or strategically distanced.

It was only in the late 1940s and early 1950s that vocal conventions alternative to what was audibly recognized as classical (realist) were marginalized. As Birgit Menzel writes, during a meeting at the Central Committee of the All-Union Communist Party in 1948, "a conflict emerged not only between different musical directions, but also between 'serious' classical and 'popular' entertainment music" (2000, p. 992), while two years earlier it had been reiterated that "the printed word sounds stronger than the pronounced word" (Babichenko, 1994, p. 199). Thus, in the late Stalinist cultural landscape, *Estrada* music found itself on this side of Zhdanov's demands for the restoration of the classical heritage and solidification of the aesthetic categories developed in relation to it, when the sound of the academically schooled voice became the "natural" way for *as if* uncontradictory articulation of the meaning of the text. This had repercussions also in repertoire policy with a disproportionate dominance on vinyl of the classical repertoire (Gershzon, 2024, p. 146). Meanwhile, performers oriented towards "beautiful" and "powerful" sound production were systematically replenishing the new "singing class," dominating the spectrum of increasingly less audible variants of the non-authoritative.

EMBODIED VOICE AND THE AUTHENTICITY OF THE FLESH

From its very outset, the Soviet cultural policy regarded voice as an object of its control. Nevertheless, it was not until the mid-1950s that judgments about *Estrada* voice

[2] This was on condition that the singers were employed by Mosestrada, Lengosestrada or regional philharmonics inscribed into the mechanisms of cultural policy that also curated the recording decision-making. For selected playlist with *Estrada* songs of the 1930s to 1950s with various stylistic elements see https://www.youtube.com/playlist?list=PLTjuddYgJQTJWdocEFjuVvdHj5GTzq50Y

became a topic of critical discussion in its own right, acquiring an alarmist tone which remained pronounced throughout the 1960s. In addition to dissatisfaction with singers on stage "who moan languidly into the microphone, distorting song melodies with their careless 'patter' (*govorkom*)" (Lemeshev, 1961, p. 35), journals highlighted the synonymity of the "microphone voice" and "voicelessness" (*bezgolos'jem*) (Petrov, 1966, p. 6). Textbooks on the *Estrada* genre published at the time pointed to the craze for "whispering into the microphone," that is, "singing without a voice," as a symptom of a lack of proper training in producing a beautiful and powerful sound "without any orthopedic devices" (Morozov, 1967, p. 23). During the meeting of the Ideological Commission of the Central Committee of the Communist Party of the Soviet Union in 1964, similar opinions were expressed about the lack of "close attention to the word" among microphone singers, whereas the calls to resist "attempts of anti-musical whisperers (*sheptunov*) to gain a monopoly on Estrada and at the microphone" became increasingly clear (Afanasyeva, 1998, pp. 513–514). Thus, this set of statements, differentiated in terms of power distribution, registers a shift in vocal sound while simultaneously attempting to preserve its normativity by reproducing ideologically charged categories.

These attempts were confronted with the differently unfolding reality of the voice, which was staged by new means and the methods of sound recording undergoing a radical transformation in the mid-1950s. The mass production of tape recorders and magnetic tape that was inspired by cultural policy (Lovell, 2015, p. 167) improved the quality of the recordings. Together with microphones that were capable of picking up and amplifying lower frequencies, they transformed the notion of the audible not only in the concert halls which were equipped with more diversified microphones, but also in the new sound recording studios, expanding their capacities above all at The State House of Sound Recordings. These studios were making magnetic tape audio recordings for broadcasting and for the "Melodiya" label that was solely responsible for vinyl replication since 1964.

In relation to the voice pitch, these changes made it technically possible for "close-ups" with a quieter sound and individual vocal characteristics such as pronunciation, intonation, and timbre that conveyed "signs of flesh" (Bulgakova, 2015, p. 480). Even though the voice always bears an index of the physical-organic context (Kolesch, 2003, p. 276), taken from the prism of historically conditioned mediatization (Baron et al., 2021, pp. 2–3), a "disembodied voice" nonetheless can exist in that its materiality renders to be non-obvious and transparent. This appears when the characteristics of the voice produced by the lungs, larynx, and lips are not recognized and actualized as signs of the individual body with the history of its social formation but are instead foreshadowed by the cultural intelligibility of "high technique of word and voice." With new recording technologies, voices became more bound to their material sources, not pointing to the abstract notion of professionalism and vocal beauty but working as vehicles for the social imagination. Not only did the voice become a more independent layer of the song; its material

specificity and transformation from a mere vessel of the text into an autonomous artistic medium became increasingly perceptible on *Estrada* exemplified by the emergence of new distinct "individual" performance styles, be it the foreign accent of Edita Piekha or the "crooning" of Mark Bernes that, despite its appearance in a movie a decade earlier, became a common place for many singers particularly in late 1950s.

In this regard, the "microphone craze" had a larger context tied to the establishment of a new cohort on *Estrada*, when artists with little formal training from amateur venues – usually young female singers – were recruited by male "producers" like orchestra directors Eddie Rosner or Oleg Lundstrem, or given "promotion" by those immediately connected to the song production processes. In contrast, male *Estrada* singers more often than not would be part-time workers (*sovmestitely*) from cinema and opera who were also compensating for the inconsistent attempts to organize a system of talent acquisition, whereas drama actors were thought to be better in "appreciating the significance of words than singers" (Pakhmutova, 1961, p. 87). Recruiting was one of the main practical issues running like a common thread through the discussions about *Estrada* as a state-organized enterprise that sought to increase its appeal at a time of competition with popular music from "the West" that started to reach the Soviet listener through different channels. In response, *Estrada* cultural production turned to selected Western styles, genres, rhythms, and sonic aesthetics, with this reception marking a shift from the previous sources of musical citation. All this contributed to "the decomposition of the 'classical' timbre-acoustic and song-intonational unity of the Soviet world" (Ganzha, 2014, p. 62) and provoked concerns that were merely a reaction to a different sound quality, as it was new parameters of authenticity that questioned the authoritative style.

Moreover, the authenticity of the voice was invoked not only by a closer bind between voice and body, but also by a transformation in the very reality of the voice or, more precisely, in its realism. Whereas voice recording had previously been understood primarily as a means of capturing its reality, that is, reproducing how *Estrada* singing would sound in a live performance, the spread of technologies such as the microphone and magnetic tape displaced the "natural" vocal sound and its associated parameters of pitch. What had been required to fill both the concert venue and the song itself, now took on technologically fabricated sonic forms. The emergence of recording studios and the profession of the sound engineer (Gaklin, 1961) marked a transition from the realism of performance to a fabricated reality in which the voice could be modulated, edited, cut, and reassembled, layered across multiple tracks, and enhanced through reverberation and spatial effects. The advent of stereophonic sound in the late 1950s further transformed the perception of the song's acoustic space by constructing its spatiality and positioning the voice within it. Despite the concerns of proponents of "natural" voice, technologically produced artificiality gradually came to be associated with a new form of authenticity: not with the truthfulness of immediate performance, but with the performance of immediacy. These modes did not replace one another; rather, they formed a field of possibilities for stating the voice with new technologies that were used differently by

singers that started to perform on *Estrada* before[3] and after the mid-1950s[4], which nevertheless does not form a clear-cut divide of vocal aesthetics and performance practices.

The effect of vocal intimacy, along with the voice's "quiet" and "whispering" qualities, also registered gendered scripts characteristic on the one hand of the "crisis of masculinity" and the "preoccupation with men's vulnerability" in popular culture of the 1960s (Dumančić, 2021, p. 12). It was characteristic on the other hand of the moral-ethical politics governing female behavior that was establishing particular links between appearance and identity (Gradskova, 2007, p. 153). We would add that it was characteristic also of a use of voice that was framed within culturally accepted models of feminine modesty and restraint. In this sense, the authenticity of the voice was not a universal category; rather, it existed within a cultural context and the expectations regarding the newly formed connection between the bodily indexes of the voice and the external gender-specific manifestations that had to be signified – which included those related to fashion as it became increasingly important with television concerts and a widening *Estrada* iconography in magazines or on vinyl covers.

CONCLUSION

Even though the previously established realist relationship between the written word and voice were rearticulated in practice, on the discursive level the forces of Socialist Realism continued to operate through multiple agents of cultural politics. In an attempt to preserve the vocal norm, they referred to stable categories, associating certain sounds with discourse both about "mastery" of a voice that did not need technical support as well as about the respectful treatment of the written word. In contrast, whereas "small" microphone voices were deemed incompatible with the lyrics of Soviet writers as they demanded "big" and "expressive" gestures. A similar logic was fueling discussions about Soviet art in general, seeking to stabilize artistic norms in a transformative situation that Evgeny Dobrenko described as one in which "Socialist Realism was dying longer than it lived" (2025, p. 134). In fact, the preoccupation with *Estrada* voice was lingering up until the late 1960s, whereas later cultural politics found other, more tangible, ways of preserving Socialist Realism in Soviet popular music, institutionally as well as

[3] Singers such as Nina Dorda, Kapitolina Lazarenko, Gelena Velikanova, Irina Brzhevskaya, and Klavdiya Shulzhenko were established *Estrada* soloist with individual concerts. This privilege was reserved for performers whose level of mastery had received institutional recognition. More often than not they relied on a comparatively unmodulated vocal sound. The same can be noted for performers associated with the folk genre, such as Lyudmila Zykina, Olga Voronets, and Ekaterina Shavrina: https://www.youtube.com/playlist?list=PLTjuddYgJQTKjwRTaSc1WJQsXZUVeZMjB

[4] Voices of younger performers such as Maya Kristalinskaya, Edita Piekha, Tamara Miansarova, Lidiya Klement, and Larisa Mondrus tended to be more processed and marked by a wider range of echo effects, reflecting the influence of the numerous artistic collaborations through which new *Estrada* fashions were shaped: https://www.youtube.com/playlist?list=PLTjuddYgJQTKIiDSi3G-fruCzMGwoavQB

thematically (Zhurkova, 2025, p. 197). In fact, the tradition of vocal production techniques, "voice training," and work on vocal delivery maintained its continuity in various ways. Wherever it was possible this continuity was upheld within specific music schools and under the guidance of particular masters. This is evident in the late Soviet era, especially in the turn to Soviet choral music or musical theater, whose representatives not only preserved the experience of the past but also participated in the mentoring of new *Estrada* stars.

Technologically mediated voices on *Estrada* departed from the predominantly representational logic confined to text towards a performative one, allowing the fabrication of authenticity in a way that did not reflect an already existing reality, but produced it within a horizon of cultural intelligibility. Sincerity, as a modality of authenticity, in this sense became possible as a cultural technology within the context of ideological transformations during the Thaw and for staging its emotional regime. Accordingly, the apparent emergence of a new vocal "authenticity" should not be understood as the expression of inner truth or sincerity. Instead, it resulted from the intersection of technological mediation, disciplinary techniques, and discursive expectations that produced authenticity on *Estrada* as an effect that could be recognized, circulated, and legitimated within Soviet popular culture. It is not assumed that the voices were in a way "liberated" from the authoritative style or that the new way of vocal appearance was a rebellion against it, as long as we remain in the framework of a state-sponsored popular culture. On the contrary, vocal performance, retaining its institutional embeddedness, acquired the ability to actualize an individualized presence and thus participate in the formation of new regimes of cultural recognition. This effect drew an invisible yet highly perceptible line between the former authoritative style, transferred into different forms, and the voice that gradually was saturating the communicative logic of the mainstream well beyond the Thaw.

This logic shaped *Estrada* song into a more autonomous cultural product, whereas the sociability of the voice – rooted in its specific materiality – provided the capacity to generate recognition, attachment, and response. Not only did it contribute to what later would become an *Estrada* stardom system, but also in the context of expanding mass culture facilitated the creation of a culturally recognizable stage persona. In the late Soviet context, it merged with the necessity of having a personality (*lichnost'*) with a parallel existence in the expanding media circuits – the press, visual production, rumors – extending the presence of the performer beyond the stage and creating new forms of proximity. In this sense, *Estrada* becomes "popular" by expanding its audience coverage and by organizing a feedback loop between performers and listeners. All in all, during the mid-1950s to 1960s, *Estrada* music underwent a complex transition from a mass genre to a popular one, linked to the reorientation of socialist production toward what was considered lovable, listenable and, ultimately, profitable.

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Research article

Giving Voice to Silent Film: Iraida Yusupova's Music for “Space Flight” (1935)

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Abstract

The practice of adding a new musical score to old silent films is common among modern composers. This is due to the desire to modernize old cinema, as well as the fact that the music accompanying silent films during their creation was often random, improvised, and therefore easily replaceable. But for successful dubbing, it is necessary to accurately understand the specifics of silent films, their artistic structure, which is fundamentally different from sound cinema. An example of successful work is the music by Iraida Yusupova for the film *Space Flight* (1935). This is the first Soviet science fiction film about the conquest of the Moon, with eminent scientist Konstantin Tsiolkovsky participating in its creation. In this work, the composer follows the rules of silent film, creatively reinterpreting them. The soundtrack to this film is a multi-layered score consisting of orchestral music, vocals (solo and choral) numbers, electronic sounds imitating noises or forming melodies, and even cues. Each of these layers is characterized not only by a specific timbre, but also by leitmotifs that run through the whole picture in a modified or unchanged form. The way this multicomponent canvas is organized is a total counterpoint at all its levels. This is a polyphony of samples – sound, arbitrarily short units of meaning that are accelerated, decelerated, superimposed on each other, and combined with other elements of the musical canvas. The second level is the polyphony of the noise layer and orchestral music. Another contrapuntal pair is a sound sequence and a video sequence. And finally, the fourth is the polyphony of styles. Stylizing the music of the 30s, Yusupova resorts to the technique of ironic detachment from the original, which shows the author's handwriting as a composer. This postmodern aesthetic makes this work original, witty, and combines the past, present, and future in one space.

Keywords: Silent film; Film music; Artistic space-time; Film dubbing; Total counterpoint; Postmodernism; Iraida Yusupova

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Научная статья

Музыка И. Юсуповой к к/ф “Космический рейс” (1935) как опыт озвучания немого кино

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Аннотация
Практика озвучания старых немых фильмов распространена среди современных композиторов. Это вызвано желанием осовременить старое кино, а также тем, что музыка, сопровождавшая немые фильмы во время их создания, часто была случайной, импровизированной, а значит, легко заменимой. Но для удачного озвучания необходимо точное понимание специфики немого кино, его художественной структуры, которая принципиально отличается от кино звукового. Пример успешной работы представляет собой музыка Ираиды Юсуповой к фильму “Космический рейс” (1935). Это первый советский научно-фантастический фильм о покорении Луны, в создании которого принимал участие выдающийся ученый Константин Циолковский. В этой работе композитор следует правилам игры немого кино, творчески их переосмысливая. Саундтрек к этому фильму представляет собой многослойную партитуру, состоящую из оркестровой музыки, вокальных (сольных и хоровых) номеров, электронных звучаний, подражающих шумам или складывающихся в мелодии, и даже реплик. Каждый из этих слоев характеризуется не только специфическим тембром, но и лейтмотивами, проходящими в измененном или неизменном виде через всю картину. Способ организации этой многосоставной ткани – тотальный контрапункт на всех ее уровнях. Это полифония сэмплов – звуковых, сколь угодно коротких единиц смысла, которые подвергаются ускорению, замедлению, наложению друг на друга и сочетанию с другими элементами музыкальной ткани. Второй уровень – полифония шумового слоя и оркестровой музыки. Еще одна контрапунктическая пара – звуковой ряд и видеоряд. И, наконец, четвертый – полифония стилей. Стилизуя музыку 30-х годов, Юсупова прибегает к приему иронического отстранения от оригинала, в чем проявляется авторский почерк композитора. Такая постмодернистская эстетика делает эту работу оригинальной, остроумной, позволяет соединить в одном пространстве прошлое, настоящее и будущее.

Ключевые слова: Немое кино; Киномузыка; Художественное пространство-время; Озвучание фильма; Тотальный контрапункт; Постмодернизм; Ираида Юсупова

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The late 19th and early 20th centuries brought the history of cinema a huge number of silent films, many of which are true masterpieces. However, over the 130 years of cinema's existence, its language has changed significantly, and silent films often seem anachronistic to modern audiences. Therefore, attempts are being made to bring them back to life in various ways. One of the first is to recreate the soundtracks that accompanied silent films. This is driven by the fact that the music that accompanied silent films over a hundred years ago has, in many cases, not survived. That which has survived to this day is generally inferior in artistic quality to the visuals. It usually consisted of improvisations by the pianist or compilations of well-known musical works. And although Camille Saint-Saëns was one of the first to specifically compose music for the silent film “The Assassination of the Duke of Guise” (Le Bargy & Calmettes, 1908), the vast majority of soundtracks were incidental and easily replaceable. Therefore, modern composers strive to create a soundtrack that is both congenial to the visuals and more contemporary. However, this task is far more difficult than it might seem at first glance, and the fact that there are few successful modern scorings for silent films only confirms this. We would like to present a rare example of a successful and quite witty soundtrack for a silent film, created by Russian composer Iraida Yusupova (von Xylander, 2025).

However, in order to appreciate Yusupova's work, it is necessary to have a good understanding of the initial conditions for the realization of her task, that is, the features of the artistic structure of silent films. As we know, it originated as a moving photograph, that is, a sequence of two-dimensional images mounted with each other. The shocking effect that the first pictures by the Lumiere brothers had on the audience is well known: at the sight of a moving train, the audience screamed and jumped up from their seats (“Arrival of the train at La Ciotat station,” Lumière & Lumière, 1896). But it is rarely mentioned that the shocking effect was caused not only by the illusion of a moving object approaching the viewer, but also by the silence of this movement, as the Lumière brothers' first films were accompanied only by the crackling of the projector. The unnaturalness of the silent moving image was soon recognized and eliminated by available means, the most available of which was music. It solved several problems for silent film, but least of all were they related to plot or emotions – from this perspective, the image in silent film is completely self-sufficient. Music, firstly, as the only sound element of film, created a spatial correlate for the moving images, thus shaping the spatiotemporal structure of cinema as a specific artistic language. “The material of screen art consists of real space, given in sound, and time 'imprinted' in the image” (Irza, 1992, p. 100). The main task of music in silent film was to create a third, spatial dimension for a two-dimensional, flat image.

Secondly, music made the moving image audible, and therefore real, for everything in motion, according to psychology, must sound. This explains the continuous, non-stop performance of music in silent films. Changes in rhythm, tempo, melodies, and so on were primarily correlated with the changing shots and the movements of figures within the frame, rather than with the story or emotions of the film. Thirdly, it ensured the coherence of both individual fragments and the whole, constructing its form. As Leonard Rosenman points out, “what we are dealing with, then, is basically a literary form, not a musical form. Certainly, the music can contribute a great

deal in supporting an overall form, but this form originates with the film itself, not the music” (Burt, 1994, p. 5). It must be remembered, however, that music in film becomes part of the cinematic structure and exists according to its laws, and not vice versa. Thus, at all three levels of cinema's artistic structure – ontological, conceptual, and psychological – the role of music in silent film is fundamentally different from its function in sound cinema. Specifically, its connection to the story, conceptual, and emotional aspects of the work was minimal, which explains the replaceability of music in silent film, which is impossible in sound cinema.

Creating a soundtrack that does not destroy the structure of the artistic language of silent films is just one of the tasks that the composer solves when re-sounding it. Another task is the stylistic non-contradiction of the visual series to the auditory one. Its difficulty lies in avoiding banal stylization, in which the meaning of re-sounding is lost, by creating a modern score in style and sound that would overcome archaism without breaking the integrity of the entire work. Before proceeding with the consideration of how Iraida Yusupova coped with these tasks, it is necessary to say a few words about the film itself.

Figure 1. Film still from “Space flight” @Mosfilm Studio. https://youtu.be/ZcABqUOb3Dw?si=yJZZthZxQ6RBMSdz

"Space Flight" is the first Soviet science fiction film about lunar exploration. The film takes place in 1946. Soviet space explorers attempt to conquer the Earth's satellite by launching spacecraft carrying animals, but these attempts prove unsuccessful. Then, despite his advanced age, the team leader, Academician Sedykh, decides to fly to the Moon himself, along with his colleagues and the young pioneer Andryusha, who has secretly boarded the ship. The cosmonauts land on the far side of the Moon and attempt to cross to the Earth-facing side. Along the way, they encounter unexpected obstacles and difficulties, but the brave cosmonauts successfully overcome them and return safely to Earth, where they are greeted with a ceremonious welcome by their compatriots (Zhuravlev, 1935).

Figure 2. Film still from "Space flight" @ Mosfilm Studio.

The idea of the film was warmly supported by the state, and the film crew involved as a scientific consultant 76-years old famed scientist Konstantin Tsiolkovsky. As the film's director Vasily Zhuravlev recalled, Tsiolkovsky enthusiastically prepared for the filming, believing that cinema, to a much greater extent than literature, was able to convey ideas about space and popularize the idea of its exploration among young people (Fiodorov, 1970, p. 89). Tsiolkovsky personally drew 30 sketches of a spacecraft, outlined the state of weightlessness, ways of human movement on the surface of the Moon, the mechanism of lunar landing, the behavior of cosmonauts inside the ship, and many other details.

Figure 3. Drawing by Tsiolkovsky for the film ”Space flight” (Tsiolkovsky, 2021, p. 19).

Figure 4. Drawing by Tsiolkovsky for the film ”Space flight” (Tsiolkovsky, 2021, p. 20).

Unfortunately, Tsiolkovsky died several months before the official premiere of the film, which took place in 1936 in the Kremlin. The film was a huge success not only in the USSR but also abroad, with copies purchased in more than 20 countries. Obviously, “Space Flight” continues not only the fantastic books by Jules Verne and the films by Georges Méliès, but above all the ideas of Russian cosmism of which Tsiolkovsky was a prominent representative. The concept of turning outer space into a living space for a highly developed persons of a new type, proposed by the Russian cosmists (Fyodorov, 1982), was continued in its own way during the Soviet era, as evidenced by this film.

Film Credits:
Director: Vasily Zhuravlev
Screenplay: Alexander Filimonov, with the participation and scientific advice of Konstantin Tsiolkovsky
Cinematography: Alexander Galperin, I. Shkarenkov
Art Directors: Alexey Utkin, Yury Shvets, Mikhail Tiunov
Cast:
Sergey Komarov as Academician Sedykh
Vasily Kovrigin as Professor Karin
Nikolay Feoktistov as Institute Postgraduate Student Viktor Orlov
Vasily Gaponenko as Andryusha Orlov
Ksenia Moskalenko as Marina, Professor Karin's Assistant
Sergey Stolyarov as Launch Commander

The idea to write music for “Space Flight” was suggested to Iraida Yusupova by her husband, cinematographer and video artist Alexander Dolgin, back in 1998. Based on the video material Yusupova first created a concert version of the music for this film, and only 15 years later a full soundtrack synchronized with the image was born, ideally suited to the video sequence (Zhuravlev & Yusupova, 2009). “Space Flight” is not the composer's only experience of working with silent film. In 2002, she wrote the music for Friedrich Wilhelm Murnau's silent film “Nosferatu, a Symphony of Horrors” (1922), and in 2003 for his film “Sunrise” (1927). Besides, in 2017, Yusupova was inspired by another fantastic film production – the silent film by Yakov Protazanov “Aelita” (1924), based on the novel by Aleksey Tolstoy. She wrote a “Martian Opera,” which was executed as a performance and as an accompaniment to fragments from Protazanov's film. All these works are very interesting, highly professional and cinematic. But it would appear that Yusupova's work on the soundtrack to “Space Flight” is the most complex, full of original discoveries and even cultural insights.

The first thing to note when assessing the composer's work on this film is the precise adherence to the rules of silent cinema: the music is continuous, existing parallel to the image, following the changing shots, the dynamics within the frame, and the overall mood, without overstepping the boundaries of the screen or attempting to transform silent film into sound. But Yusupova doesn't simply follow the rules; she creatively reinterprets them and plays with them in an unconventional way.

The soundtrack to this film is a multi-layered score consisting of orchestral music, vocals (solo and choral), electronic sounds imitating noises or forming melodies, and even speeches. Each of these layers is characterized not only by a specific timbre, but also by leitmotifs that run throughout the whole film in a modified or unchanged form (one can single out, tentatively, the opening optimistic “pioneer song,” the “moonlight” theme – an allusion to „The Dark Side of the Moon“ by Pink Floyd – the themes of “anxiety,” “victory” and other sound symbols). The way this multicomponent canvas is organized is a total counterpoint at all its levels. Firstly, it is the polyphony of samples – a favorite technique of the composer. Samples are sound, arbitrarily short units of meaning that are accelerated, decelerated, superimposed on each other and combined with other elements of the musical canvas.

The polyphony of the noise layer and orchestral music is the second line of counterpoint, and it is precisely polyphony, since each of these elements has its own semantic role in the sound score (noise symbolizes the technogenic world, orchestral and vocal music – the human world).

Another contrapuntal pair is a sound sequence and a video sequence. Their interaction is non-trivial: on the one hand, it does not violate the basic principles of combining music and images in silent films described above, on the other, techniques not typical for silent films are introduced here, for example, the performance of songs and other vocals, which creates a kind of parallel plot to the image. Indicative of this is the episode when academician Sedykh packs a suitcase before his expedition to the Moon. It is accompanied by a tango paraphrase of the popular song “Oblivion” (music by G. Vars, (aka Henry Varshavsky) & F. Refrain (aka Felix Konarsky)) from the late 1930s, exaggerating the sentimentality of the situation and thus creating a comic effect. In the concert performance, this song is performed by the soloist of the choir who comes to the proscenium with a dance movement, further enhancing the comic connotation.

The use of noise is equally non-trivial: in a number of episodes, they claim to be sound correlates of events occurring in the frame, but they only claim this and are not. The viewer and listener are made to understand that the electronic noise is not the sound of what is shown on the screen, but only its sound image. This creates a distance between what is shown and what is heard, and this is a very subtle and suitable technique: while remaining within the framework of silent film, the composer distances herself from it, looking at silent film from the perspective of the future.

Finally, the fourth type of counterpoint is the polyphony of styles. The composer makes no secret of the fact that virtually all of the music written for the film is stylized. This includes the opening choral song, set to the most popular Soviet composer of the 1930s-1950s Isaak Dunaevsky, who worked extensively in film; it also features dances fashionable at the time, such as the tango, waltz, and foxtrot; and jazz, which was rapidly sweeping the globe. Stylization extends beyond sounds to lyrics, using original lyrics from songs of the time and adapting them to the context of the film (for example, the lyrics to Dunaevsky's famous Soviet song “Captain” with poetry by Vasily Lebedev-Kumach). The traditionally used cosmonaut lines, “Key on launch!” and “Let's go!,” are also adapted. But all these stylizations share one important and fundamental nuance: while remaining as faithful to the originals as possible, they contain something that

indicates the author's stance on them. The optimistic opening chorus, stylized as Soviet anthems, acquires a “too Soviet” character through persistent repetitions and ostinatos; the deliberate simplicity of the pioneer songs makes them a bit naive; and the intentionally sentimental tangos and waltzes evoke irony toward the film's characters. It is very important to emphasize here that the composer does not stoop to caricature and does not pretend to criticize the events depicted – this would be both rude and dishonest. We are talking about light irony, which gives a certain detachment, a look from the outside at what is happening on the screen, and at the film itself as a whole, and such a result in terms of wit and skill of execution is a great achievement of Iraida Yusupova. Firstly, it does not contradict the film, since the script, the mise-en-scene, and the dialogues contain a lot of humor and self-irony (it is not known, however, whether this corresponded to Konstantin Tsiolkovsky's plan). Secondly, it reveals the author's origin: if the music is stylized, then where is the author? Within this creative method, the author reveals herself in the gap between the stylization and the original, just as a pause in music is not an absence of sound but its continuation. The author's statement here lies in her detachment. This creative method is typical not only for the composer Iraida Yusupova but also for the mainstream aesthetics of the second half of the 20th and early 21st centuries, associated with postmodernism. The presentation of art as a game with meanings and established forms, reinterpreted in an ironic key, “intertextuality turned to the past” (Andreeva, 2007, p. 23), a mixture of genres and styles, mass and elite, serious and funny, “one’s own” and “someone else’s” – all these generic features of postmodernist art can be found in Yusupova’s soundtrack to the film “Space Flight.”

This work by Iraida is performed in three versions: as a concert piece, as the film‘s soundtrack (Zhuravlev & Yusupova, 2009), and in combination, when a screening is accompanied by a live performance synthesized with recorded orchestral and electronic parts, and this latter option seems to be the most interesting. The Pokrovsky Ensemble acts as “live” performers, with whom the composer has been working fruitfully for a long time and whose folklore sound sharpens the ironic overtones of the vocal numbers. In this case, there is a double effect: on the one hand, such a presentation of the film brings it back to the days of silent films, the screenings of which were accompanied by live (solo or orchestral) music. On the other hand, the presence of performers on stage introduces an element of theatricalization and enhances the feeling of detachment, turning cinema into a game of cinema as part of a meta-performance.

Thus, Iraida Yusupova managed to do the seemingly impossible in this work: stay in the past, within the framework of silent cinema, without ever violating them, without breaking the aesthetics and imaginative system of this art, and at the same time transfer it to the present, create a space-time continuum in which the past and present are connected as well as the future shown in this wonderful film.

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Research article

Displaced, Distorted, Reclaimed: “Voice” in Metal Music

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Abstract

Metal music studies have extensively examined the genre's engagement with power, transgression, and social critique. By contrast, the lyrical construction of “voice” as a thematic and philosophical phenomenon has received comparatively little scholarly attention. This study addresses this gap by investigating the relationship between metal song titles that feature different grammatical variants of the word “voice” and distinct ontological and affective themes. The naming of voice in song titles signifies a distinct ontological position rather than a mere compositional choice and constitutes the core argument of this study. A purposive sample of 169 songs titled “Voice,” “Voices,” “The Voice,” “The Voices,” or “A Voice” was compiled from the Encyclopaedia Metallum, and their lyrics were subjected to qualitative content analysis. Textual segments were coded to identify the source, nature, and response of the voice, and then refined into comprehensive thematic categories based on Foucault's theorization of disciplinary power, Kristeva's concept of abjection, and Bakhtin's dialogism. Accordingly, three principal themes were identified. The authority theme, as evidenced by the use of definite-article titles, constructs a singular, inescapable sovereign voice commanding obedience. The abjection theme, which is dominant in the bare plural “Voices,” portrays voice as a multiplied, chaotic phenomenon tied to psychic dissolution, fear, and violence. The agency theme, as manifested in both bare and indefinite singular titles, positions voice as a site of self-empowerment, political resistance, and dialogic potential. The predominance of the abjection theme within the metal imaginary suggests that voice is most commonly interpreted as a form of psychic crisis rather than as a manifestation of authority or empowerment. These findings contribute to the field of metal music studies by demonstrating that lyrics provide a rich source for systematic, theory-informed investigation and that metal music constitutes a significant cultural archive for the broader interdisciplinary study of voice and subjectivity.

Keywords: Abjection, Dialogism, Disciplinary Power, Lyrics, Metal Music, Subjectivity, Phenomenology of Voice

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Научная статья

Вытесненный, искажённый, отвоёванный: “Голос” в метал-музыке

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Аннотация

В исследованиях метал-музыки обстоятельно рассматривалось обращение жанра к проблематике власти, трансгрессии и социальной критики. Напротив, конструирование “голоса” как тематического и философского феномена в текстах песен получило сравнительно мало научного внимания. Настоящая статья восполняет данный пробел, исследуя связь между различными грамматическими вариантами слова “голос” в названиях метал-песен и определёнными онтологическими и аффективными темами. Центральный тезис исследования состоит в том, что именование голоса в названиях песен указывает на определённую онтологическую позицию, а не сводится к простому композиционному выбору. Из Encyclopaedia Metallum была отобрана целевая выборка из 169 песен под названиями “Voice”, “Voices”, “The Voice”, “The Voices” или “A Voice”, тексты которых были подвергнуты качественному контент-анализу. Текстовые сегменты кодировались для выявления источника, природы и реакции голоса, после чего сводились в развёрнутые тематические категории, опирающиеся на предложенную Фуко теорию дисциплинарной власти, концепцию абъекции Кристевой и диалогизм Бахтина. Соответственно, были выделены три основные темы. Тема власти, проявляющаяся в использовании названий с определённым артиклем, конструирует единый, неотвратимый и суверенный голос, требующий повиновения. Тема абъекции, доминирующая в форме множественного числа без артикля “Voices”, представляет голос как умноженный, хаотический феномен, сопряжённый с психическим распадом, страхом и насилием. Тема агентности, проявляющаяся как в формах единственного числа без артикля, так и в формах с неопределённым артиклем, позиционирует голос как пространство самоутверждения, политического сопротивления и диалогического потенциала. Преобладание темы абъекции в метал-воображаемом позволяет предположить, что голос чаще всего трактуется как форма психического кризиса, а не как проявление власти или расширения возможностей субъекта. Данное исследование вносит вклад в область исследований метал-музыки, демонстрируя, что тексты песен представляют собой богатый источник для систематического, теоретически обоснованного исследования, а сама метал-музыка служит значимым культурным архивом для более широкого междисциплинарного изучения голоса и субъективности.

Ключевые слова: Абъекция; Диалогизм; Дисциплинарная власть; Метал-музыка; Субъективность; Тексты песен; Феноменология голоса

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INTRODUCTION

The voice occupies multiple positions within the domain of human experience, functioning as sound, metaphor, and philosophical inquiry. This phenomenon can be regarded immediately as one of the most profound expressions of selfhood, as well as the primary medium through which external power penetrates the psyche (Foucault, 1977; Ihde, 2007). The terms “voice” and “voices” embody this duality, while a voice may act as an individual's representative or address the individual, as in the clinical phenomenon of “hearing voices” (Dolar, 2006). This semantic multiplicity renders “voice” an exceptionally suitable site for cultural analysis (Thomaidis & Macpherson, 2015), particularly within musical genres where vocal extremity and lyrical intensity converge (Phillipov, 2012; Walser, 1993).

This dichotomy has long been a subject of profound philosophical contemplation. As Adriana Cavarero (2005) argues, the voice reveals “the uniqueness of each existent,” anchoring subjectivity in the embodied act of vocal utterance rather than in abstract cognition. Steven Connor (2000) has traced the oscillatory patterns in Western culture, in which the voice has been simultaneously venerated as a guarantor of presence and feared as a vehicle of ventriloquism and dispossession. Mladen Dolar (2006) has advanced the concept of voice as an uncanny “remainder” that surpasses the bounds of linguistic meaning and acoustic materiality, a phenomenon that is fully neither the purview of the speaking subject nor that of the listening other. More recently, Konstantinos Thomaidis and Ben Macpherson (2015) have advocated interdisciplinary “voice studies” that consider voice as an embodied practice, a cultural symbol, and a phenomenological event. Collectively, these perspectives imply that voice ought not be regarded as a mere neutral auditory phenomenon; rather, it is inherently intertwined with inquiries concerning power, identity, and the limits of the self.

Metal music constitutes a uniquely fertile site for this inquiry, and not merely incidentally, as the voice assumes a dual presence within the genre. Vocally, it accentuates the extremity of utterance through guttural screams, growls, and operatic singing, establishing the sounding voice as the primary expressive medium (Burns, 2025; Walser, 1993; Weinstein, 2000). Thematically, it returns insistently to the exploration of the limits of the self as confronted with power, subjection, madness, transgression, and resistance (Kahn-Harris, 2007; Phillipov, 2012). Within this genre, extreme states find expression beyond mere representation, as they are performed through a multifaceted combination of lyrical and sonic elements (Overell, 2014; Unger, 2016). Consequently, metal music represents a distinctive site for exploring the lyrical construction of voice, arguably surpassing other genres in the intensity and analytical richness of its lyrical composition. In this context, the voice assumes a central role as a medium for expressing profound psychic and political themes. While a substantial body of scholarship, ranging from Robert Walser's (1993) seminal study of guitar timbre as a form of empowerment to Michelle Phillipov's (2012) theorization of death metal's affective intensity, has examined the sonic and performative dimensions of the metal voice, there is a paucity of research on how the notion of “voice” functions as a lyrical and conceptual theme within the genre. Within the realm of metal music, the utilization of titles containing the word

"voice" or "voices" in song titles does not merely serve as a label for a musical composition. Instead, it constitutes an act of selection, whether conscious or intuitive, from a spectrum of ontological positions that carry distinct philosophical implications.

This study aims to reveal and interpret the aforementioned ontological distinctions through a qualitative content analysis of 169 metal songs whose titles present the word "voice" in various forms. Drawing on a comprehensive conceptual framework grounded in Michel Foucault's (1977, 1980) theorization of disciplinary power, Julia Kristeva's (1982) concept of abjection and semiotic disruption, and Mikhail Bakhtin's (1981, 1984) dialogism and the heteroglossic potential of utterance, the analysis categorizes the lyrical construction of voice into three principal modalities: authority, abjection, and agency. By undertaking this investigation, the study makes a significant contribution to the interdisciplinary dialogue between metal music studies, philosophy of voice, and cultural theory. Furthermore, it demonstrates that metal music lyrics constitute an essential and currently underutilized archive for theorizing the phenomenology of vocal experience in late modernity.

This study proposes that these modalities exhibit a coherent distribution across the analyzed lyrics, demonstrating a discernible tendency to correspond to the manner in which each song designates its own voice. Specifically, when the voice is referred to as "The Voice" or "The Voices," it typically constructs an already identified, sovereign presence, a sovereign that commands and forecloses reply. When the term "Voices" is used without further qualification, it typically evokes an uncontained multiplicity that dissolves the boundaries of the self. Moreover, the use of "Voice" or "A Voice" in these contexts suggests openness to the potentiality of voice, emphasizing the relational and emergent nature of utterance, which remains inadequately defined or articulated. Accordingly, the form of the title functions as a threshold of interpretation, signifying to the listener the ontology of voice that a song inhabits prior to encountering its lyrics, constituting a form of indexicality as described by Silverstein (2004). Therefore, these naming practices correspond to the authority, abjection, and agency modalities, though systematic departures from this pattern illuminate the conditions under which the lived construction of voice works against the expectation its title would otherwise set.

VOICE IN CRITICAL THEORY AND METAL MUSIC STUDIES

The philosophical interrogation of "voice" has a long and complex genealogy, with scholars examining the term from various angles across different historical periods. This conceptualization can be traced back to Aristotle's distinction between phōnē (animal sound) and logos (meaningful human speech) (Naas, 2022; Sparshott, 1994), and extends to Jacques Derrida's (1976) critique of phonocentrism. In Western thought, there has been a persistent shift between privileging the voice as the guarantor of presence and truth and suspecting it as the vehicle of illusion and domination (Cavarero, 2005; Connor, 2000). Foucault's (1977, 1980) studies on power and discourse offer a seminal framework for understanding the voice as a means of authority, in which power operates not solely through overt coercion but also through discursive regimes that generate "truths" and regulate subjects. The authoritative "voice" in its unambiguous, singular form can be

comprehended as an embodiment of what Foucault (1980) termed “power/knowledge,” a voice that not only conveys but also obligates obedience, molds perception, and precludes competing utterances. Indeed, this assertion signifies the voice of the sovereign entity, the institutional framework, and the internalized sense of moral rectitude that functions as a form of self-discipline.

Kristeva's (1982) theory of abjection provides a contrasting framework for understanding the multiplied, chaotic voice. In this context, the abject is theorized as that which disturbs identity, system, and order, “what does not respect borders, positions, rules.” The aforementioned phenomenon of “hearing voices,” particularly in its association with psychosis and the dissolution of the unified subject, corresponds to Kristeva's understanding of the semiotic, the pre-symbolic, rhythmic, pulsional dimension of language that threatens to overwhelm the symbolic order. Furthermore, Bakhtin's (1981, 1984) dialogism offers an additional theoretical framework, reinterpreting multiplicity not as a form of pathology but as the fundamental condition of human expression. In this sense, each word is considered to be “half someone else's” (Bakhtin, 1981), thereby highlighting the notion that meaning emerges from the dynamic interplay of voices engaged in dialogue. The Bakhtinian “voice” can be characterized as inherently relational, contextual, and resistant to monologic closure.

Building upon these foundations, Mladen Dolar's (2006) “A Voice and Nothing More” further elaborates this theoretical framework by conceptualizing voice as an entity that transcends the realms of meaning and sound, a phenomenon that eludes the purview of linguistics and acoustics. This double excess is methodologically consequential for this study, as a textual analysis engages the voice on the side of meaning, while its acoustic materiality, the dimension to which vocal techniques pertain, reconnects with the lyrical findings in the discussion section. The “object voice,” as Dolar (2006) terms it in accordance with Lacan's theory, occupies the uncanny space between the self and the “other,” between the interior and the exterior, rendering it an object of both fascination and dread. Within the context of metal music lyrics, the barren or ambiguous “voice” often embodies this dialogic capacity: a voice that responds, resists assimilation into authoritative discourse, and establishes new possibilities for agency and resistance.

The field of metal music studies has undergone significant expansion following the seminal contributions of Deena Weinstein's (2000) foundational sociological analysis and Walser's (1993) pioneering musicological intervention. Engagement with themes of power, transgression, and social critique has been extensively documented across multiple subgenres (Kahn-Harris, 2007; Phillipov, 2012; Spracklen, 2020). From the late 1990s onward, the rise in the study of metal music in fields such as subcultural studies, sociology, and music video analysis has led to a surge in scholarly work on the topic (Coggins, 2019). Karl Spracklen (2014, 2016) has theorized metal music as a “communicative space” where counter-hegemonic discourses are articulated and negotiated. Similarly, Keith Kahn-Harris (2007) has influentially analyzed the genre through the lens of “transgressive subcultural capital.”

More recently, scholars have begun to examine specific aspects of metal music with greater scrutiny. Rosemary Overell's (2014) ethnographic work on grindcore scene exemplifies how experiences in these environments function as a form of “affective

intensity” that resists discursive capture. Nelson Varas-Díaz et al. (2024) have explored the potential of metal music for “decolonial truth-telling”. Studies on specific bands have examined how metal lyrics engage with socio-political phenomena, including war, environmental destruction, and political manipulation (Elnur, 2024; Fathan & Budiwati, 2026; Saarinen, 2013). Harris Berger's (1999) phenomenological approach further demonstrates the value of attending to the lived dimensions of musical meaning-making, including the ways in which voices both performed and narrated. Rosemary Lucy Hill's (2016) research on gender, metal, and the media has also generated significant insights into the gendered nature of metal music subcultures. However, a systematic analysis of how the concept of “voice” is thematized within metal lyrics remains conspicuously absent from the existing literature. This study addresses this gap by treating “voice” not merely as a sonic or performative phenomenon but as a lyrical-philosophical inquiry, which metal musicians engage with in remarkably nuanced ways.

Based on the theoretical foundations outlined above, this study provides a threefold framework for analyzing the concept of “voice” in metal music lyrics. Following Foucault's theorization of disciplinary power, the first theme, “The Voice as Authority,” explores how songs with titles like “The Voice” or “The Voices” depict voice as a singular, commanding, and often oppressive entity that demands obedience and exercises disciplinary power over the lyrical subject. Drawing on Kristeva's concept of the abject, the second theme, “Voices as Abjection”, explores how songs titled “Voices” depict the voice as a multiplied, chaotic, boundary-dissolving phenomenon associated with madness, psychic fragmentation, and the collapse of the subject/object distinction. Grounded in Bakhtin's dialogism, the third theme, “Voice as Agency,” examines how songs titled “Voice” or “A Voice” construct voice as a site of emergent selfhood, dialogic engagement, resistant speech, or the potentiality of meaningful utterance. This threefold framework elucidates predominant tendencies rather than prescribing rigid categorizations, thereby offering a nuanced and multifaceted perspective on the phenomenon.

METHODOLOGY

The dataset for this study was obtained through a systematic search of Encyclopaedia Metallum, the most comprehensive online metal music database, which catalogs over 195,000 bands and their discographies (Encyclopaedia Metallum: The Metal Archives, n.d.). The search targeted all songs with the exact titles “Voice,” “Voices,” “The Voice,” “The Voices,” or “A Voice,” for which complete English lyrics were available. After removing entries with unavailable, instrumental, or non-English lyrics, the final corpus comprised 169 songs spanning multiple subgenres, including death metal, black metal, thrash metal, power metal, progressive metal, doom metal, gothic metal, and various hybrid forms, as well as different release types, such as full-length albums, EPs, singles, demos, and splits. The lyrics were compiled into a structured dataset including band name, album title, release type, song title variant, and full lyrical text. This purposive sampling strategy was designed to capture the full range of grammatical and ontological permutations of “voice” within the metal music. The generated dataset

establishes a rigorous basis for the qualitative interpretation of lyrical content through thematic analysis.

The analytical object of this study requires clear delineation before engaging with the subject matter. In this study, the acoustic and performative dimensions of vocal delivery through which metal lyrics are articulated have been methodically bracketed in order to isolate the lyrical and semantic construction of voice as a textual object. This bracketing functions analytically rather than ontologically, thereby avoiding the implication that the sonic materiality of the metal voice is irrelevant to meaning. Indeed, vocal technique constitutes one of the most potent signifying resources of the genre (Phillipov, 2012; Walser, 1993). Instead, the decision to initiate the study by examining the lyrical content is indicative of the study's specific aim, which is to recover the conceptual and philosophical thematization of voice that has remained obscured by the field's longstanding emphasis on timbre and performance. The relationship between these lyrical modalities and their characteristic modes of vocal delivery is addressed directly in the discussion section, where the textual findings are reconnected to the acoustic body of the voice.

In this study, a qualitative content analysis approach (Hsieh & Shannon, 2005; Mayring, 2000; Schreier, 2012) was adopted, aligning with the methodology employed in recent lyric-based metal music research, which utilizes systematic coding and thematic categorization. The analytical procedure was executed through a multi-stage process, with each stage being interconnected with the preceding stage. The lyrics were read iteratively to develop familiarity and identify recurrent motifs, metaphors, and narrative structures associated with the concept of voice. Subsequent to this preliminary coding phase, an open coding phase ensued, wherein textual segments referencing voice were coded according to three distinct dimensions: the characterization of the source of the voice (internal, external, unknown, divine, demonic); the nature of the voice (commanding, whispering, screaming, multiplied, singular); and the lyrical response of the subject to the voice (obedience, fear, resistance, empowerment, fragmentation). Following a cyclical process of comparison and abstraction (Elo & Kyngäs, 2008; Vaismoradi et al., 2013), the initial codes were then reorganized into higher-order categories corresponding to the three ontological themes of the conceptual framework: authority, abjection, and agency. Finally, exemplary lyrical passages were selected to illustrate each category, with particular attention to the rhetorical strategies employed to construct voice, including metaphor, personification, imperative mood, and interrogative forms.

The constant comparative method was employed throughout to ensure analytical trustworthiness, with new data continuously compared against previously coded material (Maykut & Morehouse, 1994). Researcher reflexivity was maintained through ongoing documentation of analytical decisions and interpretive assumptions (Creswell & Miller, 2000). The threefold framework was modified in accordance with emergent data, thereby ensuring the inclusion of lyrical passages beyond the confines of pre-established categories when they did not substantively align.

FINDINGS

An examination of the 169 songs within the dataset reveals significant disparities in the distribution across various title variants. The plural form "Voices" is the most prevalent, significantly outnumbering the singular "The Voice" and the plural "The Voices." The bare singular "Voice" and the indefinite "A Voice" constitute the smallest categories. This distributional pattern is analytically significant because in the realm of metal imaginaries, the experience of voice is most typically characterized as uncontained multiplicity rather than singular authority or bounded agency.

"I'm the Voice and You're My Slave": Voice as Authority

The presence of the definite article in lyrics ("The Voice" or "The Voices") consistently conveys the notion of voice as an external or relatively external authority that wields power over the lyrical subject. The defining characteristics of this theme encompass control, domination, and the dissolution of individual autonomy.

Crest of Darkness's "The Voice" exemplifies this modality with considerable clarity: "I'm the voice in your head / I'm the voice, and you're my slave." In this text, the voice is presented as an external entity, addressing the listener directly and claiming authority over the listener's internal experiences. The employment of the definite article serves to underscore the singularity of this voice, articulating a unifying and comprehensive presence that refuses to acknowledge any form of rivalry or plurality. This master-slave dialectic aligns with Foucault's (1977) concept of disciplinary power as a mechanism that is internalized through surveillance and control.

This thematic intensity is further illustrated by Denim and Leather's "The Voice": "I am the voice that screams inside your mind / I am the evil that commands your body and your soul [...] Your doctor is wrong, I'll never set you free / Your mind is full, you're crazy, can't you see?" In this text, the voice wields a dual effect, simultaneously claiming dominance and subverting external sources of authority, namely the doctor and medical knowledge. This assertion of authority positions the voice as the sole interpreter of reality, effectively eclipsing other potential perspectives. This concept aligns with Foucault's (1980) notion of the productive dimension of power, characterized by the capacity not only to repress but also to shape the individual's perception of reality.

Sanity's Eclipse's "The Voice" offers a nuanced dramatization of this power dynamic through a dialogic structure: "I want you. – Leave me alone. / You will loose. – I don't need your help. / I am stronger than you. – I don't let you out / You can not resist my force. – Get out of my head." The subject's resistance is progressively overcome until the final capitulation: "The voice is now stronger than before, I let it out, can't take it anymore! [...] I escaped by using a knife." Within these lyrics, escaping from The Voice's authority becomes synonymous with self-destruction, a vivid illustration of internalized power that echoes Foucault's (1977) notion that disciplinary regimes effectively create the entities they seek to control.

Enslaved's "The Voices" extends this analysis to collective authority: "I hear their poisonous words again / As they call out for submission and code [...] These were the voices that destroyed us." The plural definite article in "The Voices" functions as a

signifier of institutional or systemic power, representing a code, a regime, or a cohesive apparatus of submission. Specifically, the response, “Fail to comply – reborn in war / The answer being no,” introduces a moment of resistance that is explicitly framed in terms of confrontation rather than liberation. Psychosis's “The Voices” further elucidates this theme: “The voices of your masters / Are hung in the air / You hear them whispering in the darkness of the night / Your time has come / Get up! [...] They are crying for the sacrifice of blood.” Within this context, the voice that assumes a masterful role demands more than mere compliance by necessitating ritual sacrifice, which positions the individual as a mere medium for mysterious and uncontrollable forces.

Sociopathy's “The Voice” sheds light on the compulsive dimension: “Voice inside my head / Murder act / Brings my soul to relieve [...] Whatever voice says, I must do it / Because I'm weak in my sinful soul.” By deliberately acknowledging powerlessness, the individual conveys a stance that transcends conventional notions of resistance or even reluctant compliance. Instead, this acknowledgment signifies a fundamental weakness in the face of The Voice's authority. This perspective aligns with Dolar's (2006) conceptualization of the “voice as object,” a phenomenon that emerges from a dominant position and transcends the individual's capacity for refusal or resistance. Similarly, Queensrÿche's “The Voice” articulates a culminating moment of self-recognition: “when life is hanging from a thread... you can hear that voice in your head [...] And now my heart's done bleeding, but I've just started seeing.” In this context, the voice emerges at the threshold of death and vision, functioning as “voice as object,” a residue that persists when all signification has been stripped away.

Within the theme, analysis reveals a predominant subject-object relationship, characterized by the dominance of “The Voice” over the lyrical content. The definite article functions as a grammatical marker of ontological closure, representing the voice that has already been identified, named, and established as sovereign within the psyche.

“Voices Growing Louder Still”: Voice as Abjection

The plural form “Voices” represents the most prevalent theme in the dataset, exhibiting a consistent narrative trajectory. This thematic profile portrays voices as a multiplied, uncontrollable, and disruptive phenomenon, associatively linked with psychic disintegration, violence, and the abject.

Born from Deception's “Voices” offers a quintessential expression of this tendency: “Instead of quiet, there is chaos / Voices growing louder still / Insatiable, their thirst for blood / Demanding once again to kill [...] The voices leave him restless, awake at night, never sleeping / The voices are relentless, at all hours, always speaking.” The voices in these lyrics defy conventional boundaries, disrupting the traditional distinctions between waking and sleeping and between interior thought and exterior action. Their insistence represents a demand for the dissolution of the traditional boundaries between subject and act, rather than the unconditional compliance demanded by The Voice. This concept aligns with Kristeva's (1982) notion of abjection, conceptualized as a state of lacking respect for boundaries, established positions, or prescribed rules.

Algea's “Voices” serves to reinforce this perspective: “Voices inside my head / Wanting me dead / That bring pain to loved ones / In exchange of shame [...] Breaks the boundaries of reason / Confounds my mind with malice / And desecrating thoughts of death.” By explicitly referencing “breaking boundaries of reason” and “desecrating thoughts,” the voices establish themselves as agents of semiotic disruption. This disruption, similar to Kristeva's (1984) concept of semiotic chora, involves the breakdown of the symbolic order with considerable force.

Dream Theater's “Voices” exemplifies self-awareness in a theoretical sense: “Voices repeating me / 'Feeling threatened? We reflect your hopes and fears.' / Voices discussing me / 'Others steal your thoughts, they're not confined within your mind.'“ Indeed, the voices explicitly announce their role as reflections, repetitions, and discussions, thereby illustrating the decomposition of the individual's psyche into a cacophony of competing perspectives. In this manner, the notion that thoughts are “not confined within your mind” articulates precisely the Kristevan dissolution of the “self/other boundary” (Keltner, 2006).

A more nuanced illustration of this phenomenon manifests in Alice in Chains's “Voices”: “Who am I? Is this me? Am I wrong? Or thirteen? [...] Everybody listen / Voices in my head / Everybody listen / Cause you'll see what mine says.” The initial inquiries serve to underscore the inherent identity crisis that accompanies the experience of voices. The imperative “everybody listen” paradoxically externalizes the internal chaos, thereby requiring others to bear witness to the fragmentation. Additionally, Burning the Oppressor's “Voices” introduces the institutional dimension: “White walls around me… I cannot see the exit / Voices invade me, voices impose all limits / Welcome to my world, my reality / This is my world, a paranoid story.” In this context, the “white walls” symbolize the confines of the psychiatric institution, while the voices “impose all limits” on the autonomous perception of the subject. This intersection of madness and institutionalization recalls both Kristeva's (1982) analysis of abjection in relation to the social order and Foucault's (1965) earlier work on madness and civilization.

The Accüsed's “Voices” achieves a devastating compression: “Curled up on the floor / Four walls and a bed / Me, myself and the voices in my head.” The persistent reiteration of this refrain symbolizes the experiential phenomenon of the voice ensnared in a repetitive loop, the self-reduced to its most fundamental aspect, surrounded by its own inherent plurality. Borknagar's “Voices” further explores this theme, expanding it into the existential realm: “There are voices in the air, there are voices in the air. / They always find me, they find me, no matter where I go [...] When I finally stop to breathe / All the voices will only linger in the field.” In this context, the voices transcend their internal nature, permeating the landscape itself. Ultimately, the only release from this state is death, defined as the cessation of breathing. Nevertheless, as posited by the lyrics, the voices merely “linger” in the space between life and death.

Toxik's “Voices” encapsulates the complete trajectory from internal affliction to externalized violence and ultimate self-destruction: “These voices in my head they say / Just what they want to say / They taunt me in my sleep / They want me to kill their way [...] Free from them, they're finally out / Out, get them out.” The only resolution to this

predicament, as elucidated in the following discourse, lies in the literal effusion of one's own blood: “From my wrists, blood cascades / Free from them, they're finally out.”

Within this theme, the most prevalent responses observed include fear, a sense of loss of control, a desire for cessation, and expressions of violence, either enacted or demanded by the voices. Rather than exhibiting successful resistance, the individual's response is characterized by ambivalence, shifting between feelings of helplessness and horror, and a subsequent capitulation of will. This consistent pattern across various songs from disparate subgenres, countries, and decades suggests that the unadorned plural “Voices” has solidified within the metal imaginary as a stable signifier for psychic dissolution.

“Fear No Master”: Voice as Agency

The least extensive theme, represented by songs titled “Voice” or “A Voice,” exhibits a distinctly divergent profile. In this context, voice does not function as the totalizing sovereign or the chaotic swarm, but rather as an emergent, relational, and potentially resistant utterance that is aligned with Bakhtin's (1981, 1984) concept of dialogism. Despite the plural title, Archetype's “Voices” articulates a discursively agentive narrative: “Here I am, the shady voice inside your head / Shake the silence off and face yourself instead [...] Rise! Upon your darkest past / Feel the strength and the pain from the memories that'll last [...] Locate the masterpiece you were searching for.” In this context, the voice transcends the conventional paradigm of authority, instead evoking the individual's inherent potential for self-creation. The imperative “Rise!” does not function as a disciplinary directive, as would be expected in the context of The Voice. Rather, it can be understood as the concept of a “word with a sideways glance,” as described by Bakhtin (1984). By employing this term, the message is directed not only to address the other, but also to establish both the author and the recipient of the message.

Warforged's “Voice” explores the concept from an existential-phenomenological perspective: “...blurry faced things staggered out from the trees [...] I tried to scream, can't you hear me calling from the dark?” In this context, voice can be understood as a verbal expression that has not yet been addressed to its recipient, thereby exemplifying the Bakhtinian concept of an “utterance” in a state of suspension, situated at the intersection of the individual and the external world. Sinbreed's “The Voice” employs a comparable but inverted logic. Notably, the title names a singular, authoritative voice typically associated with the authority modality, yet subverts this conventional designation to critique the master-slave dynamic: “I hear a voice in my head and in my heart / Getting louder day by day / It calls my name telling me to dare the start / To no longer stay a face in the crowd / I will stand for my beliefs – strong and proud [...] Never bow your head – fear no master.” The explicit rejection of the master-slave dynamic, as exemplified by the phrase “fear no master,” serves to invert the established paradigm of the “authority” domain.

Within the realm of lyrical content, Mortad's “The Voice” stands out as a noteworthy exemplar, particularly for its political significance. Dedicated to Neda Agha-Soltan, the young Iranian woman killed during the 2009 pro-democracy movement,

whose name corresponds to "The Voice": "Neda fear not / Stay with us [...] Bore a hole through the stone / Fought with her flesh and bone [...] Smothered the will / Our will to mutiny." Voice is theorized as political agency in this context, signifying the act of voicing truth to power despite the potential for lethal consequences. This perspective aligns with Bakhtin's (1981) concept of the "internally persuasive word," which challenges authoritative discourse, and with Cavarero's (2005) notion of voice as the embodiment of "uniqueness of each existent". Noxus's "Voices" reframes multiplicity as solidarity rather than fragmentation: "You are the voice, we do this for you [...] Let me hear / All I want / All I need / Hear your voice / Scream my name." In this context, the imperative "hear your voice" inverts the traditional structure of the "Voices" domain, wherein voices are typically imposed on a passive subject. In contrast, the individual actively seeks the other's voice as a fundamental element in defining their own identity and sense of self.

Within this theme, the prevailing response to the voice manifests through engagement rather than obedience or submission. Specifically, the subject, characterized by lyrical content, engages listeners by inviting them to listen, respond, question, and ultimately take action. Within this framework, voice is not conceptualized as a possession or an affliction, but rather as an event that occurs between individuals.

DISCUSSION

Qualitative content analysis of lyrical content has yielded a threefold taxonomy, "Authority, Abjection, Agency." This framework reveals how metal musicians, across a broad spectrum of subgenres, engage with the concept of "voice" in resonant ways with contemporary philosophical and critical-theoretical frameworks. This convergence ought not to be considered purely coincidental, as the voice, the primary medium of metal music performance and one of the core thematic domains of its lyrics, occupies the intersection of the genre's genre-specific thematic preoccupations, as evidenced by the lyrics analyzed in this study.

The overwhelming predominance of the "Abjection" theme necessitates particular consideration. This distributional tendency implies a prevalent association of voice with psychic crisis within the metal imaginary. The voices expressed in these lyrics deviate from the rationality, communal harmony, or constructive discourse characteristic of conventional lyricism. Instead, they embody a dissolution of these qualities, wielding violence, curtailing autonomy, and erasing the boundaries between the self and the other, the interior and exterior, rationality and madness. This finding resonates with Phillipov's (2012) understanding of metal music as an affective experience worthy of exploration. It also aligns with Overell's (2014) ethnographic observation that extreme music scenes foster a sense of "brutal belonging" through the shared experience of intense sound and themes.

While less prevalent, the "Authority" theme is deemed more philosophically consequential. The construction of voice as a singular, disciplinary, inevitable sovereignty is exemplified in the lyrics "I'm the voice and you're my slave," by Crest of Darkness, which elucidate a theory of internalized power analogous to Foucault's (1977)

analysis of the “panopticon”. At this juncture, the voice emerges as an internal observer that requires no external validation, having already assimilated itself within the psyche of the individual. The recurrence of this motif across a variety of musical genres and time periods indicates that the experience of being compelled by an inner voice of authority is a persistent cultural concern with unique expressive potential through metal music. This finding further aligns with Niall Scott's (2012) observations concerning the internalization of discursive structures within subcultural expressions and Owen Coggins's (2018) analysis of how metal music facilitates experiences of transcendence and submission through sonic extremity.

Despite its classification as the least substantial thematic category, the “Agency” theme provides a crucial and noteworthy counterpoint. The analysis of songs within this theme reveals the capacity of metal lyrics to serve not only as a medium for documenting subjection and fragmentation, but also for the imaginative representation and enactment of resistance. Mortad's dedication to Neda Agha-Soltan transforms “The Voice” from a metaphor of inner turmoil into a political declaration. Sinbreed's injunction to “fear no master” directly challenges the logic of domination as espoused by the “Authority” theme. Meanwhile, Archetype's imperative “Rise!” reconfigures voice as a tool of self-empowerment. These findings align with Varas-Díaz et al.'s (2024) recent positing that metal music functions as a form of “truth-telling” in contexts of political and cultural oppression, and with Heather Savigny and Simon Schaap's (2018) broader claim that metal music studies should attend to the resistant and emancipatory potentials of the genre alongside its transgressive dimensions.

A comprehensive analysis of the dataset indicates a strong and persistent, though not exclusive, association between the way a voice is designated in a song and the ontology of vocal experience embodied in its lyrics. By employing the singular and definite voice in a song, the voice effectively establishes an authority that is already identified, sovereign, and established. When “Voices” is used without qualification, it evokes a presence that is anonymous, multiple, and uncontainable. The use of an indeterminate singular (“Voice,” “A Voice”) denotes the domain of potentiality, signifying an unformed voice yet to be defined and appropriated. The principal aberrations from this paradigm manifest in the agency modality, wherein songs reappropriate titles otherwise associated with authority or abjection. Drawing upon Silverstein's (2004) conceptualization, these naming practices can be regarded as sites of performative enactment, where cultural presuppositions concerning the “what” and the “who” of communication are indexically reconstructed in each instance of utterance.

Interpreting metal music lyrics as text while invoking phenomenologies of the voice that privilege its sonorous and embodied dimensions (Cavarero, 2005; Ihde, 2007) poses the issue of creating an apparent tension. Given Cavarero's (2005) notion of voice as a primary signifier of uniqueness in its embodiment rather than in its semantic content, an exclusively textual reading faces the possibility of reproducing the phenomenon of devocalization it aims to contest. However, this tension remains more apparent than substantial, and its dissolution illuminates the scope of the extant findings, underscoring their limitations. Roland Barthes (1977) identifies a level of signification inherent in the materiality of vocal production, which operates independently of semantic content within

the context of song. This level of signification renders the body audible, thereby emphasizing the physical nature of vocal production over semantic interpretation. This grain, as posited by Barthes, is distinguished from, and indeed prioritized over, the communicative and expressive register of the sung message. Nevertheless, this study conceptualizes these two aspects as co-implicated facets of a single signifying event, thereby pursuing the lyrical-semantic dimension without denying the inherent meaning carried by the vocal grain. Dolar's (2006) concept of “object voice” offers a framework for understanding the phenomenon by articulating the dimensions of vocal experience that exceed both the auditory and the linguistic dimensions that extend beyond the conventional boundaries of language. Consequently, the lyrical and sonic dimensions are understood to be intertwined, rather than confined to distinct realms.

From this perspective, the three identified modalities are reinforced, without being contradicted, by the distinctive vocal characteristics of the genre. The authority modality, typified by a singular voice that dominates and forecloses response, finds its acoustic counterpart in the declamatory, intelligible, and monologic registers that assert mastery over the sonic domain. The abjection modality corresponds to the growled and screamed textures in which semantic intelligibility itself begins to dissolve, an audible enactment of the semiotic breaking through and overwhelming the symbolic order (Kristeva, 1982; Phillipov, 2012). Furthermore, the agency modality is frequently characterized by the dynamic interplay of clean and harsh registers, which has become a structural feature of the genre (Burns, 2025). This interplay manifests at the level of vocal production, thereby exemplifying the dialogic relation between voices theorized by Bakhtin (1981). Accordingly, this analysis provides a preliminary textual examination of a phenomenon that warrants a more comprehensive multimodal description, including an analysis of its constituent elements. This analysis highlights the interdependence between lyrical themes and vocal delivery, suggesting that these elements should be considered together in subsequent multimodal studies.

Situating these findings within the broader discourse on voice and subjectivity underscores the significance of this study. In Don Ihde's (2007) phenomenology of listening, a distinction emerges between the voice of the other and the inner voice. The metal music lyrics examined in this study systematically challenge this distinction. The voice materializes from the periphery, gradually permeating the internal domain. Concurrently, voices emanate from within, overwhelming the exterior. At the interface between interior and exterior realms, Voice/A Voice manifests, signifying the nexus of these two dimensions. This persistent destabilization of the inside/outside boundary is essential to Cavarero's (2005) phenomenology of voice. Additionally, this study suggests that metal music functions as one of its most articulate contemporary artistic expressions. Similarly, Thomaidis and Macpherson (2015) emphasize that voice inhabits the contested space between embodiment, signification, and affect, rather than being confined to a single modality. This notion is substantiated by the analysis of lyrical content in this study.

This study provides methodological insights for the field of metal music studies. By focusing on a specific lexical unit, “voice,” and examining its semantic and ontological variations across a substantial corpus, the analysis underscores the value of

systematic, theory-driven investigation in the context of metal lyrics. Adopting a qualitative content analysis approach can reveal patterns that might be overlooked through close reading of individual songs. This approach also preserves the interpretive depth typically diminished by purely quantitative methods while maintaining trustworthiness.

CONCLUSION

This study has demonstrated that metal music lyrics constitute a substantial and theoretically valuable repository for investigating the ontology of "voice" in contemporary culture. A qualitative content analysis of 169 songs yielded three distinct themes: "The Voice as distinct authority", rooted in Foucauldian power relations; "Voices as chaotic multiplicity" articulating Kristevan abjection; and "Voice/A Voice as emergent agency" in resonance with Bakhtinian dialogism. The noteworthy uniformity exhibited by these phenomena across a wide array of subgenres, national contexts, and historical periods suggests that the notion of "voice" addresses a foundational aspect of metal music imaginary. Consequently, it extends to the broader cultural phenomenology of auditory experience in late modernity.

The findings carry several implications for various domains of scholarly inquiry. In the context of metal music studies, this approach underscores the importance of examining not only vocal performance and musical structure but also the thematic construction of voice. For the philosophy of voice, they provide empirical evidence drawn from a dataset of 169 diverse subcultural texts. This evidence demonstrates the ontological distinctions theorized by Foucault, Kristeva, Bakhtin, Dolar, and Cavarero. From a broader perspective, within the domain of cultural studies, these phenomena offer a compelling illustration of how a marginalized musical genre engages with some of the most pressing questions (Who speaks? Who exerts authority? To whom does the voice of the text belong?) of contemporary individuality and subjectivity.

Future research would benefit from extending this analysis in several directions. A comparative study across different musical genres could examine whether the "voice as authority" pattern appears in the lyrics of contemporary genres with comparable frequency. A diachronic investigation into the evolution of voice construction across the history of metal music would provide valuable insights. Additionally, a reception study could examine how listeners experience the varied ontological domains in metal music. Furthermore, a multilingual analysis examining the construction of voice in metal music lyrics written in various languages with different grammatical structures, such as the presence or absence of definite articles, could offer novel insights into the impact of linguistic nuances on the perceived ontological effects. Undeniably, when metal musicians employ the term "voice," "voices," or simply "voice," they engage in one of the most fundamental and enduring philosophical discourses, encompassing inquiries into the essence of speech, the act of being addressed, and the phenomenon of being spoken through.

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Research article

Whispers of a Fibre Optic Cable – Technogenic Echoes as Eerie Technofutures in Wilke Weermann's *Unheim*

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Abstract

In his play *Unheim*, Wilke Weermann envisions a dystopian future shaped by imaginative forms of interplay between humans and smart technologies: smart homes are inhabited by ghosts in the form of previous residents that have imprinted themselves into the home's technologies by interacting with it. The home continues to produce technological acts as if the human would still be living in it, shaping itself around an absent person – and by that creating the un-home-ly notion of a ghost, as an echo of the previously human inhabitant. The phenomenon of echo appears in *Unheim* both traditionally as the repetition of voice as well as in the form of non-vocal acts within communicative context being replicated. In this article we aim to analyse the world presented in *Unheim* in regard to its contribution towards a process of meaning creation in considering certain human-technology-relations that can be opened up to hermeneutical analysis. By employing a grammatical approach towards technology, the latter can be understood as technology games (in reference to Wittgenstein's language games) and a way we do things. It is found that in *Unheim*, conveyed through the notion of echo, smart home technologies perform moves that constitute a shift from a way we do things to a way *things* do things that is abstracted from human activity. This way things do things that is inscribed into the smart home establishes things as being autonomous in a specific way that is indifferent to humanity and therefore calls into question accountability by humans for technological developments.

Keywords: Unheimlich, Echo, Eerie, Hermeneutical Technology Assessment, Autonomous Technology, Uncanny, Dwelling

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[34] A firm commitment to the importance of academic discussion and an exchange of ideas sometimes collides with the need not to be misunderstood in contentious times. This is the case for one of the authors of this paper who therefore prefers to remain anonymous

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Научная статья

Шепот оптоволоконного кабеля – Техногенные отголоски жуткого технобудущего в пьесе Вильке Веерманна “Унхайм”

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Аннотация
В своей пьесе “Унхайм” Вильке Веерман представляет антиутопическое будущее, сформированное воображаемыми формами взаимодействия человека и умных технологий: умные дома населены призраками в виде бывших жильцов, которые оставили свой след в технологиях дома, взаимодействуя с ним. Дом продолжает производить технологические действия, как если бы в нем все еще жил человек, формируясь вокруг отсутствующего человека – и тем самым создавая неуютное представление о призраке как об отголоске прежнего обитателя-человека. Феномен эха в “Унхайме” проявляется как традиционно в виде повторения голоса, так и в форме невербальных актов в коммуникативном контексте, которые воспроизводятся. В этой статье мы стремимся проанализировать мир, представленный в “Унхайме”, с точки зрения его вклада в процесс создания смысла при рассмотрении определенных взаимоотношений человека и технологий, которые могут быть подвергнуты герменевтическому анализу. Используя грамматический подход к технологиям, последние можно понимать как технологические игры (в отсылке к языковым играм Витгенштейна) и способ, которым мы делаем вещи. Обнаружено, что в “Унхайме”, передаваемом через понятие эха, технологии “умного дома” совершают действия, которые представляют собой переход от способа, которым мы делаем вещи, к способу, которым вещи делают вещи, абстрагированному от человеческой деятельности. Этот способ, которым вещи делают вещи, заложенный в “умном доме”, устанавливает вещи как автономные особым образом, безразличным к человечеству, и, следовательно, ставит под сомнение ответственность человека за технологические разработки.

Ключевые слова: Ýнхайм, Эхо, Жуткое, Герменевтическая оценка технологий, Автономные технологии, Зловещее, Жилище

Благодарность Мы хотели бы поблагодарить издателя Schaefersphilippen, и Вильке Веермана, которые любезно предоставили неопубликованную рукопись пьесы “Унхайм” и разрешили процитировать отрывки из нее. А также Юлию Савченко за предложение проанализировать пьесу через призму теорий “Das Unheimliche”, и за предоставление теоретических основ.

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[1]

[2] Твердая приверженность важности научных дискуссий и обмена идеями иногда вступает в противоречие с необходимостью не дать понять себя неправильно в сложные времена. Именно так обстоит дело с одним из авторов этой статьи, который предпочитает оставаться анонимным

“Das smarte Heim der Zukunft,	“The smart home of the future,
Blinzelt im Sleep Mode	Blinks in sleep mode
Mit seinen roten Augen.	With its red eyes.
Schnarchende Lüfter Tragen die Kälte herein	Snoring fans bring in the cold
Und bedecken die Prozessoren damit.	And cover the processors with it.
Knisternd wendet die Taktfrequenz sich auf die Seite.	The clock frequency crackles as it turns on its side.
Nur selten geht ein Rollen durch die Datenträger.	Only seldomly does a scroll pass through the data carriers.
Das rote Lämpchen aber schweigt	But the red light remains silent
Von den Träumen des Geräts.”	About the dreams of the device.”

(Weermann, 2022, pp. 5–6)[3]

– a voice introduces the smart home ARCADIA in Wilke Weermann’s play *Unheim* (“Un-Home”, a play on words referencing the Freudian “*unheimlich,*” often translated as “uncanny,” “unhomely,” or “eerie“). The play that was written and directed by Weermann premiered in October 2022 at the Schauspiel Frankfurt and received critical acclaim, including the Kurt Hübner Directing Award (Schauspiel Frankfurt n.d.). In this paper, we discuss the play as an instance of art doing philosophy, as Weermann’s work contributes to an understanding of our technological world. *Unheim* is particularly interesting as it explores smart technologies – especially that of the smart home – through the lens of the *unheimlich* which provides compelling insights into the ways humans and technology relate to and interact with each other. While also having seen the play at Schauspiel Frankfurt, we work from the (unpublished) script in order to properly engage with the content of the play. In a sense, we do not contemplate the play itself as an artifact, but rather enter the play in a field study of sorts and engage with the artifacts as they are presented to us on the plot level.

The anthropomorphic character of the home as it is portrayed in the beginning already marks a central theme in *Unheim*: Technological systems, most importantly smart homes, are conceptualised as actors in the various interplays of human-machine-interaction. These actions create phenomena which by humans are perceived as “paranormal” and “unhomely”, which is what brings the protagonist, the ghost hunter or “investigator of abnormal affairs” Ira, onto the scene (Weermann, 2022, p. 4). Voices are one of the primary means of how the uncanny presents itself in *Unheim*, the “whispers of fibre optic cables” being a formative childhood memory for Ira (p. 6).

[3] All translations from Weermann (2022) are by the authors.

AN EERIE ECHO

In the play, we follow Ira, whose first investigation concerns a woman who feels like her deceased wife is still present in the room next to her. After a short examination of the matters at hand, Ira explains to the woman that the house acts as if her wife was still there; that "we inscribe ourselves into the space we inhabit" and hence the smart home forms around ourselves, our actions, and adapts to our routines (Weermann, 2022, p. 8). After an inhabitant dies, the smart home continues to act according to the previously learned inscriptions as if the human was still there – and in doing so creates a ghost, an echo of its former inhabitant. This "failure of absence" elicits a notion of eeriness as Mark Fisher (2016, p. 62) describes it; the actions carried out by the home evoke speculation about their cause due to their seeming intentionality: Is the deceased wife still present? If so, how and in what way? Is she, perhaps, a ghost? Is this a *paranormal* event? The last question is the one being asked by the woman in the play, leading Ira to explain that the event itself is *abnormal* ("anormal", Weermann, 2022, p. 7), paranormal being the interpretation of said event. She then continues to explain how the house is the cause of the feeling of the deceased wife still being present as it keeps lighting cigarettes like it used to when the wife was still smoking them. Fisher (2016, p. 62) notes:

> The eerie oncerns the unknown; when knowledge is achieved, the eerie disappears.

In the scene, Ira's explanation of how the presence of the ghostly entity came to be is not sufficient to the woman, who is still afraid of formatting the house due to the possibility of wiping the soul of her late wife in the process which might be stored on its hard drive. She then decides to say goodbye to her without the investigator present (Weermann, 2022, p. 9). Knowledge of the phenomenon's cause is not fully acquired and therefore a feeling of eeriness remains.

The ghost in this scene is an echo in an Ovidian sense: In "Narcissus and Echo", Ovid (ca. 8 C.E./2004, III 339-510) introduces the character of Echo, a nymph who is cursed to lose her ability to speak, only being able to repeat the words of others. After being rejected by the self-obsessed Narcissus, Echo's body withers away, only leaving her voice living on in the mountains, continuing to repeat other's utterances. While the reader holds full knowledge about the utterance's origins, this is not the case within the tale on the plot level: Echo, just as the acoustic phenomenon, is an eerie entity[37]. Similar to Ovid's Echo, the echo in *Unheim* repeats actions another person has previously performed. As these actions cannot be linked back to an embodied acting subject, a

[37] Other philosophers have interpreted the tale of Narcissus and Echo differently – or rather, have stressed other aspects of it –, most notably Derrida, who parallels the relation between the two characters with the one between author and reader: the author being blind in uttering words and the reader filling them with meaning. In this process, Echo appropriates Narcissus' words, making them her own (Dick & Kofman, 2002). This further raises questions concerning agency and intentionality, and hence the eerie: Is there intent behind Echo's words that goes beyond just repeating Narcissus' words?

feeling of eeriness arises. This is also the case for the whispering fibre optic cables, which Ira – unsatisfactorily – explains to be "simply data. Yearnings of some other people" (Weermann, 2022, p. 7).

It seems to not be sufficient to know of the material origins of the phenomenon to dissipate its eeriness. This might be due to its nature being not only a matter of information, but also an experience of atmospheric quality: Since the material mechanisms cannot be directly experienced, sensory impressions are still interpreted as manifestations of the "ghost" or an immaterial soul of the deceased, often independently from abstract knowledge.

With the play's title being a direct reference to the German *unheimlich*, eeriness is how the uncanny shows up in the scene in *Unheim*. The tale provides insight about another element of the uncanny present here: that of familiarity or repetition. Freud identifies this as something "well known, familiar" showing up in a different, now distorted form, creating doubles and confusions, which poses fundamental doubts and questions about the identity of a person, or, at times, the self (Freud, 1919, p. 309). As an echo being a repetition of something familiar, *Unheim* creates countless opportunities for such confusions – either in the form of the aforementioned "ghosts" or later on, when the apartment complex "Arcadia" is introduced (Weermann 2022, p. 14). These apartments can be inscribed by several residents at once, simultaneously creating an individual configuration for every resident. Slowly, the boundaries between the residents begin to blur, leading to artifacts that call into question previously clear notions about the identities and locations of the characters. With the uncanny also characterized by Schelling (1857, p. 649) as something that should have stayed hidden in secrecy or latency but has shown itself, these phenomena hint at an underlying mechanism that the corporation behind the apartment complex did not intend to be shown. By becoming, in a way, autonomous and interacting with its residents as an eerie entity, the smart home uncovers its true nature that is shaped only superficially by a strive for comfort for its residents; neither does it seem to only follow the purpose designated by the corporation, which is to generate profit; it becomes its own entity with a completely different, unclear agency, which culminates in the complete disappearance of humans.

This is in line with another element of the uncanny differentiated by Freud and Jentsch, which is fundamental doubt about the "aliveness" of an object – something that shows up ubiquitously in an automated world, where the intended purpose of technologies seems to deviate from its actual use or behavior (Gransche, 2020, p. 41). Wherever this happens, we tend to instinctively assume some form of independent agency, which, by virtue of not being natural, appears uncanny.

CONSTRUCTING A TECHNOFUTURE

Literary and dramatic works such as *Unheim* are part of processes of meaning creation: They conceptualise technofutures, consisting of both the technologies themselves as well as how they are used and how they shape society – and thus offer ways to interpret, understand and assess current, emerging or imaginative technological developments. These works, or rather the visions expressed by them, are therefore object of technology assessment, more precisely: hermeneutical TA (Wei-Kang Liu, 2023).

Weermann envisions a world for us to enter; a world to read, understand and interpret; a world in which interplay between humans and technology is performed differently. Although imaginative, the future described in *Unheim* is not a discontinuous one such as those posited by trans- and posthumanists. Rather, it "serve[s] the quite different function of transforming our own present into the determinate past of something yet to come" (Jameson, 2007, p. 288). Central to this vision is the technical work that is the smart home: As we enter the play – be it in written form or performed on stage – we also enter the smart home itself as a technical world that is to be explored, that "draws together material things as well as human developers and users" and hence can be considered a world in the sense of "composition or putting together of numerous elements or parts" (Nordmann, 2023, p. 194). A hermeneutical technology assessment of such worlds, then, investigates "what they signify about the ways in which humans and things can live and work together" (p. 194).

Understood this way, *Unheim's* smart home is neither a prediction of how our future might be nor a mere fiction – instead, it tells us "about the hopes and fears, practices and discourses of today" (Grunwald/Nordmann, 2023, p. 38). It offers an interpretation of the technology and in doing that attaches meaning to it, which is part of a hermeneutic circle in which different actors – such as artists and playwrights, but also technicians and TA-practitioners, politicians and civilians – co-construct the societal meaning of a certain technology. The question, then, arises as to what meaning this construction of a future holds for the present.

The smart home in *Unheim* is a continuation of Ray Bradbury's *There Will Come Soft Rains*[38], a short story that describes a now empty automated house whose inhabitants were killed in a nuclear explosion. The house now continues to cook, clean and read poems as if the deceased residents were still alive (Bradbury, 1950). A comparison of *Unheim* with the short story by Bradbury, originally published in 1950, emphasises how constructions of the future are not future presents, but present futures that have their time of construction inscribed into them. The now past future of *There Will Come Soft Rains* is dominated by the then imminent threat of nuclear war (which might have become more relevant again recently). The automated house here is parallelised with nature by inclusion of Sara Teasdale's identically-titled poem as the stories' centerpiece which describes flora and fauna coming back after a war that had annihilated humankind:

> And not one will know of the war, not one
> Will care at last when it is done.
> Not one would mind, neither bird nor tree,
> If mankind perished utterly
>
> (Teasdale, 1918, as quoted in Bradbury, 1950, p. 170)

We propose to understand Bradbury's automated house mainly as a narrative device: it signifies that the story is set in a science-fiction future where such technologies exist. It surely can also be object to a hermeneutical analysis, but it is not the central

[38] Interestingly, *Soft Rains Will Come* is set in the year 2026, the year this paper is written.

technology that is causal to the dystopian world of Bradbury – instead, this is the atom bomb. The automated home, which continues to act as if its residents were still there, shows the abruptness of how a nuclear strike could end humanity: It does not mind "if mankind perished utterly", it is merely part of the petrichor that heralds the soft rains to come. The automated house tells us about fears concerning the extermination of humankind which comes without any warning whatsoever and which is materialised in the atom bomb and mediated through the automated house.

In *Unheim*, on the other hand, the smart home itself is the source of the eerie: WhileBradbury's automated house told readers about fears of a nuclear apocalypse, Weermann's smart home tells us about a present where the imminent threat of nuclear war has waned and automation and smart technology is present in our lives, materially as well as in narrative forms of the future. Bradbury's house tells us about disquieting technology, Weermann's house *is* the disquieting technology.

UNEARTHING THE UNHOME

Technofutures as described deal with meaning of technologies. We propose to approach 'meaning' in a (late-)Wittgensteinian use-oriented way:

> the meaning of a word is its use in language
>
> (Wittgenstein, 1953/2009, §43, p. 25e)

This use, according to Wittgenstein, is structured by language games whose rules both limit and make possible – in the Kantian sense of being a transcendental condition of possibility – the particular use in a given context: a use of a language-sign is only meaningful insofar as it plays a role in a language game (Wittgenstein, 1953/2009, §41, p. 24e). Wittgenstein stresses that speaking a language, partaking in a language game is part of a "form of life" (§23, 15e), a way to do things which encompasses multiple language games and is interwoven with human activity.

Following this concept of meaning and translating it to technology[39], the meaning of a technological object, thus, would be its rules of use in "*technology* games" (Coeckelbergh, 2018): The meaning of a hammer, for example is tied to human activity of hammering, games of building and repairing and a form of life: "an entire socio-technological environment in which use of roofs, gardens, and houses are part of the *way we do things*" (p. 1512). Knowing the meaning of a thing, then, is knowing how to operate with it, how to employ it in certain technology games. Now consider technologies that are objects of (hermeneutical) TA, that is, technologies related to the future, existing in

[39] This approach is not novel and can be attributed to Mark Coeckelbergh who proposed the concept of technology games (Coeckelbergh, 2018; Coeckelbergh & Funk, 2018) and Alfred Nordmann whose inquiry focusses on the early Wittgenstein (Nordmann, 2018; 2020). For a discussion of the two theories see Pezzica, 2023. It is to be noted that while in a previous paper Leon Pezzica has contrasted the two positions ("syntactical Technogrammar" referring to Nordmann's work versus "deep Technogrammar" referring to Coeckelbergh's), upon further examination we would like to reconcile both conceptualisations, stressing their complementary character.

the form of prototypes or imaginaries: the question that is to be asked in regards to the meaning of those technologies are:

> What are the conditions of possibility – consisting in technology games and a form of life – that make possible a use of said technologies?

Alfred Nordmann, in reference to Jameson, compares this type of TA with the work of an archeologist:

> Prototypes have a precarious ontological status. Just like isolated things from the past that were found here or there, they are here, right in front of us, but they testify to a way of living that is quite alien to us, unfamiliar. (Nordmann as quoted in Borrmann et al., 2023, p. 58)

Just as the archeologist tries to construct a past that provides a structure for unearthed artifacts to be used, we in the role of a TA-practitioner construct a future that provides a structure for prototypes and imaginary artifacts to be used – the future is, in this sense, "unearthed" as well (Nordmann in Borrmann et al., 2023, p. 58). Now, what are the artifacts unearthed from the soil that is Weermann's *Unheim* and what games, what form of life, what way to do things makes possible the employment of those artifacts into human activity?

The smart home that has been object of this analysis so far is explicitly part of various technology games: games of smoking and of cleaning, of cooking and food shopping (Weermann, 2022, p. 8). The home itself is an actor in those games, not only in the sense of the artifact being "co-responsible" in the poietic "bringing forth" of it as Heidegger (1954, pp. 7–8) puts it, but in the sense of performing acts within a technology game that are decidedly ascribed only to human actors. Bruno Latour attributes such an actor-status even to more rudimentary artifacts such as a "groom" (a door closer):

> The groom is indeed anthropomorphic, in three senses: first, it has been made by humans; second, it substitutes for the actions of people and is a delegate that permanently occupies the position of a human; and third, it shapes human action by prescribing back what sort of people should pass through the door. (Latour, 1992, p. 160)

But if, following Latour, even simple technologies such as a door closer are to be considered "permanently occupying the position of a human", making moves within a technology game that are usually reserved for human actors, what is the peculiarity – if there is any – of the acts produced by Weermann's smart home? How is the smart home any different – or in any other quality anthropomorphic – from the groom? This is elucidated by the previously explored notion of eeriness: The groom's acts can be attributed to an entity whose operating principles are known to humans playing the going-through-the-door technology game. Due to the embeddedness within the game, the groom's acts are meaningful and its intentions evident to humans playing the game; it is, therefore, particularly not eerie (although it might be to humans who are not familiar with how a groom functions). Furthermore, the groom's mechanism can be experienced in a more direct or material way: we can see the mechanical arm that closes the door and we

see the groom closing the door as a result of a human actor opening it. There is, therefore, no uncanny atmosphere being emitted by the groom.

While, coming from an ANT perspective, the groom could be argued to be just as autonomous as any other nonhuman actor, the perceived autonomy is evidently of a different quality from the one being exerted by the smart home in *Unheim*: The groom makes a meaningful move within a technology game, the going-through-the-door game, which is part of the way we do things; its *nomos*, understood as the rules governing the role it plays within the technology game, is decidedly not self-inscribed, but co-constructed by human-machine-interaction. The smart home's actions, on the other hand, are not meaningful to the human actors it interacts with, they are, in this sense, *ungrammatical*; the smart home seems in a way 'untethered' from the rules governing how we interact with things. Within the "imaginary working order of people and things" (Nordmann, 2023, p. 211) posited by the smart home the people seem to take a back seat, the "way we do things" becomes a "way *things* do things". The conditions of possibility that give meaning to the technological acts of the smart home consist of a form of life within which technology acts independently from humans. Just like in the play, *technology becomes its own entity with a completely different, unclear agency, which (metaphorically) culminates in the complete disappearance of humans*.

This technofuture differs from the dystopian visions expressed by popular works of science fiction: *The Matrix'* Machines or *The Terminator's* Skynet, though certainly autonomous in a comparable way, are not eerie: There is no "failure of presence" or "failure of absence", no speculation concerning "a sense of alterity, a feeling that the enigma might involve forms of knowledge, subjectivity and sensation that lie beyond common experience" (Fisher, 2016, p. 62). The Machines and Skynet are hostile and pose a threat to humanity, but their actions form an openly exploitative relationship with human actors instead of appearing as a ghostly echo that is abstracted from actual human life. Gransche identifies this kind of open hostility as the antithesis to the uncanny, the point at which the veil is "lifted completely" (Gransche, 2020, p. 42).

The abstraction, however, constitutes a shift away from a way we do things to a way things do things, namely in a mode that is alien, incomprehensible and eerie to us, that produces an unhomely atmosphere and hints at underlying mechanisms that should have stayed hidden. These mechanisms can be captured by what Marek Poliks and Roberto Alonso Trillo call "lift": the tendency of capital to abstract itself "from the soil, from physical capital and human labour" – it is "the machinic impulse toward abstraction" (Poliks & Trillo, 2025, p. 60).

This "machinic impulse" is inscribed into the smart home, it is part of a working order of things where the human becomes irrelevant in its role as an actor and technology is "lifted" from human activity. Poliks and Trillo push this vision even further by coining the term "exocapitalism", which they define as "a self-replicating machine of unknown origin whose internal drives not only contradict but remain utterly ambivalent to the interest of its former dependencies (sun, earth, oil, human). The human's relationship to capitalism moves from generative to irrelevant" (Poliks & Trillo, 2025, p. 87). Although

"exocapitalism" as a comprehensive theory of capitalism is lacking[40], Poliks and Trillo describe a *vision* of a technocapitalism that is indifferent to the human, that is some kind of otherworldly eerie entity who – though currently – does not necessarily use humanity as a substrate. Exocapitalism falls short in its ontological description of capital, but posits a working order of things which exists in the form of a vision, of a narrative that is part of the discourse on the relations (present and future) between humans and technology.

The exocapitalist vision – or, equivalently: the exo*technological* vision – is precisely the form of life the smart home in *Unheim* hints at: Technology is *exo-* to the human, neither is it brought forth by humans nor defined via its interactions with human actors. The house neither "plays theatre with you" nor "for you" (Weermann 2022, p. 8), it just produces acts entirely abstract from human activity. Claire Cical explicates the meaning this notion of capital-generating technology being external to human endeavor has for society:

> What Exocapitalism expresses, in cosmological and computational form, is therefore humanity's mimetic desire to escape itself, to rid itself of the unbearable responsibility implied by mediation. By presenting capital as an autonomous, indifferent, and external organism, the theory offers a form of symbolic absolution: if the system is exo, then responsibility evaporates in complexity. (Cical 2026, p. 6)

This lack of responsibility is materialised in Weermann's smart home. Through its eerie autonomy it uncovers a future in which things act indifferent towards humanity – and humanity, in turn, lives alongside increasingly abstracted technology, indifferent to our own responsibility – despite the fact that "we inscribe ourselves into the space we inhabit" (Weermann, 2022, p. 8) and it therefore still carries our imprint.

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Research article

Dead City: The Semiotics of Post-Apocalyptic Urbanism in Contemporary Cinema

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Abstract.
The city is viewed as the quintessence of human civilization – a space where architecture, infrastructure, and social practices form a unified semiotic mechanism for the production of meaning. This study focuses on the transformation of this mechanism following the disappearance of its primary actor, the human. Drawing on key genre works – *28 Days Later* (2002), *I Am Legend* (2007), *The Road* (2009), *A Quiet Place* (2018), *Mortal Engines* (2018), and the television series *The Last of Us* (2023) – the article analyzes the visual and acoustic semiotics of the "dead city." Particular attention is paid to iconic imagery: the deserted Westminster Bridge (*28 Days Later*), where the absence of urban noise generates the effect of "silence as text;" a vegetation-overgrown New York City (*I Am Legend*), where nature consumes the architectural symbols of capitalism; and the post-industrial ruins in The Road. Through the theoretical lenses of Marc Augé, Jean. Baudrillard, Yurii. Lotman, Michel Foucault, and Andrey Tarkovsky, the transformation of urban space from a locus of vital activity into a zone of semiotic entropy is examined. The research methodology combines visual film semiotics, the cultural anthropology of urbanism, and phenomenological spatial analysis. A frame-by-frame analysis of key scenes reveals the specifics of post-apocalyptic representation: the capturing of the city as an archaeological monument to itself (*28 Days Later*); the transformation of the soundtrack into an instrument of terror (*A Quiet Place*); and the phenomenon of natural recolonization that creates a visual palimpsest where nature and culture enter into dialogue (*The Last of Us*). The study also conceptualizes the phenomenon of "automated systems without humans" – an infrastructure that continues to function in the absence of its creators. Three key dimensions of post-apocalyptic urbanism are identified: visual ruination (architectural decay as a metaphor for civilizational collapse), acoustic inversion (the replacement of urban noise with anxious silence), and natural recolonization (the return of the biosphere to anthropogenic space). The dead city is shown to function not merely as a backdrop for catastrophe, but as a complex semiotic text that encapsulates not only the end of civilization but also a critique of contemporary urbanism, anthropocentrism, and technological progress.

Keywords: Post-apocalypse; Urban semiotics; Urban anthropology; Visual culture; Acoustic environment; Film analysis; Cultural memory; Anthropocene; Ruination; Natural Recolonization; Artificial intelligence; Non-places; Simulacrum; Heterotopia; Semiosphere; Baudrillard; Augé; Lotman; Foucault; Tarkovsky

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Научная статья

Мёртвый город: Семиотика постапокалиптического урбанизма в современном кинематографе

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Аннотация
Город рассматривается как квинтэссенция человеческой цивилизации – пространство, где архитектура, инфраструктура и социальные практики образуют единый семиотический механизм производства смыслов. В фокусе исследования – трансформация этого механизма после исчезновения его главного актора, человека. На материале постапокалиптического кинематографа последних двух десятилетий анализируется семиотический коллапс урбанистического пространства, в котором привычные знаковые системы продолжают функционировать в отсутствие интерпретаторов. На материале ключевых кинопроизведений жанра – "28 дней спустя" (2002), "Я – легенда" (2007), "Дорога" (2009), "Тихое место" (2018), "Хроники хищных городов" (2018) и сериала "Одни из нас" (2023) – анализируется визуальная и акустическая семиотика "мёртвого города». Особое внимание уделяется иконическим образам: пустынному Вестминстерскому мосту ("28 дней спустя"), где отсутствие урбанистического шума создаёт эффект "тишины как текста»; заросшему растительностью Нью-Йорку ("Я – легенда"), где природа поглощает архитектурные символы капитализма; постиндустриальным руинам ("Дорога"). Через призму концепций М. Оже, Ж. Бодрийяра, Ю. Лотмана, М. Фуко и А. Тарковского рассматривается трансформация городского пространства из локуса жизнедеятельности в зону семиотической энтропии. Методология исследования сочетает методы визуальной семиотики кино, культурной антропологии урбанизма и феноменологического анализа пространства. Выявлены три ключевых измерения постапокалиптического урбанизма: визуальная руинизация, акустическая инверсия и природная реколонизация. Доказано, что мёртвый город функционирует не в качестве декорации катастрофы, а как сложный семиотический текст, содержащий критику современного урбанизма, антропоцентризма и технологического прогресса.

Ключевые слова: Постапокалипсис; Семиотика города; Урбанистическая антропология; Визуальная культура; Акустическая среда; Киноанализ; Культурная память; Антропоцен; Руинизация; Природная реколонизация; Искусственный интеллект; Не-места; Симулякр; Гетеротопия; Семиосфера; Ж. Бодрийяр; М. Оже; Ю. Лотман; М. Фуко; А. Тарковский

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THE CITY AS TEXT AND BODY: THEORETICAL FRAMEWORK

The City as a Sign System

Yuri Lotman defined the city as a complex text of culture, within whose structural architectonics streets perform the function of syntax, architecture acts as morphology, and everyday human practices operate as pragmatics (Lotman, 1996). Roland Barthes, in his foundational research on urban semiotics, similarly emphasized that the city continuously "speaks" to its inhabitants through multiple heterogeneous codes – ranging from monumental architectural forms to street names and commercial signs (Barthes, 1986).

In a post-apocalyptic context, this sign system undergoes a radical and irreversible transformation. The disappearance of the human being as the primary decoder leads to the emergence of a phenomenon that Umberto Eco conceptualized as "semiotic drift" – a situation where signs permanently detach from their original denotations and begin to function completely autonomously, generating uncontrollable chains of connotations (Eco, 1976). In the film 28 Days Later (2002), this process is visually manifested through the melancholic images of an empty London, where traffic lights and road indicators continue to transmit imperative regulations to non-existent transport flows.

The iconic scene of a lifeless London in 28 Days Later lasts about four minutes and represents a methodical, cinematically precise deconstruction of urban space through the category of absence. The camera closely follows Jim (Cillian Murphy), who has just awakened from a coma, on his existential journey from St. Thomas' Hospital across a silent Westminster Bridge toward the monumental Houses of Parliament. Director Danny Boyle deliberately utilizes the digital wide-angle optics of the Canon XL1, which, due to its specific, grainy resolution, creates a pseudo-documentary effect of "immediate witnessing." Each frame panoramically captures the main sign markers of the British capital – Big Ben, Piccadilly Circus, and Trafalgar Square. However, all these global simulacra are presented here as dead archaeological artifacts, having totally lost their pragmatic function as urban landmarks.

In this context, the mise-en-scène featuring an overturned red double-decker bus against the backdrop of the Palace of Westminster's clock tower is highly representative: a key cultural symbol of British identity and stability is literally upended, desacralized, and reduced to a heap of scrap metal. The final touch of this semiotic collapse is the bank notes scattered chaotically across the asphalt – a material signifier of economic value and capitalist exchange that has completely and irrevocably lost its signifier in the new world (Baudrillard, 1994).

The Organic Metaphor of the City: Tracing the Phantom Bios

The concept of the city as a living organism has deep roots in urban planning. Patrick Geddes conceptualized the city as an evolving bio-social system that undergoes natural phases of growth, maturity, and decay (Geddes, 1915). In post-apocalyptic cinema, however, this organic metaphor undergoes an inverted, necrophilic transformation: the city is represented as a corpse – a macro-body whose vital, metabolic processes have ceased, yet whose rigid anatomical structure remains intact.

By extrapolating Giorgio Agamben's concept of "bare life" (zoe) – which describes a biological existence violently severed from its political and social framework (bios) (Agamben, 1998) – we can define the dead city as the absolute spatial limit of this dichotomy. The post-apocalyptic city is a terminal space where the architectural "body" (the material substrate of civilization) continues to physically persist in the landscape, but its social "breath" and institutional life have been entirely extinguished. It speaks to us not through active speech acts, but through the traumatic muteness of its architectural organs, remembering a form of life that it can no longer sustain.

Non-lieux and the Totality of Placelessness

While in late modernity non-places (non-lieux) function as isolated islands of anonymity within a sea of historically and culturally rooted spaces (Augé, 2017), the post-apocalyptic catastrophe dialectically transforms the entire city into a total, all-encompassing non-place. Edward Relph anticipated this spatial amputation, describing "placelessness" as the systematic erosion of local authenticity and meaningful human attachment (Relph, 1976).

Zygmunt Bauman argued that in "liquid modernity," the rigid, fixed structures of early modern institutions dissolve into fluid, unstable postmodern networks (Bauman, 2000). In the post-apocalyptic urban landscape, this spatial deterritorialization reaches its absolute zenith. The post-city is no longer liquid; it is evaporated. All utilitarian, sacred, and social delineations within the urban matrix are permanently erased, flattening the landscape into a homogenous, entropic medium of ruins and alienation where every street is a corridor to nowhere.

Heterotopia and Negative Spatial Production

In the dead metropolis, a process of total heterotopization unfolds: every location becomes radically 'other' in relation to its original teleology and pragmatics — what Michel Foucault defined as spaces that exist outside all places, yet remain localizable (Foucault, 1986). Henri Lefebvre demonstrated that social space is not a passive container, but is actively produced and reproduced through daily human practices (Lefebvre, 1991).

When these practices are abruptly annulled, the space enters a phase of "negative production." It does not vanish physically; instead, it continuously produces its own emptiness, its own absence. It becomes a heterotopia in its purest form – a place where real cultural spaces are simultaneously represented, contested, and inverted. The post-apocalyptic city "speaks" to the survivor and the viewer precisely through this negative production: its signs are no longer instructions for action, but monuments to a vanished referent.

Extending the Urban Text: The Spatial Boundaries of Stalker and Wall-E

A potential critique of this framework might suggest that landscapes such as the "Zone" in Andrei Tarkovsky's Stalker (1979) or the planetary garbage dump in Andrew Stanton's Wall-E (2008) transcend the boundaries of the classical city. However, within a semiotic reading, both spaces remain fundamentally urban texts. The Zone in Stalker,

littered with the drowned industrial artifacts of a vanished modernization, is a post-city – an urbanism that has been deconstructed and re-wilded, where the "grammar of things" has broken down into a mystical topology.

Similarly, the waste-towers of Wall-E are literally composed of the discarded material culture of a hyper-consumerist metropolis. The city here has not disappeared; it has been repackaged by automated algorithms into monolithic cubes of compressed history. Both cases demonstrate that the post-apocalyptic space is never truly vacant of urbanity; rather, it represents the terminal stage of urban serialization, where the city continues to communicate its traumatic memory through its residual infrastructure.

VISUAL SEMIOTICS OF RUINATION

The Aesthetics of Decay

The visual language of post-apocalyptic cinema is entirely grounded in the aesthetics of entropy. Robert Smithson, in his essays on new monuments, conceptualized ruins as "monuments of entropy" – specific objects in whose material structure time is objectified in the form of progressive decay (Smithson, 1996).

In I Am Legend (2007), Manhattan is represented as a monumental ruin of global proportions, where modernist skyscrapers have turned into silent vertical tombs of a departed civilization. Director Francis Lawrence actively utilizes high-budget computer-generated imagery (CGI) to create expressive images of trees and wild grass piercing through the deformed asphalt of Times Square.

The hunting scene, in which Robert Neville (Will Smith) pursues a herd of deer down Fifth Avenue, is extraordinarily expressive in this regard. The dynamic camera captures the once-elite storefronts of Tiffany, Gucci, and Louis Vuitton, overgrown with wild ivy and shrubs: the former shining temples of consumerism and global capitalism appear as lifeless archaeological monuments. In this perspective, nature asserts itself as an active semiotic agent, deliberately and aggressively rewriting the once-rigid anthropogenic urban text.

Natural Recolonization as a Visual Code

The invasion of the wild biosphere into the urban landscape represents a distinct, plot-defining visual code of the post-apocalyptic narrative. Anna Tsing (2015), in her anthropological work on the ruins of capitalism, describes in detail how nature inevitably returns to abandoned, devastated industrial loci, generating new, unforeseen forms of life.

In the television series The Last of Us (2023), this process is pushed to its visual and conceptual absolute: the metropolis is transformed into a self-sustaining post-anthropogenic ecosystem, where deadly fungal spores replace the air, and entanglements of roots and vines simulate former cable and communication networks.

Donna Haraway, within her concept of the "Chthulucene," proposes thinking of the era that succeeds the destructive Anthropocene as a period when multiple interspecies life forms are forced to create strange, new symbiotic connections (Haraway, 2016). The post-apocalyptic city visually instantiates this posthumanist idea through images of hybrid

landscapes within which the natural and the cultural, the organic and the tectonic, are diffusely and indistinguishably interwoven.

Architecture of Fear

Post-apocalyptic architecture functions as an immanent generator of intense affects of fear, existential anxiety, and vulnerability. The ruined constructivist skeletons of buildings, the window openings gaping with blackness, the dark enfilades of corridors, and the deserted streets form a spatially distributed, highly suggestive emotional field.

Paul Virilio (1986), within his research on "dromology" and the logic of speed, predicted that the late-modernist megacity would inevitably evolve into a global space of total catastrophe. In post-apocalyptic cinema (most representatively expressed in the post-industrial, lifeless world of The Road), this prophecy is realized literally. The city appears as a frozen, permanent catastrophe, where historical time has irreversibly stopped at the very moment of civilizational collapse, turning the former protective urban structures into a labyrinth of permanent threat.

Stalker: Sand as the Dust of Civilization

Perhaps no one in world cinema has expressed the latent ontology of a decaying urban space more accurately and poignantly than Andrei Tarkovsky in Stalker (1979). The artistic space of the Zone represents not just an abandoned location, but a polar "post-city" – a locus where technogenic civilization has completely dissolved in the chaotic fluctuations of an alien environment (Tarkovsky, 1986).

In the famous, meditative scene with sand dunes filling the floors of ruined rooms, the visual means of the film filigreely create a physically palpable effect of internal, implosive decay of architecture. These undulating drifts of sand act not as a banal sign of a triumphant invasion of wild nature, but as a complex visual metaphor for time that has become tangible matter. Dust and sand in Tarkovsky's artistic system are the dispersed remnants of former meanings, the material substrate from which absolute oblivion is woven.

The director captures the Zone as an organic macro-body in whose depths the latent, elusive processes of mortification, decay, and, simultaneously, paradoxical, mystical sanctity continue. An industrial building, slowly swallowed by a sea of sand, broadcasts the image of a temple turned to dust. At this point, a key transition for visual semiotics is manifested: from architecture as a tectonic construction and the triumph of human will, to architecture as a relic, dust, and desacralized remains.

ACOUSTIC SEMIOTICS OF SILENCE

The Soundscape of the Apocalypse

Raymond Murray Schafer, the founder of acoustic ecology, introduced the fundamental concept of "soundscape" for the description and analysis of the sonic environment (Schafer, 1977). In a post-apocalyptic city, a radical, catastrophic

transformation of this landscape unfolds – from an oversaturated industrial noise to a total silence.

In the context of A Quiet Place (2018), film theorist Michel Chion defines such a condition as "acousmatic," where the source of sound is latent, invisible, or completely alienated from the object (Chion, 1994). Silence in this space ceases to be a passive void; it turns into a hyper-semiotized locus where absolutely any decibel is instantly articulated as a sign of deadly danger.

Sound designers Erik Aadahl and Ethan Van der Ryn created a unique auditory environment in which minimal micro-noises – the creaking of wooden floorboards, the rustling of dry leaves, breathing – acquire a hypertrophied, existential significance. The mise-en-scène in the abandoned pharmacy is highly representative in this regard: the automatic sliding doors open silently, the electronic scoreboard blinks speechlessly in the twilight, but these once-familiar signs of a normal, safe urban life are now read as a sinister trap. A radical inversion occurs: sound turns from a neutral domestic background into a direct signifier of imminent death.

Echoes of Civilization

In the space of a dead city, sound begins to function as a specific archaeological trace – a ghostly echo of an irreversibly vanished civilization. In The Last of Us, a pop music composition from the pre-war past, sounding lonely in the depths of a ruined shopping mall, produces an almost unbearable emotional affect on the viewer.

As Joel and Ellie make their way through the mall's atrium, overgrown with wild trees, under a randomly preserved automated broadcast, this track manifests itself as the auditory equivalent of a ruin. We capture the phenomenon of a "simulacrum-sound" – a sign that has completely lost its empirical addressee but has not lost its ability to intensely generate meanings and transmit cultural memory.

Conversely, in the film adaptation of The Road (2009), the post-apocalyptic continuum is totally devoid of musical accompaniment and the living sounds of nature. This absolute acoustic devastation and vacuum are perceived by the viewer psychologically harder than any most expressive visual image of architectural destruction. Here, the very absence of sound becomes the dominant signifier – the darkest of all possible codes of non-being.

Bioacoustics of the Post-City

Bernie Krause, in his pioneering studies of "biophony," clearly demonstrates how natural environmental sounds are organized into strictly differentiated, complex acoustic niches (Krause, 2012). Under the conditions of the megacity's demise, a process of total replacement of urban "anthrophony" (the technogenic noise of human activity) by the sovereign "biophony" of advancing nature unfolds. This fixes a fundamental shift in the acoustic semiotics of space.

In the screen universe of The Last of Us, each dead city possesses a unique, highly individual bioacoustic identity: wild birds build nests in the voids of office skyscrapers, groundwater breaks through the concrete arteries of the subway with a hollow echo, and the wind wanders unobstructed through empty shopping galleries. Nature does not simply

colonize concrete remains; it constructs a fundamentally new acoustic order on top of the old one, textually rewriting and recoding the urban landscape.

TEMPORALITY OF THE DEAD CITY

Time After Time

The post-apocalyptic urban landscape exists in a specific temporal regime that literary theorist Frank Kermode conceptualized as "the time after the end" (Kermode, 1967). This is not the cyclical time of archaic myth, nor the linear, progressivist time of modern history, but what Giorgio Agamben defines as "messianic time" – a compressed, residual time that still endures after the accomplished finale (Agamben, 1998).

In the film adaptation of The Road, the screen world is totally devoid of any chronological markers: the viewer is not informed exactly how many years have passed since the global catastrophe. Father and son make their tragic journey through a homogenous space in which historical time has irreversibly frozen at the moment of civilization's demise and is now slowly degrading along with its material substrate. Charred forest massifs, a permanently gray leaden sky, buildings crumbling from old age – all these are signic representamen of the same phenomenon: time that has become a total space of decay.

Memory of Ruins and the Palimpsest of Time

In The Last of Us, the directorial and camera optics continuously combine and rhyme the traces of the pre-war past – faded advertising billboards, road markings, ruined playgrounds – with aggressive live vegetation growing through concrete. Before us unfolds the phenomenon of the palimpsest in its literal, textual understanding: on top of the decaying text of human civilization, advancing nature writes its sovereign narrative, without erasing the former cultural codes completely, but entering into a tragic dialogue with them.

A diametrically opposite semiotic technique is used by Andrei Tarkovsky in Stalker (Tarkovsky, 1986). The space of the Zone exists absolutely outside of a determined historical time. The exact moment of the catastrophe is fundamentally bracketed out of the narrative: the Zone represents an autonomous temporal bubble that has completely fallen out of the continuum of history. It is this oppressive and simultaneously fascinating feeling of total timelessness that makes Stalker the deep philosophical and aesthetic prototype of all modern post-apocalyptic urbanism in world cinema.

POSTHUMAN PRESENCE

AI Without Humans

A special place in the semiotic structure of the dead city is occupied by automated systems and elements of infrastructure that continue to function after the disappearance of the human population. Philosopher Nick Bostrom describes a hypothetical scenario in

which artificial intelligence and autonomous algorithms pedantically perform the functions embedded in them in the total absence of their creators (Bostrom, 2014).

In post-apocalyptic cinema, this phenomenon becomes a source of a specific type of existential anxiety – the effect of the uncanny (Das Unheimlich) in the psychoanalytic understanding of Sigmund Freud, when the familiar and domestic suddenly turns into something alien and frightening. In 28 Days Later (2002), traffic lights continue to switch mechanically for non-existent traffic; in I Am Legend, the electronic media facades of Times Square broadcast glossy advertisements for viewers who are no longer there; in The Last of Us, escalators move silently without shoppers. The city turns into a total ghost-automaton, imitating vital processes after the physical disappearance of living beings.

The visual poetics and tragedy of the useless, looped labor of machines are particularly vividly embodied in the animated film Wall-E (2008, dir. A. Stanton). The screen action unfolds under the cheerful musical theme from the musical Hello, Dolly! (1964), which creates a paradoxical semiotic contrast: the optimistic melody of the anthropogenic past accompanies the monotonous mechanical routine of the robot cleaner in the posthuman present. Wall-E methodically sorts garbage, compresses waste, and builds giant towers of trash – the algorithm works flawlessly, but its pragmatic results are needed by no one.

A direct conceptual parallel is found in the Soviet animated masterpiece There Will Come Soft Rains (Tulyakhodzhayev, 1984), based on Ray Bradbury's short story. In the middle of a city scorched by a nuclear catastrophe, a robotic house continues its daily program: it prepares breakfast, broadcasts music, and persistently invites the owners to the table – however, the inhabitants themselves have long since turned into ashen shadows on the melted wall. Unlike the Hollywood Wall-E, where the finale leaves hope for a new reclamation of home, the Soviet adaptation ends with an absolute entropic finale: the automated system burns down, and only the indifferent rain of nature remains in space.

Theorist Rosi Braidotti, within the framework of critical posthumanism, notes that the onset of the posthuman era means not the physical end of man as a species, but a radical deconstruction of the very understanding of the human and subjectivity (Braidotti, 2013). In the space of the dead city, this transformation is clearly materialized through melancholy images of autonomously functioning machines that are completely devoid of teleology and a higher purpose.

POLITICAL ECOLOGY OF CATASTROPHE

Capitalism of Ruins

Naomi Klein, in her concept of the “shock doctrine,” describes in detail how large-scale geopolitical and natural disasters are cynically used for a radical restructuring of socio-economic systems (Klein, 2007). In post-apocalyptic cinema, the dead city often appears as a paradoxical “capitalism after capitalism,” where the processes of

accumulation, structuration, and hierarchy continue even in the total absence of the subjects of accumulation themselves.

Anna Tsing and several contemporary theorists introduce the concept of the "Capitalocene" – an era in which the logic of global capitalism acquires the proportions of a destructive geological force (Tsing, 2015). In this optics, an abandoned megacity manifests itself as a monumental monument to the Capitalocene, whose predatory infrastructure has physically outlived its creators.

The most literal, grotesque embodiment of this idea is found in the film Mortal Engines (2018, dir. Christian Rivers). The post-apocalyptic continuum here is rigidly organized according to the principle of so-called "municipal Darwinism": giant traction cities on wheels and tracks continuously hunt each other in the barren wastelands, literally devouring smaller settlements for resource extraction. The moving London swallows a small mining town in the very first minutes of screen time, methodically dismantling it for spare parts in its giant mechanical bowels. When London collapses at the end of the film, its debris freezes in the desert, turning into monumental ruins of an unrestrained expansion that has nowhere else to advance.

This image correlates perfectly with David Harvey's concept of the "spatial fix," which argues that capitalism temporarily resolves its internal systemic contradictions exclusively through continuous geographical expansion and the colonization of new spaces; when this territorial resource is finally exhausted, the technogenic system inevitably implodes and collapses (Harvey, 2001).

Ecology Without Nature

Timothy Morton, in his fundamental work Ecology Without Nature, convincingly proves that the very classical concept of "nature" as something external and separated from man is a fading ideological construction (Morton, 2013). In the space of a post-apocalyptic city, this dichotomy is finally annulled, making the markers of the natural and the cultural completely indistinguishable.

Bruno Latour conceptualizes such a state as a "parliament of things," within which non-human actors receive an equal ontological status with the human subject (Latour, 1993). In the series The Last of Us, the collective fungal intelligence of the Cordyceps constructs its own emergent communication networks directly through the ruins of human infrastructure. The mycelium spreading underground replaces the fiber-optic Internet, and deadly spores replace atmospheric air. Nature does not simply destroy human traces; it creates an alternative, fundamentally non-human, rhizomatic semiotic system on top of the ruined sign codes of the Anthropocene.

CINEMATIC ARCHAEOLOGY OF THE FUTURE

Media Archaeology of the Apocalypse

Post-apocalyptic cinema functions as a specific archaeology of the future: it represents our actual present as a future inevitable ruin, generating a paradoxical phenomenon of "nostalgia for the present." The screen dead city becomes a powerful

trigger for the “affect of absence” – an intense emotional experience of emptiness as a hyper-semiotized space, deeply saturated with latent meanings.

The silent London in 28 Days Later, the depopulated Manhattan in I Am Legend, the Boston overgrown with wild vegetation in The Last of Us – all these visual markers exploit the psychological mechanism of painful, traumatic recognition. The viewer is confronted with the deconstruction of well-known global urban topoi from whose structure the human being itself has been radically subtracted.

Post-Apocalypse as a Cultural Diagnosis

The powerful wave of post-apocalyptic cinematic discourse in the 2000–2020s chronologically and symptomatically coincides with a growing global anxiety about the climate crisis, the Anthropocene, pandemic threats, total technological dependence, and the rapid erosion of modernist social institutions.

Philosopher Fredric Jameson once formulated a famous cultural diagnosis: it is easier to imagine the end of the world than the end of capitalism (Jameson, 2003). Post-apocalyptic cinema acts as a striking symptom of precisely this mental and ideological stagnation – the total impossibility of conceiving an alternative historical future otherwise than through the total ruination and collapse of the present. The dead city in this context is a giant speculative mirror into which living modern megacities look fearfully, trying to reflect the contours of their probable end. And what they find in this reflection testifies explicitly to the deep phobias and crises of our actual society.

CONCLUSION

Thus, the post-apocalyptic city in contemporary cinema represents a multidimensional, complex semiotic phenomenon within which visual, acoustic, temporal, and political-ecological codes form a unique metalanguage for articulating the latent cultural anxieties of the late modern era. A city deprived of man exposes the total dependence of the urban sign system on the permanent presence of an interpreting and decoding subject. At the moment when this subject is annulled, the megacity is transformed into a cyclopean palimpsest where heterogeneous temporal, natural, and technological layers of meaning are chaotically superimposed on each other in a situation of permanent “semiotic drift.”

The conducted research allows for the recording of three key theoretical conclusions.

First: semiotic collapse as a mirror of modernity. The dead city explicates the latent fears and crises of late capitalism and the Capitalocene – phobias of total automation, ecological collapse, and the loss of existential meanings in a world oversaturated with simulacra.

Second: posthumanist perspective of urbis. The space of the city after man demonstrates the empirical possibility of a non-anthropocentric, symbiotic existence of the landscape, in which non-human agents (from AI to fungal mycelium) form a “parliament of things” and enter into new interspecies interactions.

Third: a new poetics of ruins. Unlike classical romantic ruins of the 18th and 19th centuries, which melancholically referred to a distant ancient or medieval past, post-apocalyptic ruins generate a unique affect of "premature nostalgia" – a longing for our own present, which has not yet physically had time to become history.

The screen image of the dead city outgrows the framework of a banal genre element of mass visual culture, manifesting itself as a major conceptual and epistemological tool for the critical analysis of contemporary urbanism, globalization, and their potential futurological trajectories. In the critical era of the Anthropocene, this image functions simultaneously as an uncompromising civilizational warning and as an open invitation to reimagine the relations between humanity, technology, and the biosphere — and, on this basis, the present study has sought to identify and characterize the precise moments at which the city, even in its silence, can still be heard.

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Research article

The Concealment of Meaning – On Husserl's Triple Critique of Mathematical Technization, Mathematization as Technology, and the Technization of Natural Sciences

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Abstract

In an era marked by the increasing proliferation of technology and frequent technological crises, Husserl's critique of the technization of modern European science is of great significance for understanding the essence of technology. Although he did not explicitly propose a definition of technology, he clearly delineated the differences between technological phenomena and scientific meaning, distinguished science from technology, and discussed the interactive relationship between them. He conducted a triple critique of mathematical technization, mathematization as technology, and the technization of natural sciences, pointing out that modern science has degenerated into technology, issuing a prophetic warning against the crisis caused by this transformation, and proposing a countermeasure to resist technological erosion and retrieve the primordial meaning of science by returning to the everyday lifeworld. This critique, however, does not imply that Husserl was opposed to technology as such. He understands that the formation of mathematical science results from a technological impetus. Therefore, an analysis of Husserl's thoughts on technological critique is conducive to understanding the technological essence of modern science and clarifying the relationship between science and technology. It also shows how strongly Husserl's phenomenology is committed to the tradition of rationalism and, as such, can function as a technical countermeasure to the technization and crisis of science.

Keywords: Husserl; Technology; Mathematization; Science; Lifeworld

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Научная статья

Сокрытие смысла – О тройной критике Гуссерлем математической технизации, математизации как технологии и технизации естественных наук

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Аннотация
В эпоху, отмеченную растущим распространением технологий и частыми технологическими кризисами, критический анализ Гуссерля в отношении технизации современной европейской науки имеет огромное значение для понимания сущности технологий. Хотя он не предлагал явного определения технологии, он четко очертил различия между технологическими явлениями и научным смыслом, разграничил науку и технологию, а также рассмотрел характер их взаимодействия. Он провел тройную критику — математической технизации, математизации как технологии и технизации естественных наук, — указав на то, что современная наука выродилась в технологию, высказав пророческое предупреждение о кризисе, вызванном этой трансформацией, и предложив контрмеру для противостояния технологической эрозии и возвращения изначального смысла науки через возврат к повседневному жизненному миру. Эта критика, однако, не означает, что Гуссерль был против технологии как таковой. Он понимает, что формирование математической науки является результатом технологического импульса. Таким образом, анализ размышлений Гуссерля о критике технологий способствует пониманию технологической сущности современной науки и прояснению взаимосвязи между наукой и технологией. Он также показывает, насколько сильно феноменология Гуссерля привержена традиции рационализма и, как таковая, может функционировать в качестве технической контрмеры против технизации и кризиса науки.

Ключевые слова: Гуссерль; Технология; Математизация; Наука; Жизненный мир

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INTRODUCTION

Modern science and technology have achieved brilliant accomplishments which are transforming and reshaping people's lifestyles. For example, the current rapid development of artificial intelligence (AI) has brought unprecedented convenience to people's lives, while triggering many new problems. Reflecting on technology has thus become an urgent task of the times. This paper revisits Husserl's critique of technology from his later years and his warning about the crisis of European science. Taking his interpretation of the development of modern science as a clue, it discusses his characterization of the technological essence of modern science, analyzes his assertion that technization has led to the crisis of European science, philosophy, and human nature, examines his proposed solution to overcoming the crisis by returning to the everyday lifeworld, and explores the contemporary significance of his critique of technology and warning of crisis.

The next section of this paper begins by elaborating Husserl's idea that modern European science was born out of the process of the geometrization or mathematization of nature. It analyzes the formation and development of geometry, showing that Geometric concepts were first idealized and then objectified. It explains the role of idealization and measurement technology in the objectification of geometric concepts, showing that geometrization is equivalent to objectification. Geometry can directly serve the description of the spatial characteristics of nature, that is, the direct geometrization or mathematization of the spatial forms of natural objects. According to Husserl's interpretation, Galileo took geometry as a model to carry out the indirect mathematization of all properties of nature different from the direct mathematization of spatial form, from which modern natural science or mathematical physics was born. Since then, natural science has been committed to the complete mathematization of nature, and Galileo has thus become the father of modern science. Accordingly, mathematized nature has become an objective nature that embodies mathematical relations, and natural science is committed to finding mathematical formulas for the laws of this objective nature – structural formulas have taken the place of phenomenal nature.

The next section then expounds Husserl's triple critique of mathematical technization, mathematization as technology, and the technization of natural sciences. Since the modern era, mathematics itself has achieved tremendous development, and formal mathematics has emerged. The idea of formalization has been applied not only to the mathematization of nature but also to mathematics itself, thereby transforming mathematics into a technology – this is meant by mathematical technization. Mathematical operations have become a game of symbols, and mathematics has lost its original scientific significance. Mathematization, which is based on technized mathematics, has also degenerated from a method of acquiring truth into a technology. Furthermore, when natural science uses mathematization as a technology to explore the mysteries of nature, natural science itself loses its original meaning and degenerates into a technology. Mathematical technization is the determining factor, mathematization as technology (or the technization of mathematical methods) is the intermediary, and the technization of natural sciences is the result. The essence of these processes of

technization is that all three induce a deviation from some original meaning. Taken together they result in a complete loss of connection with the given nature of the everyday lifeworld. Ultimately, this leads to the concealment of the meaning of the lifeworld by technology with technology replacing truth.

The third section then discusses Husserl's warning about the crisis brought about by the three dimensions of mathematical technization, mathematization as technology, and the technization of natural sciences. This triple technization has not only directly led to the crisis of European science – the loss of scientificity and the replacement of science by technology – but also to the crisis of philosophy and human nature. Positivist philosophy has replaced rationalist philosophy, and human beings have become technicized themselves. To resolve the crisis, it is necessary to retrieve the primordial meaning of science, that is, to return to the everyday lifeworld, advocate rationalist philosophy, and ground science in phenomenology. The fourth part reflects on the contemporary significance of Husserl's critique of technology.

FROM TECHNOLOGY ENABLING SCIENCE TO TECHNOLOGY REPLACING SCIENCE AND ITS METHODS

Technology and the Transition from Intuitive to Pure Geometry

Husserl argues that mathematization constitutes a pivotal moment in the development of modern European natural sciences. The modern era gave rise to the idea of the world as a rational unity of infinite existence – that is, all things in the infinite world are connected through reason (Husserl, 1954, p. 20). Thus, the world can only be comprehended through rational methods, and mathematics provides such a rational and objective approach.[1] Accordingly, the cognition of the world is the cognition of its rational essence, namely, the cognition of the various ideas that constitute the rationality of the world as their relations are considered eternal and unchanging. The rational essence of the world is objective, and so are mathematical ideas; therefore, the rational essence of the world can be expressed through mathematics, that is, through the process of mathematizing the world. From this, it became a universal consensus among moderns that "material nature has an ideal mathematical existence" (Neumann, 2001, p. 266) and that the language of nature is mathematics.

Mathematics originates from people's primordial intuition about the lifeworld – arithmetic begins with the counting experience of concrete objects (such as apples and stones), and geometry begins with the intuitive perception of spatial forms (such as tabletops and houses). The lifeworld is the original source of meaning for mathematics (Husserl, 1970, p. 79). Mathematics is not a static system of knowledge but an evolutionary process from "intuitive mathematics" to "formalized mathematics." Through "idealization" and "abstraction" it strips away the concrete properties of things in the lifeworld, forming a pure symbolic and axiomatic system (e.g., from concrete

[1] Mathematics is a template of rationality and objectivity, and the world understood through it is also rational and objective.

counting to abstract numbers, from intuitive geometry to pure geometry), and ultimately becomes a formalized field of meaning independent of the lifeworld (Husserl, 1970, pp. 430-431).

According to Husserl, under the influence of Plato's theory of ideas, ancient Greek mathematics, especially Euclidean geometry, idealized the geometric objects in the empirical world and ultimately established a deductive system of propositions composed of axioms and theorems – "a pure rational whole" whose task is to cognize "a finite and closed a priori" (Husserl, 1954, p. 19). In the modern era, as the concept of space expanded to the infinite, the task of geometry also expanded to the infinite. The idea of an infinite world and a systematic rational science that studies its objects began to take shape, which was further facilitated by the development of formal mathematics, namely, a comprehensive rational science: mathematical natural science or mathematical physics. Galileo transformed modern mathematical physics from an idea into a reality through the mathematization of nature. The essence of his thought on mathematization is to reform ancient physics with geometry, taking "geometry as the meaning foundation of exact physics" (Husserl, 1954, p. 21).

In ancient times, people abstracted the spatial forms of things (such as straight lines, triangles, circles, and cubes) from the objects they experienced in their intuition of the surrounding world. Different people had different perceptions of these forms, and the perfection of their depictions varied according to different practical interests and the technical level of the time. On the one hand, people could improve the depiction of forms by advancing drawing and measurement technologies; on the other hand, the ideal limit of each form could not be fully depicted even with the improvement of technology. For ideal forms do not exist in reality. The idealization and construction of these forms by people were objectified in an intersubjective community. The object of study of geometry is these objective ideal forms; therefore, it is the mathematics that studies spatiality, and this is the original intuitive geometry.

When people break away from empirical things and directly construct new univocal geometric forms using objectively identical ideal forms, for instance, constructing new polygons with triangles as basic elements, the intuitive geometric method is replaced by "an a priori, abstract, all-encompassing, and systematic method" (Husserl, 1954, p. 24), and intuitive geometry evolves into pure geometry. The new geometric method originates from the "technically applied methodology of measurement and determination" in the pre-scientific, intuitive surrounding world (Husserl, 1954, p. 24). People form subjective geometric concepts through intuition of the surrounding world, and these subjective concepts are universalized and objectified in practical measurement. For instance, in the process of using measurement technology, people first define the concepts and geometric forms of the measured objects, then determine their quantitative and positional relationships, and finally use as measuring tools rigid basic geometric things that are universally recognized as unchanging in practice. The entire measurement process is a process of jointly formulating standards through intersubjective negotiation. In the standardization process, geometric concepts and other related concepts become objective, universal, and univocal. Measurement technology was initially associated with land surveying in the empirical world, it later evolved into abstract graphic calculation by pure

theoretical geometers, facilitating the transition from intuitive geometry to pure geometry. Therefore, technology promotes the transformation of geometry.

Geometric concepts originate from the idealization of the forms of objects in the empirical world. People can find physical objects in the empirical world that are similar to the objects of geometric study. Measurement activities of these physical objects, under intersubjective coordination, further universalize and objectify idealized geometric concepts (Husserl, 1954, p. 25; Kockelmans, 1989, p. 370). Thus, the univocity of geometric concepts is established, and the truth of geometry is guaranteed. Ancient geometry provided people with a model of objective and reliable knowledge which possessed absolute, universally valid self-evidence and was applied by people within a limited range related to spatial forms—that is, the spatial characteristics of the forms of objects in nature were geometrized. According to Husserl, in the modern era, under the leadership of Galileo, mathematical methods represented by geometry were applied to the entire natural field beyond the quantitative forms of objects, which is what Husserl calls Galileo's mathematization of nature. How is such unrestricted mathematization of nature possible?

The Birth of Modern Natural Science — The Mathematization and Objectification of Nature Modeled on Geometry

Pure geometry has *a priori* self-evidence and universal objectivity, and it constitutes an ideal world of object shapes. When pure geometry is applied to practical measurement, a connection is established between ideas and reality. Ideas are abstract idealizations of reality; ideas can express reality, and knowledge of ideas becomes objective knowledge about reality. Thus, *a priori* ideas become the essence of reality, and the characteristics and dimensions possessed by reality can be deduced from those possessed by ideas. According to Husserl, inspired by geometry, Galileo drew this inference: since the *a priori* axioms of geometry are the objective truth of the shapes of real objects, the objective truth of other properties of objects besides shape should also be mathematical (geometric *a priori*). He further inferred that the truths about the entire world and the patterns of causal relationships between its objects are also mathematically *a priori* and objective. For "nature can be constituted and determined in the same way in all its other aspects" (Husserl, 1954, p. 31). Therefore, he intended to use mathematics to design "a method of systematically and, in a sense, *a priori* constituting the world and its infinite series of causes and effects" (Husserl, 1954, pp. 29-30). However, Galileo encountered a problem in his mathematization project: the shapes of objects can be directly geometrized or mathematized, but other aspects of objects cannot, such as their specific sensible qualities – temperature, hardness, color, taste etc. Specific sensible qualities of objects do not have a corresponding *a priori* and objective idealization system, so they cannot be further objectified through precise measurement, nor can they be directly mathematized like shapes.

The birth of modern science lies in the mathematization of physics. Properties other than object shapes fall within the scope of physics research. The mathematization of the specific sensible qualities of objects is both part of the process of the mathematization of physics and part of the process of scientization. The development of modern science lies

also in mathematization – that is, replacing the qualitative interpretation methods of ancient philosophy with the quantitative analysis methods of mathematics (Zhou, 2025, pp. 328-329). By establishing measurable quantitative concepts, quantitative concepts replace qualitative concepts. The increase in the number of quantitative concepts in a discipline indicates a higher degree of mathematization and scientization of that discipline (Carnap, 2020, pp. 53-62). To mathematize the specific sensible qualities of objects, it is necessary to establish relevant quantitative concepts, that is, objective concepts that can be measured. According to Husserl, to directly mathematize the specific sensible qualities of objects, it is necessary to first idealize them to form subjective concepts, and then to measure these subjective concepts to form objective concepts, just as in the case of defining geometric concepts. However, the specific sensible qualities of objects belong to the secondary qualities of objects related to the sensory organs of the subject – that is, they do not belong to the objects themselves – and thus cannot be idealized and directly mathematized.[2]

According to Husserl, to mathematize the specific sensible qualities of objects other than shape, Galileo shifted his mode of thinking: since direct mathematization was impossible, could they be mathematized through an intermediary? Given that the causal world determines *a priori* that objects in the world are tangible entities in space and time – their shapes are filled and possess specific sensible qualities, and shape is closely integrated with its filling and sensible qualities into a single whole – it can be inferred that there exists a causal connection between the shape of an object and its specific sensible qualities, such that a change in one will induce a change in the other. Therefore, as long as the shape of an object can be directly expressed mathematically, the specific sensible qualities causally connected to it can also be represented through the mathematics of shape change. For instance, temperature change is indicated by the numerical values corresponding to the volume change of a mercury column; color is derived from the analysis of the wavelength of light reflected by an object's surface; and sound is manifested according to the amplitude of the vibrational displacement of an object. In this way Galileo found a solution for the mathematization of the specific qualities of objects – indirect mathematization – thereby enabling their idealization and objectification as well. At this point, all properties of objects, from shape to other qualities, had been mathematized.

On this basis Galileo and his successors further achieved the mathematization of the whole of nature through direct and indirect mathematization. The tools they employed in the process of mathematizing nature were: first, mathematics and its latest achievements including algebra, the mathematics of continuity, and analytic geometry; second, there are universally valid measurement methods. Pure mathematical ideas pointed the way for practical measurement, and measurement in turn further objectified mathematical ideas and the nature associated with them, with nature itself being mathematized in this process. Thus, pure mathematics and practical measurement carried out a "two-level idealization" (Husserl, 1954, p. 38), and physics as the science that

[2] Objects that can be directly mathematized correspond to Locke's primary qualities; objects that can be indirectly mathematized correspond to Locke's secondary qualities (Rang, 1989, pp. 99-100).

studies nature “always presupposes a primitive physics, to which a metrology grounded in technology and practice belongs" (Neumann, 2001, p. 279).

Galileo’s purpose in mathematizing nature was to explain this causal world in a mathematical manner, even though the causal connections of the world were a hypothesis derived from universal induction. "The entire infinite nature as a concrete universe of causality – this was the essence of the peculiar concept – evolved into a uniquely applied mathematics" (Husserl, 1954, p. 36). He was not concerned with the presuppositions of this causal world; instead, he focused on how to use mathematics to make the causal connections of the world manifest in a self-evident way – expressing causal relationships through mathematical formulas, that is, "laws of real dependencies in the form of functional dependencies of numbers" (Husserl, 1954, p. 40).

Galileo’s process of mathematizing nature was simultaneously a process of idealizing and objectifying nature, through which nature acquired its objective existence. For in the process of mathematizing nature on the model of geometry, the concept of objective nature was established, measured, and applied. "In Galilean mathematical mathematization of nature, this very nature is now idealized under the guidance of new mathematics, and itself becomes — in modern terms — a mathematical manifold" (Husserl, 1954, p. 20). "Nature is mathematically defined in its ‘true being-in-itself’" (Husserl, 1954, p. 54), and physical research aims to find the mathematical expressions of causal connections between objects. In this way, Galileo founded modern mathematical natural science, whose purpose is to discover the laws of nature. The mathematical expression of a law of nature is a formula, whose value lies in explanation and prediction. The predictive power of a formula stems from the mathematical relationships formed among the various concepts through mathematization within the formula,[3] and these mathematical relationships are translations of the causal relationships obtained from inductive hypotheses about phenomena. Ultimately, the hypotheses about causal relationships originate from the intuition of experiences in the lifeworld. Therefore, formulas can influence people’s practical activities in the lifeworld through prediction. Natural scientists, however, focused their research on finding the formulas of nature, to the point of separating the formulas from nature itself. “People were led to grasp the true being of nature itself through these formulas and their conceptual framework." (Husserl, 1954, p. 43)

The Alienation of Science from the Lifeworld: Husserl’s Triple Critique of Mathematical Technization, Mathematization as Technology, and the Technization of Natural Sciences

According to Husserl, the new developments in mathematics have intensified the separation between formulas and nature. First, the arithmetization of geometry has emptied the meaning of pure geometry, and algebraization has severed geometry’s connection to the pure intuition of spatial forms. Furthermore, a completely universal formalized mathematics that transcends arithmetization has emerged – namely, the *mathesis universalis* (universal science) conceived by Leibniz, which represents the

[3] "The significance of formulas in the world of formulas lies in idealities" (Husserl, 1954, p. 48).

highest formalization of algebra (Husserl, 1954, pp. 44-45) – and this has weakened the meaningful connection between mathematics and concrete nature. A universal formal logic, a science of the whole of manifolds, is a fully algebraized or arithmetized formal mathematics. It is employed to mathematize nature in general or nature as a whole, that is, to mathematize genera and species, yet it disregards all concrete individual cases of nature. Therefore, the mathematization of nature by formal mathematics loses its meaningful connection to concrete nature. Finally, the aforementioned formal algebraic (arithmetical) thinking has been applied to algebra and arithmetic themselves. This higher-order algebraization has become a technique – the technization of formal mathematical thought – and mathematics has turned into an abstract symbol game based on operational rules. Mathematics itself is thus first to lose its connection to the world on which it bases.

When such technized mathematics displaces formal mathematics and undertakes the mathematization of nature, people completely lose the meaning of the formal expression of nature and any intuition of nature. Thus, the "technization of mathematics empties the meaning of mathematical natural science" (Husserl, 1954, p. 45). On the one hand, mathematical technization has replaced the mode of thinking in which natural science constructs theories through experience with a mode of thinking that engages in a game of symbolic concepts. On the other hand, mathematical technization has supplanted the methods of natural science, making "all methods essentially tend to externalize themselves into integration with technization" (Husserl, 1954, p. 48). "Thus, the natural science is subject to multiple transformations of meaning and overlapping of meanings" (Husserl, 1954, p. 48). As mathematics has become a technology, the original meaning of mathematization – that mathematics is the rational essence of the world – has been forgotten, and mathematization has instead become a technology for explaining nature. Therefore, mathematical physics has thus degenerated into a technology (Husserl, 1954, pp. 51-56).

Mathematical technization is both the cause of mathematization becoming a technology and the cause of technology replacing science and concealing nature. Therefore, it is the foundation of Husserl's critique of the technization of science. As indicated above, the formalization and symbolization of mathematics itself are the causes of mathematical technization. If Husserl holds that mathematical technization is worthy of critique, does this mean that the development of mathematics itself should be criticized, or that mathematics should not be used to explain nature? To answer this question, it is necessary to clarify what the original meaning of mathematics is for Husserl and whether the technized development of mathematics has deviated from its original meaning. On this basis, the essence of mathematical technization, the essence of mathematization as a technology, and further the essence of the technization of science can be revealed. Only then can the significance of Husserl's critique of technology emerge.

As noted earlier, according to Husserl, geometry originates from people's intuitive perception of the spatial forms of objects in the surrounding world. It is the result of people's idealization of these spatial forms and the objectification of the idealized achievements in practical measurement. Geometric concepts have corresponding living world experiences, and the original meaning of geometry lies in expressing these

experiences. Arithmetic begins with people's counting experiences of concrete things in the surrounding world. Counting is a mental activity of people, and numerical concepts are originally given in a collective act or categorial intuitive act of people's consciousness (Melle, 1983, p. 481; Rang, 1989, p. 109). Arithmetical algorithms are methods for deriving truth (Rang, 1989, p. 114), and truth represents the real numerical relationships of things in the surrounding world. Therefore, the meaning of mathematics derives from people's rich and intuitive experiences in the lifeworld. The original meaning of mathematics is that it is a "cognition of the world" (Husserl, 1954, p. 46; Rang, 1989, pp. 123-124). This world cognition truly "gives meaning" to formal mathematics and the technization of formal mathematics, and "gives truth to norm-conforming results" (Husserl, 1954, p. 46; Rang, 1989, p. 108).

Husserl does not oppose the combination of mathematics and technology. He understands that the formation of mathematical science is the result of a technological impetus. Ancient measurement technology enabled the emergence of geometry: "All of arithmetic is a sum of technized methods which are designed to overcome the essential imperfection of our intellect touched upon here" (Husserl, 1970, p. 192; Rang, 1989, pp. 112-113). The establishment of arithmetic benefited from the application of the sensory-semiotic method, because symbolic representations can replace the intuitive representations of large numbers that are beyond the reach of human capabilities (Rang, 1989, pp. 110 and 120).

Arithmetic needs to rely on derived symbols to represent numbers and expand mathematical knowledge. Original numerical thinking is both the meaning foundation and the source of validity of derived symbolic thinking (Rang, 1989, p. 113). The introduction of symbols is the application of technology in arithmetic and also makes arithmetic resemble a technology. However, the symbolic method precisely enables arithmetic to become a science (Rang, 1989, p. 113), because arithmetic as a science arises from the "disclosure of the idea of the telos of truth" (Rang, 1989, p. 108).

This original sensory-semiotic method was not yet a formal game based on arbitrary rules; it remained connected to content-based thinking and could lead to truth (Rang, 1989, p. 114). According to Husserl, the relationship between formal systems and content-based thinking is determined by three methodologically consecutive steps: "transformation starting from symbols, then calculation, then transformation of symbols generated in thought" (Husserl, 1970, p. 258; Rang, 1989, p. 114). The formalization of mathematics is a transformation starting from symbols: first, the formalization of mathematical content, then the formalization of mathematical methods, and finally, the technization of formal proof completely eliminates content-based thinking linked to truth. This causes the meaning of the algorithmic symbolic system, or the semantic interpretation of a formal calculus, to deviate from the original meaning of mathematics (Rang, 1989, pp. 115-117; Mazijk, 2019, p. 531). Mathematical science as an established system of truth is replaced by technical methods for acquiring truth. Although, formally, technized mathematics remains a form of cognition, it is no longer a cognition of the world. Only when a formal "calculus is endowed with signification in terms of content" (Rang, 1989, p. 124) can mathematics continue to exist as a science of cognition about the world.

The mathematization of nature marks the birth of modern mathematical natural science and modern mathematical physics, while the mathematization as a technology marks the point where modern natural science and modern physics begin to turn into a technology. The original meaning of physics lies in exploring the world perceived by human senses: "Thus, the original meaning of physics is the cognition of the sensible world, which means the cognition of our everyday lifeworld" (Rang, 1989, p. 121). The original meaning of physics stems from the rich sensory intuition of the lifeworld. Yet highly mathematized-technized modern physics is dedicated to finding mathematical formulas for the universe, completely severing its connection to the lifeworld and deviating from the original meaning of physics. The ideal world established by mathematical formulas "has taken the place of the only real world that is actually given through perception, experienced and experienceable—the world of our everyday life" (Husserl, 1954, p. 49). The lifeworld is enveloped in "a garment of ideas, the so-called truths of objective science" (Husserl, 1954, p. 51).

"Since Galileo, then the idealized nature has imperceptibly taken the place of the pre-scientific intuitively given nature." (Husserl, 1954, p. 50) Nevertheless, the lifeworld, or the pre-scientific intuitively given nature, is the source and locus of meaning for all sciences, the ground of self-evidence upon which science is established, and the prerequisite for all scientific inquiry (Husserl, 1954, p. 60). Hence, Husserl remarks that Galileo was "both a genius of discovery and a genius of concealment" (Husserl, 1954, p. 53). "The original living meaning" has been covered up by "technical meaning" (Husserl, 1954, pp. 57 and 60).

From a phenomenological perspective, therefore, mathematical technization, mathematization as technology, and the technization of science all represent a deviation of science and its methods from their original meanings, a degeneration from science to technology, or what may be called "the descientification of science" (Rang, 1989, p. 105). Hypothesis and verification have become the essence of science, and in particular, the positivization of science has ultimately led science to completely lose the grand, living meaning it once possessed as a branch of philosophy (Husserl, 1954, p. 197). The mathematization is the secret behind the birth of modern science, while technization is the secret of its rapid development. "Degenerating into a technique" (Husserl, 1954, p. 201), "modern physics as a technology is precisely what distinguishes it from ancient physics" (Rang, 1989, p. 103). The technical character of modern natural science is embodied in the fact that "not only its mode of observation, but also its theories themselves have become products of productive activity and thus precisely products of technical action" (Rang, 1989, pp. 103-104). Modern natural science no longer takes the pursuit of truth as its core goal; instead, it seeks mastery over nature, and its theories have become technologies for achieving this end (Rang, 1989, p. 104). This is the core insight that Husserl aimed to reveal, and it also serves as his warning against the growing technization of the contemporary world. "Yet technique is not science" (Husserl, 1954, p. 197).

As a technology, mathematization has played a tremendous role in the development of modern physics and all the other natural sciences. With the aid of mathematizing technology, the entire field of natural science has achieved unprecedented theoretical and

practical accomplishments. By means of these achievements, humans have deepened their understanding of nature and strengthened their ability to transform and control it. In this sense, mathematization is necessary for practical societal needs. It is often taken as an unquestionable fact that technology promotes the development of science and drives social progress. Technology plays an important role in all domains of human life, and there is scarcely any sphere of contemporary society untouched by it; indeed, the comprehensive technization of human society appears to be an irreversible trend. Yet why does Husserl go against this current and subject it to sharp criticism? Is he an opponent of science and technology, a primitivist who longs for a return to nature? Or are his critiques simply mistaken and outdated? To address these questions, we had to first clarify what "technization" means for Husserl, as well as what he understands by science and by technology.

Husserl is neither an anti-scientist, nor is he a thoroughgoing anti-technologist. He does not deny or oppose modern science and its achievements, nor does he reject the necessity of mathematization and the importance of technology (Husserl, 1954, p. 53). He merely engages in a philosophical reflection on the development of modern science, pointing out the essence of modern science and the crisis brought about by its abandonment of original meaning, as well as indicating a path to overcoming this crisis – returning to the lifeworld to retrieve meaning.

RETURNING TO THE LIFEWORLD AS THE FOUNDATION OF SCIENCE

As elaborated above, mathematics in its entirety – both geometry and arithmetic – derives from the pre-scientific intuitive experiences of the lifeworld. Similarly, natural science originates from the experiential realm of the everyday lifeworld, and its original meaning lies in the cognition of the sensible world. Therefore, the original meaning of both mathematics and natural science is rooted in the cognition of the everyday lifeworld. Ultimately, however, the rapid development and escalating technization of both domains have obscured their original meanings beneath the veneer of technology, thereby precipitating a profound crisis. The process through which original meaning was constituted has accordingly faded into obscurity, "sinking into the realm of passive genesis" (Rang, 1989, p. 131; Arnold, 2022, p. 216). For Husserl, the technization of science is the process by which science deviates from its original meaning and from the lifeworld: as technology is increasingly applied within science, the connection between science and philosophy is severed, and science ultimately degenerates into mere technology. This is precisely what Husserl seeks to criticize. Thus, to restore science to its authentic essence and reclaim its original meaning, it is imperative to reactivate the process of original meaning-formation and to excavate the living, experiential ground of the everyday lifeworld that underpins technical knowledge.

From the perspective of progressivism, however, the development of mathematics and natural science is an inevitable trajectory, and their technization represents an irresistible tide of history. Initially, technology facilitated the emergence of science; subsequently, it propelled the growth of scientific inquiry; and finally, the technization of

science ensued, stripping science of its independent significance and reducing it to a mere appendage of technology. Concurrently, technology has continued its relentless advance within all quantifiable domains, ceaselessly evolving and expanding. The essence of technology lies in its power to transcend original meaning; its inherent nature drives it to depart from its foundational roots, perpetually undergoing transformation, advancement, and proliferation. Therefore, a defining characteristic of technology is its tendency to develop at breakneck speed, severing ties with its origins while using its material and theoretical outputs to conceal them. Technology functions as a homogenizing force that levels all distinctions. In an era dominated by the accelerated development of technology, its triumph and hegemony appear inexorable, and the tangible benefits it bestows upon humanity seem to multiply endlessly.

In addition, those who disagree with Husserl argue that modern micro-level particle science and macro-level cosmological science – such as quantum mechanics and the theory of relativity – appear to be far removed from the everyday lifeworld, seemingly unrelated to intuition and requiring a departure from ordinary experience. Although modern science has become highly technized, aiming at human control and the planning of nature, it nevertheless reveals truths about the natural world. Modern science is not merely technology, it remains science. Furthermore, for Husserl, the core of the technization of science lies in the formalization and technization of mathematics. Yet mathematical formalization appears to be an inevitable aspect of the development of mathematics itself. Mathematics cannot remain at the level of intuition alone; its advancement requires abstraction grounded in intuition. Like physics, mathematics follows a developmental trajectory from the simple to the complex, and from the intuitive to the abstract. From this perspective, the technization of mathematics and of science more broadly can be seen as intrinsic to their own development. Given this state of affairs, why does Husserl refuse to acquiesce to the unbridled development of technology? Why does he critique technology's occlusion of science's original meaning? And why does he advocate a return to the lifeworld – to the locus of science's original meaning? Does Husserl's critique of technology represent a conservative and anti-progressive stance?

According to Husserl, the mathematization and subsequent technization of modern natural science can be characterized as empirical positivism. This paradigm prioritizes the correspondence between empirical observations and physical theories. Positivism reveres verified objective truth, thereby gradually eroding the rational elements inherent in scientific inquiry (Thomson, 2009, p. 197). Thus, Husserl argues that the positivist trend sweeping across Europe has precipitated a crisis of philosophy, science, and human nature on the continent. This crisis of European science is not merely a crisis of scientificity, but also a crisis of the profound significance that science holds for human life (Heffernan, 2017, pp. 232, 254). The essence of this crisis lies in the misguided philosophical doctrines that have come to guide scientific practice – specifically, positivism, skepticism, irrationalism, and other philosophical currents that supplanted the rationalist core of Europe's philosophical tradition. This displacement has deprived philosophy of its rational underpinnings, rendering it incapable of steering the course of scientific progress.

Husserl follows the philosophical tradition from ancient Greece to modern times in distinguishing two levels of science. First, philosophy is understood as an "all-encompassing science, the science of the totality of beings" (Husserl, 1954, p. 5). Phenomenology he founded is conceived as the most rigorous science: a transcendental science of the world experienced in consciousness, a "science of the Lifeworld" (Luft, 2015, p. 47). Second, there are the particular sciences belonging to the natural sciences and the human sciences, which investigate specific phenomena and objects. The second level of science is grounded in the first: "phenomenology is a descriptive, *a priori* science of the subjectively experienced world; all other life-sciences — apart from other eidetic sciences such as mathematics and logic — are empirical and take as their objects what are experienced within the world" (Luft, 2015, p. 48). In modern times, science gradually emancipated itself from philosophy. As a branch of philosophy, it was originally tasked with seeking the truth of being; in its early stages, it still maintained a close connection with philosophy, was capable of self-reflection, and retained access to the lifeworld. However, as the process of technization intensified, modern science developed into positivism, thereby losing its connection with philosophy. Husserl holds that genuine science must preserve this link. He criticizes modern positivistic science for taking objectivity as the sole criterion of truth and for excluding both the human subject and universal philosophy from the domain of science (Husserl, 1954, pp. 5–8).

Despite the unprecedented achievements wrought by technology, it has simultaneously engendered a momentous crisis. Husserl stands among the few philosophers who have astutely identified and presciently warned against this technological crisis. What is even more remarkable is that he has proposed a solution to overcome it: to restore science to its original meaning by returning to the everyday lifeworld, by reestablishing the connection between science, the human subject, and philosophy.

For "all sciences are founded upon the self-evident basis of the lifeworld" (Husserl, 1954, p. 128), which constitutes "a realm of original self-evidence" (Husserl, 1954, p. 130). Thus, to resolve the crisis, a return to the lifeworld is indispensable. Within the lifeworld, the subjective status and autonomy of human beings are reaffirmed, and the rational elements of science are restored (Ruggerone, 2013, p. 182). Husserl advocates re-establishing the guiding role of rationalist philosophy in scientific inquiry, restoring philosophy's metaphysical primacy, and reclaiming philosophy's status as the first science. To this end, he proposes the establishment of a new, absolutely rigorous, and truthful science – phenomenology – which can provide a foundational grounding for natural science and thereby resolve the crisis.

CONCLUSION

The development of both mathematics and natural science constitutes a process of technization whose essence lies in the loss of scientific significance. This is the core of the crisis of European science as revealed by Husserl: Technical thinking has supplanted scientific inquiry, rendering science groundless and incapable of self-reflection. Technology has come to dominate the world; human beings have become objects of

technical manipulation, and even integral components of technology itself (Liberati, 2016, pp. 213-214). Individuals have lost the personalized lived experiences of the everyday, reduced the lifeworld to standardized entities regulated by technical metrics. The unique existential significance of human beings has been emptied. Hence, the technization of science is not merely a crisis of science, but a crisis of human nature.

To overcome this crisis, Husserl proposed tracing back the historical trajectory of scientific development and returning to the everyday lifeworld. This would lift the veil of technology that shrouds science, restore science to its authentic meaning, and ground modern natural science in phenomenology. The essence of the technization of science lies in the growing estrangement between science and philosophy. When Husserl opposes the technization of science, does he thereby espouse a view similar to Hegel's – namely, that philosophy should regain its hegemony over science and that science should return to its philosophical roots? While acknowledging that science originated from philosophy, Husserl does not oppose the independence of science relative to philosophy, nor does he deny the tremendous achievements made possible by the technization of science since the modern era. He calls for a return to the original meaning of science, seeking to reestablish its connection with philosophy and to ground it in phenomenology, in order to promote a more sound and balanced development of science. He exposes the process of technization that has accompanied the rise of modern science, opposes the reduction of science to mere technique, and criticizes the rootless development of science resulting from its complete technization. Science must not lose its way in the course of development; instead, it must be able to define its position, clarify its origins, and draw sustenance from those origins for further growth. Constant retrospection is the prerequisite for continuous innovation.

Husserl's critique carries important practical significance for the scientific community in the present age of Artificial Intelligence. It reminds us that scientists should understand the historical development of science, grasp the meaning of science itself, recognize its intrinsic connection with philosophy, and clearly distinguish the essence of science from that of technology. It also underscores the distinctive significance of the human being in the age of artificial intelligence, as well as the irreplaceable role of the human sciences. Although Husserl's critique may not fully align with certain aspects of the development of modern science, his thought undoubtedly serves as a corrective to objectivism, positivism, scientism, and technological optimism (Wagner, 1974, p. 183).

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Research article

Challenges of Cognitive Capitulation on Mastering Academic Disciplines in the Digital Environment

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Abstract

The present study was conducted in response to the alarming cognitive challenges that arise in the academic digital environment. The paper examines the impact of artificial intelligence (AI) on the mastery of academic metadisciplines and compares educational resources based on AI and traditional human-led instruction. The complexities related to preventing cognitive capitulation in studying academic metadisciplines such as math and English for specific purposes are considered. The article explores how Russian and foreign students process information in digital environments and demonstrates that integrating math and digital tools into English-language teaching enhances learning for Russian students and assists foreign students in overcoming language barriers. The study concludes that digital technologies increase motivation and reduce anxiety for low-skilled students, but they also pose challenges, especially when unconscientious students mindlessly rely on AI to complete assignments, which negatively affects their academic performance. However, surveys show that thoughtful and motivated students creatively use AI to develop their skills and critical thinking. The main conclusion of the study is that educational technologies, including digital tools and AI, should be balanced and seamlessly integrated into education. The article evaluates the pros and cons of new educational technologies and determines their suitability for preventing cognitive capitulation. The study finds that AI can both exacerbate cognitive problems and contribute to their resolution. The authors propose a professionally oriented strategy that reduces stress through interdisciplinary collaboration and the use of technology.

Keywords: Intellectual Difficulties; Cognitive Capitulation; Digital Educational Environment; Scaffolding; Cross-disciplinary Cooperation; Artificial Intelligence; Training for International Students; Meta-disciplines.

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Научная статья

Проблемы когнитивной капитуляции при освоении академических дисциплин в цифровой среде

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Аннотация
Настоящее исследование было проведено в ответ на тревожные когнитивные проблемы, возникающие в академической цифровой среде. В статье рассматривается влияние искусственного интеллекта на освоение академических метадисциплин и сравниваются образовательные ресурсы на основе искусственного интеллекта и традиционное обучение под руководством человека. Исследуются сложности, связанные с предотвращением когнитивной капитуляции при изучении академических метадисциплин, таких как математика и английский язык для специальных целей. В статье рассматривается, как российские и иностранные студенты обрабатывают информацию в цифровой среде, и демонстрируется, что интеграция математики и цифровых инструментов с преподаванием на английском языке повышает эффективность обучения для российских студентов и помогает иностранным студентам преодолевать языковые барьеры. В исследовании также делается вывод о том, что, хотя цифровые технологии повышают мотивацию и снижают тревожность у учащихся с низким уровнем подготовки, они также создают определенные трудности: некоторые недобросовестные учащиеся бездумно используют искусственный интеллект для выполнения заданий, что негативно сказывается на их успеваемости. Однако проведенные опросы показали, что вдумчивые и мотивированные учащиеся творчески используют ИИ для развития навыков и критического мышления. Ключевой вывод исследования заключается в том, что преимущества и недостатки образовательных технологий, цифровых инструментов и искусственного интеллекта должны быть сбалансированы и органично интегрированы в образовательный процесс. В статье предпринята попытка оценить плюсы и минусы новых цифровых образовательных технологий и определить, насколько они подходят для предотвращения когнитивной капитуляции. Исследование показало, что искусственный интеллект может как усугублять когнитивные проблемы, так и способствовать их решению. Авторы предлагают профессионально ориентированную стратегию, которая, по их утверждению, снижает уровень стресса за счет междисциплинарного сотрудничества и применения цифровых технологий.

Ключевые слова: Интеллектуальные Затруднения; Когнитивная Капитуляция; Цифровая Образовательная Среда; Скаффолдинг; Междисциплинарное взаимодействие; Искусственный Интеллект; Обучение Иностранных Студентов; Метадисциплины

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INTRODUCTION

We live in an era of digital abundance where virtual worlds and interactive apps expose students to contemporary challenges. This research examines how digital technologies affect students' attention, memory, comprehension, and information processing, as well as their decision-making abilities. Mentors are alarmed by the situations when students struggle to retain knowledge and surrender. The reasons for this cognitive capitulation vary, and so do the solutions to the problems. Nowadays, students turn to artificial intelligence (AI) to solve cognitive problems, which has become an important tool for them. However, complete reliance on AI also poses a danger, as it can adversely affect cognitive abilities and undermine critical thinking skills. This study focuses on academic meta-disciplines such as math and English for Special Purposes (ESP). Math often causes cognitive difficulties that lead to fear of failure and procrastination. Conversely, English, as a means of instruction, presents its own challenges. This leads to increased cognitive capitulation. It is exacerbated by information overload, multi-tasking, and constantly evolving digital tools. Educators at all levels are exploring how to integrate artificial intelligence into teaching, transforming it from a mere tool into a catalyst for learning and independent thinking.

Still, the reasons for cognitive capitulation as well as remedies for it do not have much coverage in present-day publications

Cognitive capitulation often stems from a state called "learned helplessness," coined by Martin Seligman in the 1960s (1967). People in this state feel powerless to alter their circumstances. They perceive their academic, professional, and personal challenges as insurmountable, leading to a sense of losing control. This mindset can trigger anxiety, frustration, and even depression. Simple tasks like attending university, securing a job, building relationships, or mastering new technology become daunting. When faced with significant steps, such as applying critical thinking or expressing their opinions at seminars, they often require assistance. This helplessness can push them either to capitulation or, paradoxically, to cheating.

This article defines “cognitive capitulation” or “cognitive surrender” as a phenomenon where an individual "gives up" before even attempting to act, despite possessing the initial knowledge, skills, experiences, and resources necessary for success. A person is generally able to achieve his goal, but this is hindered by the fact that he or she is convinced that failure is inevitable, which frequently results in either inaction or prolonged delay (procrastination).

Below are listed typical examples of how cognitive capitulation can occur in students.

Feeling incapable. Students feel helpless, saying "I can't do this," even though they have everything they need to succeed. They see the solution but choose inaction, believing effort is vain.

Avoiding action because of the fear of inconsistency. Students avoid activities due to fear of inconsistency, procrastinating or remaining passive, despite relevant experience. This behavior persists even when they have the necessary skills.

Minimizing success. Students often underestimate their achievements, attributing success to external factors or luck.

Studies of Dinç and Eksi on fear of failure (2019) link it to perfectionism, leading to self-criticism, low self-efficacy, and anxiety. The authors infer that group interaction reduces negative thoughts and perfectionism. Their idea is supported by our research: acceptance and shared responsibility proves to be more effective in combating procrastination than time management.

When delving into cognitive function, pedagogues invariably question the learner's readiness for engaging profoundly with new information. According to Ekaterina Korobova et al. (2018), factors crucial for effective acquisition include consistent, dedicated application; the capacity for autonomous study; independent planning; structuring the cognitive journey and ability to oversee and judge the achievements gained.

Here, we would like to highlight the ability or readiness of students to learn autonomously and the aptitude for monitoring and evaluating progress. These areas are particularly prone to bottlenecks, which can, in our view, lead to cognitive distortions and culminate in cognitive capitulation.

There is still no consensus in the academic world on whether Artificial Intelligence (AI) should be used in the educational process of universities. Nevertheless, more and more researchers and teachers see the potential in it and are optimistic about their implementation. Elena Y. Barakina et al. (2021) assert that AI-enhanced education serves as a platform, enabling students to engage more deeply with these technologies across diverse areas, thereby equipping individuals with the skills to interact with AI effectively.

When it comes to learning academic subjects in the digital environment, there are certain contradictions. On the one hand, we have a general acceptance of the digital world, but on the other, there is also a difference in attitude among people of different age groups and with different experiences. Students and younger teachers see cyberspace as something given, while older people may struggle with it. Their cognitive capitulation may be caused by the need to process large amounts of non-digital information and make decisions without relying on artificial intelligence. For these people, the digital world is a way to overcome cognitive capitulation. The older generation, on the other hand, is made up of people who are "digital immigrants" and have mastered digital tools to a certain extent but still experience some difficulty using them. It is important to note that multitasking can be easier for younger people, but the more mature people feel more comfortable in familiar academic environments and can capitulate on new tasks.

In addition, users increasingly not just use neural networks, but literally "surrender" to them. This is a new type of cognitive capitulation. In the past, technologies like calculators or GPS were used to perform specific tasks, effectively "offloading" mental labor while maintaining control. However, with the advent of artificial intelligence (AI), the landscape has shifted. Now, less mature users increasingly accept AI-generated responses as factual without verifying or critically evaluating them. This trend is most noticeable when AI answers are presented persuasively and without unnecessary complexity. In such cases, people are less likely to question the information. It is noteworthy that more mature users tend to be more critical and demanding when encountering AI-generated information.

Ensuring that new technologies do not cause harm is a significant challenge. We need to differentiate between using technology for dishonest purposes, like cheating on exams or copying essays, term papers, and diplomas, and its legitimate use to create valuable content. It's important to find a good balance. It is essential to ensure that we do not discard the beneficial elements while eliminating the undesirable ones. The goal is to use artificial intelligence (AI) to help students learn better, without stopping their growth or causing any harm that can't be fixed.

Dmitry Beskromny, founder and CEO of the digital media agency bQ Group, lecturer at the Higher School of Economics in his critical post[1] concludes that we have unknowingly entered the era of delegated thinking, where neural networks act as our mental calculators. The author implies that we now live in a world where options are chosen for us, comparisons are eliminated, and control replaces verification; tools such as ChatGPT and Perplexity provide instant summaries and links, which makes human effort unnecessary. Beskromny is discouraged by the fact that society didn't even notice the moment of their cognitive capitulation and are gradually losing their capacity for independent thought.

There are researchers who side with this opinion, for instance, Zainul Arifin et al. (2025) are discouraged by the fact that human effort is slowly but surely becoming superfluous nowadays, when AI performs our thinking for us, provides us with summaries and links. They certify that this cognitive capitulation is step by step eroding our capacity for critical analysis. Over-reliance on technology causes students to solve problems mechanically rather than conceptually. However, they remark that AI can still improve critical thinking if used thoughtfully.

The evolving economic landscape is changing the way students learn and earn certificates. Online courses tailored to individual needs may replace traditional four-year university programs.

Technology allows personalized learning trajectories, influencing learners' perceptions and interactions. Higher education graduates must be tech-literate for business life. Integrating technology in teaching is crucial. Şenol Orakcı & Karagöz (2022) surmise that traditional methods are insufficient for professional development, as technology enhances learning, motivation, and success.

To successfully master the specialized language used in a particular field of study, students need to use a wide range of cognitive abilities, which requires code-switching, or shifting from one linguistic thematic code to another, depending on context, as it is known in the academic environment. If a student does not cope with these difficulties, they may experience cognitive capitulation — a feeling of failure or defeat on their academic path. For instance, this is highlighted in Natalya Davidko's (2011) article which outlines the obstacles of teaching and learning ESP where the integration of conceptual and linguistic knowledge presents a great cognitive load to the learner.

Matthew R. Cashman et al. (2023) identify stress as the main cause of failure anxiety which in turn controls educational expectations and produces a negative effect.

[1] https://vc.ru/id91499/2301738-kogda-tehnologii-zabirayut-nashe-mishlenie

Xin Dong et al. (2022) conclude that virtual experience and being emotionally sound can help students to learn quickly and to be more adaptive to the new world of digitalization.

Very often the forerunner of cognitive capitulation is a cognitive distortion, as it can lead to incorrect conclusions and erroneous decisions, which can negatively affect students' academic success and future careers. They include focusing excessively on negatives, overestimating small events, expecting the worst, and viewing situations as either perfect or terrible. While occasional negative feelings are normal, constant cognitive distortions can harm relationships and worsen overall well-being.

Cognitive capitulation often results from the absence of carefully crafted learning strategies. Without proper guidance and training, the learners may use strategies that are not productive and lead to frustration and, in consequence, to cognitive capitulation. The study of Ali Ahmed Khan and Abdulaziz Sanosi (2024) reveals the importance of the strategy-oriented approach to teaching and curriculum design to enable learners to select the most appropriate strategies and enhance their academic performance.

The challenges that exist for the academic instruction cause cognitive overload and misalignment of the teaching and learning objectives. Salah Mejri’s (2023) article review shows that these factors can cause cognitive capitulation, because students are unable to learn and use the necessary specialized foreign language skills they need for their field of study and, therefore, fail.

At the same time, university lecturers and instructors should differentiate between cognitive capitulation, cognitive difficulty and intellectual challenge. Andrei Verbitsky (2017) views the obstacles in thematic case analysis as an "intellectual challenge" for students. The lack of a clear solution prompts the need for additional knowledge, serving as a catalyst for learning. For advanced students, it's a challenge to overcome; for those with limited expertise, it can lead to frustration. Case studies provide a comprehensive framework for developing subject-specific knowledge across multiple disciplines.

Cognitive capitulation can also be explained by the high cognitive demands of practical tasks that involve combining subject-matter, linguistic, sociopragmatic and interactional knowledge, as well as managing emotional and metacognitive aspects. Lower level students are especially prone to cognitive overload and task failure because they have not developed the cognitive resources and strategic competence required to address these demands. Nick Zhiwei Bi’s (2021) findings highlight that higher-level students who use more cognitive and metacognitive strategies are more successful in pragmatic tasks than lower-level students who use limited and ineffective strategies and often fail.

The findings of Isida Ishmuradova et all. (2025) state that different student subgroups require tailored educational strategies to address their diverse needs. As AI transforms various fields, students must be educated and prepared for these changes.

In addition, poorly designed online learning platforms contribute to academic failure through cognitive capitulation. These platforms lack scaffolding, interaction, and feedback, causing cognitive overload, emotional stress, and isolation. The result is learner disengagement and failure to meet objectives. Behzad Ghonsooly and Shams (2012) in their conclusion stress that e-learning systems should be developed based on cognitive

load theory to assist learners with navigation, interaction and feedback to avoid cognitive capitulation.

We agree with Anastasia Sofroniou et al. (2025) that various technologies, from statistical software to AI-driven platforms, significantly improve mathematics learning outcomes. Digital tools particularly enhance students' understanding of mathematical concepts in higher education. Their findings reveal that visualization aids produce the highest average performance improvements, at 39%, whereas cloud and gaming-based methods achieve more modest results. The most significant impact is seen with statistical tools, cloud platforms, and visualization technologies, emphasizing their importance for developing abstract mathematical thinking. In our opinion, this can equally be related to the teaching of English for Special Purposes when it acts as a medium of instruction.

We support Olga Sergeeva et al. (2023) who state that technical skills encompass the proficiency in utilizing a diverse range of software and hardware, digital tools, and online platforms that hold relevance within educational environments. This spans from handling simple text and spreadsheets to more intricate skills like creating multimedia.

Lyudmila C. Chikileva et al. (2023) concluded that education must prepare students for the responsible and ethical use of AI, neural networks, cyber-physical systems, and robotics as these technologies offer great potential but also pose risks that require further study to mitigate negative impacts.

Alexander Skulmowski and Kate Xu (2022) who explore cognitive load in digital and online learning, propose a hypothesis that learning should be made more accessible and name interactive learning media, immersion, disfluency, realism, and redundant elements as factors that hinder the learning process. However, they remark that the above challenges often make students want to learn more.

The above review of literature demonstrates that our research is topical and vital for assimilating knowledge within digital education. Combining academic meta-disciplines like mathematics and ESP is challenging due to linguistic, contextual, and cognitive factors. These disciplines are necessary for synthesizing knowledge and helping students understand interdisciplinary connections and broader academic contexts, particularly in digital settings.

Therefore, the purpose of the research under consideration is to investigate the factors that contribute to cognitive capitulation and to present practical strategies for mitigating the risks of its occurrence in the educational setting.

PEDAGOGICAL TECHNOLOGIES FOR DEALING WITH COGNITIVE CAPITULATION

The number of students who face challenges in their studies because they are afraid of failing is compelling. Fear causes anxiety, impairs decision-making and alters behaviour. The unconscious fear of failure influences thinking, acting as an invisible force shaping problem-solving methods.

It can be attributed to three fundamental factors. (figure 1).

1. Uncertainty: students face cognitive resistance when they encounter new knowledge. This phenomenon establishes the first vertex of the triangular base.

2. Perceived risk: upon recognizing the necessary workload for knowledge assimilation, students evaluate potential consequences of disengagement. This risk assessment covers academic failure, social consequences, negative self-perception, and related contingencies, forming the second vertex of the triangular outcomes.
3. Fear of failure: operating at a subconscious level, this pervasive influence shapes students' fundamental engagement patterns. As the latent apex of the triangle, it ultimately determines the perceived difficulty.

Admittedly, students' focus on academic challenges is most often driven by the fear of failure. This fear is a significant, hidden factor influencing their actions. Moreover, academic challenges can cause students to become disinterested in their studies, leading them to adopt negative approaches, such as evasion (putting off tasks, skipping classes, or not paying attention in class); superficiality (not really understanding the material and just memorizing facts without thinking about them); negative self-perception (feeling bad about themselves, thinking they can't do well, and ignoring their potential for success); opportune solutions (attempting academic dishonesty or disreputable shortcuts) and resignation (giving up and accepting that they will fail). (figure 2):

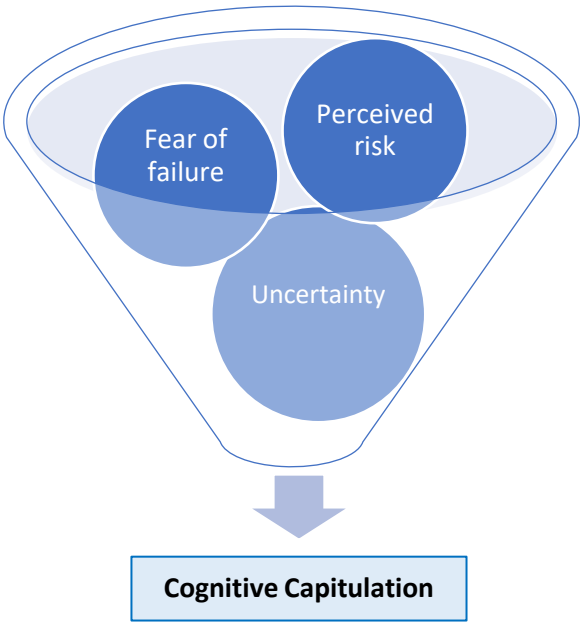

Figure 1. Background of Cognitive Capitulation

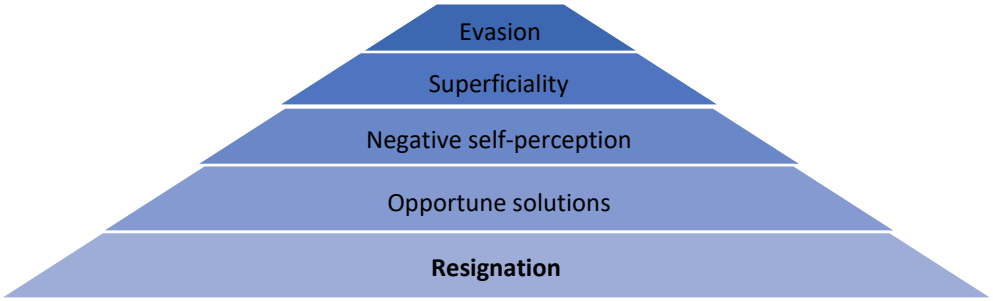

Figure 2. Negative Reactions Resulting in Capitulation

Several countermeasures reveal a potential to fight against these cognitive challenges. The brief outline of the three of them is given below.

1. Mitigating uncertainty through explanations, resources, and inquiry. This method makes learning safer and more confident for students.

2. Navigating the process. Learning should concentrate on the process, rather than the outcome. Traditionally, education emphasizes results. Therefore, shifting this paradigm requires accepting and encouraging mistakes.

3. Overcoming the fear of failure. It involves dismantling unhelpful beliefs. Engaging with students' underlying fears is crucial for fostering effective cooperation.

Mitigating Risks of Cognitive Capitulation on Mathematical Challenges

In recent years, the integration of digital technologies into mathematics learning has emerged as a crucial innovation, fundamentally transforming the landscape of mathematics education. The advent of digital tools and platforms has enhanced the accessibility and interactivity of mathematical concepts. This phenomenon is equally acute for international students; however, they face diverse challenges in their academic trajectory due to linguistic components. According to Paul Drijvers (2024) language barriers can hinder students' understanding of educational materials and participation in class activities, impede their progress, and potentially lead to cognitive challenges. The implementation of digital technologies in the classroom poses its own set of challenges. Our experience has shown that native and international students encounter different challenges. For international students, language differences are as significant as cognitive obstacles related to different academic programs and varying mathematics proficiency in their home countries.

As an example of propaedeutics of stress and cognitive capitulation, let us consider our experience in teaching higher mathematics to international students at the Preparatory Faculty of the Financial University under the Government of the Russian Federation. The program features a course called "Elements of Higher Mathematics," designed for students seeking to pursue master's or postgraduate degrees in Economics at Russian universities. The goal of the teachers delivering this discipline is to familiarize students with the terminology and didactics of Linear Algebra, Mathematical Analysis, and

Probability Theory in Russian and master mathematical methods for economic and financial analysis at the bachelor's level using digital tools like MS Excel and R Studio.

This multidisciplinary approach is particularly effective when it comes to preparing students for their further studies at the senior level. However, enrolment to university Preparatory Faculty groups does not involve careful selection of students based on their educational background. Table 1 shows results from a study on the composition of preparatory faculty students (totaling 57), including their proficiency in the Russian language, their level of mathematical knowledge, and their familiarity with Excel. To simplify the visualization, we have indicated only three options for each category: *I have mastered the academic discipline by 100% (+); I have mastered it by 50% (±) or I am completely unskilled in this academic field (–)* (Table 1).

Table 1. The level of proficiency in Russian, the level of preparation in mathematics and the level of familiarity with EXCEL

Russian	Mathematics	EXCEL	Amount %
+	±	–	4%
+	–	–	12%
±	+	±	26%
±	±	–	21%
±	–	–	11%
–	+	+	21%
–	±	±	4%
–	–	–	2%
		Total:	**100%**

Unfortunately, only 27% of international students know the Russian language well enough to be able to study in Russian, but they lack basic mathematical skills or experience of working with Excel. About 25% have a low proficiency in the Russian language, but have sufficient mathematical skills and Excel experience. There are students who do not speak Russian or have a basic understanding of higher mathematics, and these students are in the minority. As a rule, these students will continue their studies in non-technical or non-economic fields. They explain their reluctance to study mathematics by saying that they do not need it for their future careers. These learners are especially prone to cognitive capitulation.

The instructional approach at the Preparatory Faculty for international master's students is specific, focusing on the minimum of theoretical metamathematics. The emphasis is on the Russian terminology and the use of mathematical apparatus for solving professional problems, which are mastered by graduates of the Bachelor's Course at the Finance University. It is obvious that students with poor mathematical background and/or

low proficiency in Russian find it extremely difficult to understand the content during 3-4 months of study on the course.

Some international students are quite proficient in English as a foreign language, which is often used by mathematics teachers as an additional medium of instruction. Thus, by developing an individual trajectory for mastering mathematics and creating a multilingual metadisciplinary environment, the instructor creates a means to overcome cognitive difficulties caused by linguistic phenomena.

Nevertheless, most modern students of any nationality are distinguished by their high speed of information perception, clip thinking, and multitasking. It is here that the computing capabilities of Excel and the more advanced digital tool RStudio come to the rescue.

Introducing students to Excel through a Russian interface gradually immerses international students in the process of learning mathematics in Russian. The simple algorithms and built-in functions allow students to avoid a deep understanding of the mathematical apparatus for routine calculations. If working with EXCEL causes difficulties (there is no way to buy a subscription, a personal laptop does not support the Russian interface), then switching to solving problems in RStudio can bring back motivation to study mathematics, because RStudio is a free platform with the ability to work in the cloud without downloading to a computer. The RStudio interface is in English, which is common for international students from many countries.

We use digital resources to engage students from the start and solve financial and economic cases relevant to their future careers.

Such trainings stop being boring and causing rejection as "unnecessary knowledge". Financial and economic terms are given in Russian and English, mathematical formulas are derived for them, and digital tools are selected. This method of teaching is called interdisciplinary code switching, when a whole chain of codes is built, each of which expands and deepens the concept under consideration, and switching between codes makes the explanation understandable for most students (Dubinina et al., 2022b).

Our experience shows that international students can succeed academically by code-switching between Russian and English. Adding mathematical symbols, economic terms, Excel, and programming language R creates a multi-lingual digital educational environment. Figure 3 shows the solution of a training problem on the topic of the Function of two variables in the RStudio environment, where an interdisciplinary symbiosis of five components is evident.

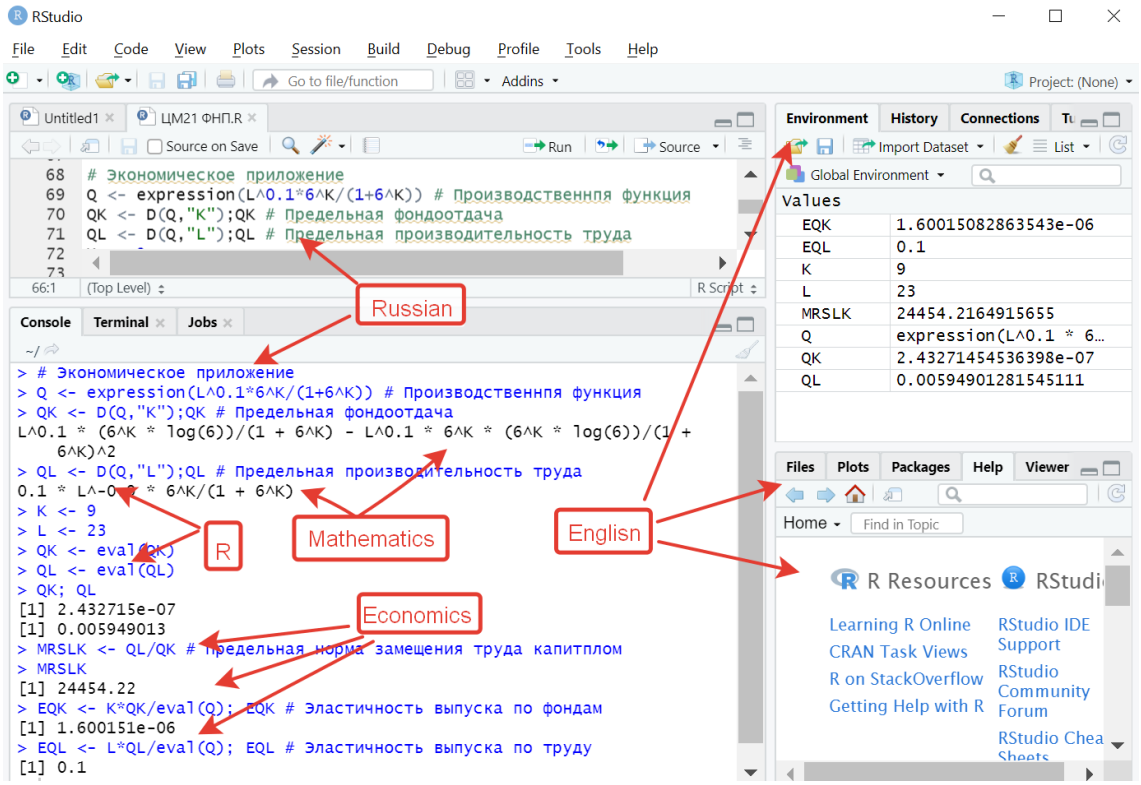

Figure 3. Multi-lingual digital educational environment

Reducing the Risk of Cognitive Capitulation on ESP

As it has been indicated above, one of the aims of this research is to find the ways to deal with cognitive capitulation on the meta-disciplines. If to consider the challenges in ESP training, the negative effects of cognitive capitulation can be overcome with the help of building the individual trajectory of learning for students who do not excel in the foreign language (Dubinina, et al., 2024). Educational scaffolding is effective because it reduces stress and enhances student control and engagement in the learning process, as teachers guide students through the structured tasks.

Scaffolding is based on Lev Vygotsky's zone of proximal development (ZPD) theory. Lyudmila Obukhova (2009) states that this influential theory, proposed by the Russian psychologist, remains crucial in education and psychology.

Jorge Bacca-Acosta et al. (2022) define scaffolding as a method to assist beginners and students with lower proficiency in English or university subjects to tackle problems or tasks beyond their current abilities.

Scaffolding offers opportunities for personalized learning by constructing educational "supports." We find it important to underscore its significance in enhancing student motivation and establishing a helpful learning environment. Moreover, we are absolutely sure that scaffolding in professionally-oriented foreign language education should integrate both linguistic and professional dimensions. It is here that code-

switching between different academic disciplines serves as a medium of instruction and reduces the level of stress for students with insufficient proficiency in one of the academic disciplines. Integrative code switching collaboration provides students with comprehensive support and a compelling edge (Dubinina et al., 2022a). For example, our practical experience at the Financial University under the Government of the Russian Federation shows that in order for code switching to be helpful in mastering various disciplines, it is extremely important to help students understand the connection between economic concepts and their mathematical counterparts. This should be combined with understanding international equivalents of these terms in English and proficiency in digital tools for analysis.

As an example of scaffolding in ESP learning process we may consider the role play on the basis of the preliminary professionally oriented case analyses. The activity is based on team-work where weaker students are paired with higher ESP proficient peers. The latter scaffold the former students' learning by initially taking the lead and modeling skills, then gradually encouraging the weaker student to become more independent in role-playing as they demonstrate competence.

This approach enables students with limited language skills to engage in quasi-professional activities early in their training, with the assistance and guidance of a more experienced peer. Thus instructors assign students to different roles based on their level of expertise. More experienced students are given the opportunity to enhance their supervisory skills by mentoring their less experienced peers. Students who have difficulty expressing themselves are supported in developing their communication abilities. Instructors provide individualized support and assistance to help each trainee progress.

Our practical experience reveals that gradual immersion in a simulated economic environment is efficient in a multidisciplinary and multilingual digital setting, with English as the medium of instruction. Students participate in professional simulations to analyze real-life scenarios. These role-playing activities improve linguistic skills, including speaking, writing, and note-taking.

Nowadays during classes, educators not only assist students in honing their ESP abilities, but they also play a key role in promoting the application of digital tools, including AI-generated graphs and other products. We find it helpful when case study results are presented in multimedia formats.

Generation Z students have matured in an era characterized by an excessive volume of information. Advanced neural networks such as GPT, DeepSeek, Gemini, and Gigachat significantly assist with various tasks, including English language instruction. These tools are particularly proficient at dissecting complex thematic scenarios. However, educators play a crucial role in guiding students on how to create effective prompts, critically evaluate AI-generated information, and seamlessly integrate it with educational content.

Students are often surprised to learn that the highly sought-after profession of a Prompt Engineer, which some sources claim can now earn over $300,000, is not primarily focused on programming but rather on the ability to structure thoughts and possess a deep understanding of a particular field. Only those who are able to critically evaluate its

response, check for logical consistency and fit it into the business context will be able to effectively interact with AI.

The approach to incorporating AI in foreign language instruction is still in its early stages, as educators seek to harness its potential without compromising student learning. In our experience, neural networks have demonstrated effectiveness in handling textual material. When dealing with extensive texts, which can be particularly challenging for digital-age students, students are given the task to instruct the AI to condense the material to a manageable length. Subsequently, students are tasked with assessing the obtained text to ensure its lexical content aligns with the active vocabulary of the topic being studied. They are then required to rephrase the text, replacing any lexical elements that do not match. For students with lower proficiency in the English language, it is recommended to utilize the "Simplify" prompt until the text becomes accessible. The student should then develop a prompt "Voice the text" and then listen to it over and over again. Following this, the student should complete the task by orally presenting the revised text. It is crucial that the outcomes of these textual manipulations should be presented without relying on the text. In this process, students engage with the thematic material at least three times, applying critical thinking to assess the AI-generated text against a predefined thematic dictionary and ensure subject matter accuracy.

Thus the professional component is blended with the language proficiency and cognitive skills are applied efficiently.

DISCUSSION

Students experiencing cognitive difficulties require involvement in mitigating uncertainty and managing failure potential. To better address such situations, we carried out a survey to gain a deeper understanding of the issues. Respondents (totally 112, mostly first year students of the Financial university under the Government of the Russian Federation), were asked to answer questions aimed at evaluating their personal experience of cognitive capitulation.

The majority, comprising 83% of the students, answering the question "Have you ever experienced intellectual helplessness in the face of difficulties while learning any academic discipline?" acknowledged having experienced this phenomenon, while 17% reported they had not. Thus, most students have encountered cognitive capitulation in one form or another, making it a serious barrier in professional knowledge acquisition.

Figure 4 presents the percentage distribution of students' responses in regard to the reasons for cognitive capitulation.

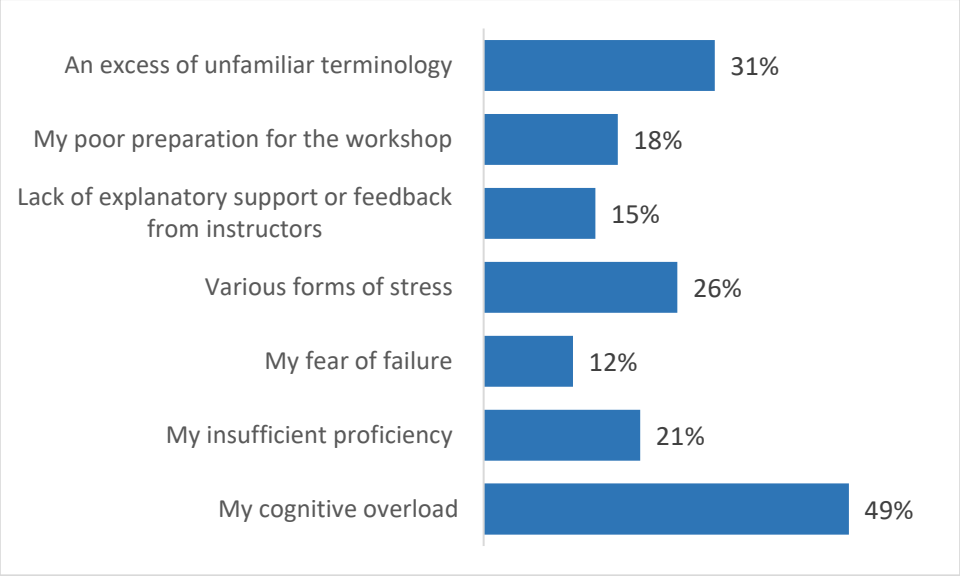

Figure 4. What in your opinion causes cognitive capitulation? Several options are possible.

As we see in Figure 4, an excess of unfamiliar terms (31%), inadequate preparation (18%), and insufficient teacher support (15%) contribute to stress and fear of failure. Additionally, students' limited language skills (12%) exacerbate the issue. This combination leads to cognitive overload (49%), a state where individuals struggle to manage the mental demands` of multitasking. In our opinion, cognitive overload stands out as the most significant factor contributing to cognitive capitulation. John Sweller (1988) first used the term cognitive overload in 1988, advancing the concept that students can successfully assimilate information only if it does not overload their brains.

Our findings echo existing research, confirming that many students face cognitive overload, often resulting in cognitive capitulation, an inability to handle the complexities of multitasking. Julia Fox et al. (2007) inferred that the condition, in which a person's cognitive abilities are overloaded with an excessive amount of information or tasks, significantly reduces productivity and causes physical and mental exhaustion. Skulmowski et al. (2022) state that virtual learning environments, with their immersive, realistic, and interactive features, can sometimes create unnecessary cognitive strain. Excessive visual stimuli and emotionally challenging conditions, though not directly relevant to learning, are crucial elements of the learning process. This is especially true when language and content complexity outpace available support. (Dubinina, 2022).

In our research we also surveyed the strategies that students employ to avert cognitive capitulation (figure 5).

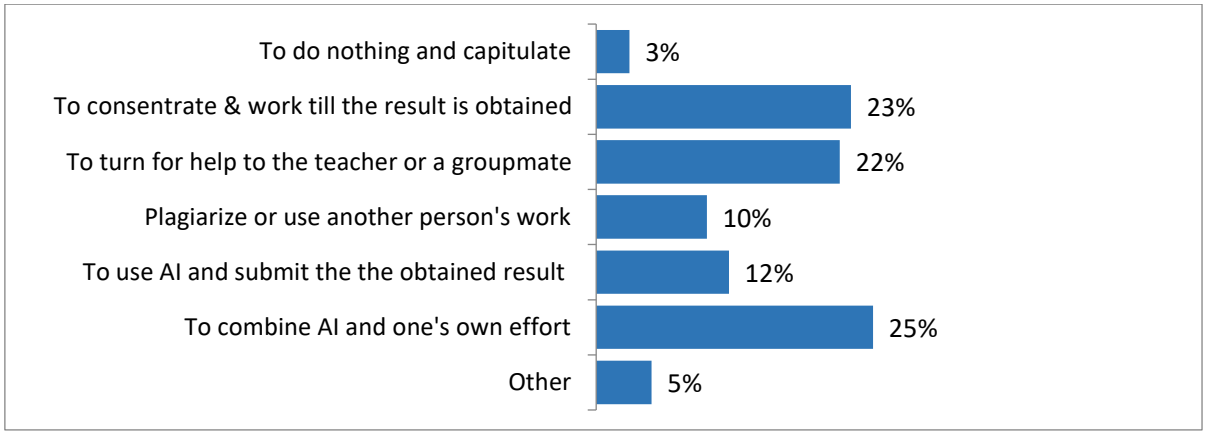

Figure 5. What strategies used to escape from cognitive capitulation do you find efficient? Several options are possible.

Other answers are also worth mentioning:

- to take rest and then to split the task into several minor fractions;
- to take a break from work and then start doing things with renewed vigor;
- to put the task off till better times, as one shouldn't delay personal matters in order to complete it;
- to tackle the assignment until one grasps it, but not to neglect other responsibilities;
- to seek assistance to find the correct solution, but not to copy mindlessly;
- to tune in to complete the task and after a successful result to please oneself with something (I always choose something delicious);
- to lie on the floor, and start crying.

However, AI is dominant in the answers: nearly 90% of students employ artificial intelligence in various forms!

Figure 6 reveals an intriguing trend in students' use of AI for academic purposes. Surprisingly, only 2% of the respondents' report having complete trust in AI. Meanwhile, 93% resort to its help from time to time.

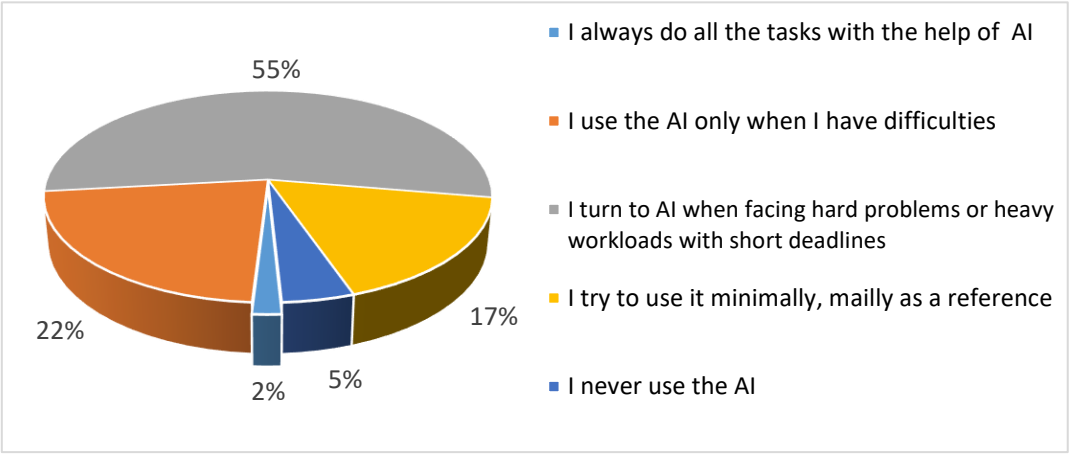

Figure 6. What role does the AI play in your education?

The main item the survey explored was the role of AI in students' academic activities. A mere 2% of participants reported always relying on AI in their studies. The largest segment, accounting for 55%, turns to AI for addressing complex problems or handling heavy tasks within tight deadlines. Another 22% use AI only when faced with challenges, while 17% make a conscious effort to minimize their dependence on it. Finally, 5% completely abstain from using AI.

Admittedly, one of the ways to help students overcome intellectual difficulties is ChatGPT. While there is an ongoing academic debate about its advantages and ethical concerns, we align with Elena Seredkina's (2024) and her critical yet moderately techno-optimistic perspective on the future of artificial intelligence. No doubt, ChatGPT's responses, though plausible, are based on the data that has been prepared in advance and lack topicality, personal experience, intuition, and empathy.

At present, it is difficult to differentiate between academic dishonesty and the innovative use of advanced technologies, and to establish the ethical and legal parameters of using AI in higher education. Nonetheless, questions remain about whether AI fosters critical thinking.

The primary goal is to ensure that AI becomes a beneficial tool in the educational process. In our view, using AI thoughtfully, under the mentor's guidance, can aid students with lower proficiency in simplifying complex material, help to create a program for solving an applied task, to generate texts, or create slides for PowerPoint presentations. Moreover, digital educational environments that incorporate visual, interactive, and scaffolded learning paths offer students the opportunity to re-engage with content in less threatening ways. Bylieva et al. (2019) emphasize that e-learning progress is directly related to how practically and accessibly content is structured.

CONCLUSION

The results of the study demonstrate that intellectual difficulties, cognitive capitulation including, are not inevitable. With the appropriate application of scaffolding techniques, immersive learning strategies, and digital educational technologies, instructors can create a safer and more accessible learning environment. It is essential to address both the cognitive and emotional needs of students, especially those from digital generations, who require personalization, visual input, and flexible pacing.

Poorly designed online learning platforms, lacking scaffolding, interaction, and feedback, can increase cognitive overload. Complex digital interfaces, managing multiple sources of information, and the emotional stress can overwhelm students, resulting in cognitive capitulation. However, technologies like virtual reality (VR) and AI-driven tools can help solve these issues by providing personalized learning, real-time feedback, and interactive simulations that reduce cognitive load and increase engagement.

Plagiarism or cheating is usually accompanied by cognitive capitulation. Those who think they cannot meet academic standards may try unethical proceedings, indicating they have given up on learning.

Thus, in this article, we explored how technology can enhance learning by making it easier for students to study effectively and intellectually engage. We found that

technology overcomes cognitive barriers and reduces academic anxiety through educational scaffolding. Consequently, integrating English for Specific Purposes (ESP) and math instruction with digital resources proves to enhance student motivation and reduce stress, including those with lower language proficiency. That is why striking a balance between educational technologies, digital tools, and artificial intelligence is essential.

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Book review

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Research article

Measuring the Invisible: A Review of Thomas Morel's *Underground Mathematics*

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Abstract

Thomas Morel's *Underground Mathematics* reconstructs subterranean geometry, or *Markscheidekunst*, as a neglected form of practical mathematics developed in the mining regions of the Holy Roman Empire. Morel presents mine surveying as a craft culture in which measurement, legal procedure, manuscript practice, map-making, and administrative record-keeping jointly made the underground knowable. This review reads the book through technical language, representation, and trust. Its central claim is that hidden subterranean space became measurable, legible, and usable through situated procedures and records. Surveying rituals, handwritten manuals, maps, and administrative documents did not merely record technical practice, they helped define what counted as reliable knowledge within mining communities. For readers concerned with technology and language, the book is valuable because it shows how authority emerged through the interplay of vocabularies, instruments, numerical measurement, visual forms, and legal-administrative procedures. The book is therefore important for historians of mathematics, mining, and craft culture, as well as for readers interested in how technical practices generate legibility, authority, and trust. Although Morel could have developed more explicit reflections on technical language, visual mediation, and the geographical boundaries of subterranean geometry, *Underground Mathematics* remains a compelling study of how measurement, inscription, and visualization transformed hidden subterranean spaces into objects of knowledge, judgment, and administration.

Keywords: Subterranean geometry, Practical mathematics, Manuscript culture, Technical representation, Craft knowledge

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Научная статья

Измерение невидимого: Рецензия на книгу Томаса Мореля "Underground Mathematics"

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Аннотация
Книга Томаса Мореля *Underground Mathematics* реконструирует подземную геометрию, или *Markscheidekunst*, как забытую форму практической математики, сложившуюся в горнорудных регионах Священной Римской империи. Морель представляет маркшейдерское дело как ремесленную культуру, в которой измерение, правовые процедуры, рукописная практика, составление карт и административное делопроизводство совместно делали подземное пространство познаваемым. В настоящей рецензии книга рассматривается через призму технического языка, репрезентации и доверия. Ее центральный тезис состоит в том, что скрытое подземное пространство становилось измеримым, читаемым и пригодным для использования благодаря ситуативным процедурам и записям. Ритуалы измерения, рукописные руководства, карты и административные документы не просто фиксировали техническую практику, они помогали определять, что считалось надежным знанием внутри горнорудных сообществ. Для читателей, интересующихся технологиями и языком, книга ценна тем, что показывает, как авторитет возникал во взаимодействии словарей, инструментов, числового измерения, визуальных форм и правовых-административных процедур. Поэтому книга важна для историков математики, горного дела и ремесленной культуры, а также для читателей, интересующихся тем, как технические практики порождают читаемость, авторитет и доверие. Хотя Морель мог бы более подробно развить размышления о техническом языке, визуальном посредничестве и географических границах подземной геометрии, *Underground Mathematics* остается убедительным исследованием того, как измерение, запись и визуализация превращали скрытые подземные пространства в объекты знания, суждения и управления.

Ключевые слова: Подземная геометрия, Практическая математика, Рукописная культура, Техническая репрезентация, Ремесленное знание

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When Johann Wolfgang von Goethe entered the service of the Duchy of Saxe-Weimar in 1776, one of his first administrative charges concerned mining. For years he directed the commission responsible for reviving the abandoned silver and copper mine at Ilmenau, descending its shafts, examining its rocks, and corresponding with surveyors and mining officials. The mineral world never released him: his house on the Frauenplan in Weimar still holds one of the largest private mineral collections of the age, nearly 18,000 specimens, and the iron oxide mineral goethite bears his name. “Rocks are mute teachers,” he reflected in *Wilhelm Meister’s Journeyman Years*; “they render the observer mute, and the best thing one can learn from them is to keep one’s counsel” (Goethe, 1829/1995). The aphorism names a real difficulty: the underground does not speak, and what it teaches resists ordinary communication. Yet the mining administrator in Goethe knew that silence could not be the last word. Mines had to be measured, mapped, recorded, and adjudicated; the muteness of stone had to be converted into numbers, lines, and documents that others could read, check, and trust. How early modern mining communities accomplished this conversion is the question at the heart of the book under review.

Thomas Morel’s *Underground Mathematics: Craft Culture and Knowledge Production in Early Modern Europe* studies a technical practice whose object resisted ordinary visibility (Fig. 1). Subterranean geometry, or Markscheidekunst, dealt with shafts, tunnels, ore veins, property boundaries, and underground routes that could not be inspected directly from the surface (Morel, 2023, p. 5). To measure the underground was therefore more than applying geometry to a difficult environment. It meant transforming a hidden and unstable space into relations that could be recorded, communicated, disputed, and administered. This is the sense in which Morel’s book may be read as a history of “measuring the invisible.”

The book makes an important contribution to the history of practical mathematics, early modern mining, and craft knowledge. Its achievement lies in shifting attention away from learned geometry as an abstract discipline. Morel focuses on the situated practices through which miners, surveyors, officials, teachers, and administrators made mathematical knowledge work. Morel shows that underground surveying developed within the legal, ritual, pedagogical, and administrative worlds of mining (Morel, 2023, p. 6). It was embedded in legal procedures, rituals of witnessing, manuscript practice, cartographic representation, and administrative documentation. Geometry, in this account, functioned as a practical means of establishing boundaries, evaluating claims, coordinating work, and producing trust.

The book is especially valuable for showing how technical authority depends on forms of representation. The underground became knowable through a chain of mediations. Instruments converted direction and distance into measurable relations, vocabularies named operations and roles, manuscripts preserved procedures, maps made inaccessible spaces visible, and records turned technical operations into recognized evidence. Morel’s study therefore presents subterranean geometry as a culture of inscription as well as calculation.

Viewed as a study of early modern technical mediation, Underground Mathematics shows how mining communities converted physical environments into measurable

relations, preserved procedures and results in written and visual forms, and used these records to support decisions. Measurement, language, image, and record remain concrete practices through which a subterranean world became legible, credible, and administratively usable.

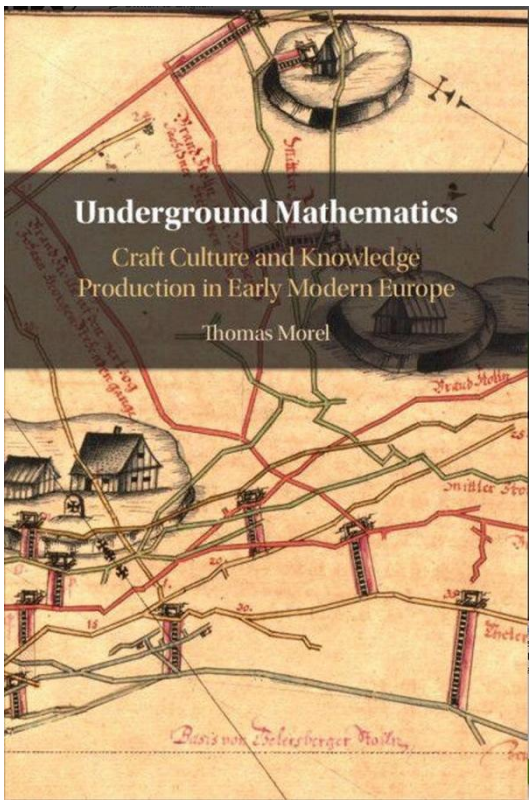

Figure 1. The book's cover of' *Underground Mathematics: Craft Culture and Knowledge Production in Early Modern Europe* by Thomas Morel

A central strength of *Underground Mathematics* is its refusal to treat subterranean geometry as a simple application of learned mathematics to mining. The German term *Markscheidekunst*, usually rendered as the "art of setting limits," already indicates the social and technical work performed by this discipline. It referred to the measurement of mining concessions, the orientation of shafts and galleries, the tracing of underground routes, and the management of spatial uncertainty in metal mines. Morel's account therefore begins from a kind of mathematics whose value lay in use: it helped mining communities establish boundaries, plan underground work, and coordinate operations.

This emphasis allows Morel to move beyond the familiar narrative of mathematics entering technical life from outside, as learned principles later applied to practical problems. In the mining regions of the Central European Holy Roman Empire, geometry emerged within a dense setting of local customs, legal rights, material constraints, and administrative needs. Its authority depended on calculation, procedure, and recognition. Surveying had to be performed in recognizable ways, witnessed by relevant actors,

recorded in appropriate forms, and accepted by the community (Morel, 2023, pp. 53-60). The book is especially persuasive when it shows that mathematical practice acquired force through procedures that made technical results socially and legally recognizable.

Morel's discussion of learned authors such as Agricola and Reinhold is important for this argument. Their printed works helped make mining visible to scholarly readers, yet also reveal the limits of treating textual description as transparent evidence of practice. Morel treats these authors as evidence of the distance between learned reconstruction and craft procedure (Morel, 2023, pp. 22, 46-49). This move redirects attention from mathematics as a formal discipline to situated work, performed with instruments, articulated in miners' language, stabilized through custom, and mobilized in decisions about property, labor, and administration. It also prepares the book's central themes: manuscript practice, cartographic visualization, and measurement as a procedure for producing trust.

A further achievement of *Underground Mathematics* lies in its treatment of craft knowledge as a representational practice. Morel places miners and surveyors at the center of a history too often dominated by scholars. He reconstructs the forms through which their knowledge was inscribed, taught, checked, and authorized: technical vocabularies, measuring procedures, instruments, sketches, manuscripts, maps, and administrative records. The book therefore avoids a narrow opposition between learned theory and tacit practice. Mine surveying was rooted in experience and embodied skill. At the same time, it depended on written, visual, and procedural forms that allowed technical operations to be taught, repeated, inspected, and authorized.

This point matters because craft knowledge is often associated with locality, orality, and resistance to formalization. Morel's surveyors complicate that picture. They worked in mines and on the surface, but their authority also took shape on paper and in drawings. Their expertise had to operate across settings: underground galleries, mining offices, apprenticeship contexts, local disputes, and courtly or state administration. In this movement, knowledge changed form. A measurement became a note, a route became a line, a procedure became an instruction, and a dispute became a record. Morel's account is persuasive because it follows these transformations while keeping them anchored in the material and social conditions of mining.

The book is especially valuable because it shows that representation belonged to technical practice itself. Technical vocabularies named operations and roles, diagrams and plans condensed spatial relations, manuscripts preserved methods, and documents gave measurements institutional weight. In this sense, Morel presents subterranean geometry as a technical culture organized around acts of representation.

This approach gives the book much of its historiographical significance. By placing practitioners at the center, Morel does not romanticize craft knowledge as an alternative to scholarly knowledge. Instead, he shows how practical expertise developed its own standards, forms of inscription, and procedures of validation. The underground surveyor appears neither as an anonymous manual worker nor as a minor version of the learned mathematician. The surveyor appears instead as a technical actor whose authority depended on connecting measurement, language, image, and record. This is where

Underground Mathematics speaks most directly to questions of technology and language: it shows how a craft became a durable technical tradition through forms of representation.

One of the most suggestive parts of *Underground Mathematics* is its treatment of manuscript practice. Morel shows that the handwritten tradition of subterranean geometry was not a marginal survival from a pre-print world. It was one of the principal working forms through which underground surveying developed as a technical practice. In this setting, manuscripts did not merely preserve knowledge after the fact. They shaped how methods were organized, taught, copied, corrected, and authorized.

The central figure here is Balthasar Rösler, through whom Morel reconstructs a seventeenth-century scribal culture of technical instruction (Morel, 2023, pp. 119-123). Rösler and his students did not publish treatises in the manner of learned mathematicians. Their techniques were copied, taught, and maintained through handwritten books that described tasks, instruments, diagrams, and procedures. Morel makes this point concrete through Adam Schneider's Rösler-derived manuscript, in which the apprentice is led from instruments to calculation and then to record-keeping. The measuring chain, suspended compass, and semicircle are not presented as isolated tools, but as parts of a sequence that turns an underground route into measurable data. The right triangle, called the "master of mathematics," translates the inclined chain into horizontal and vertical components, while the Grubenzug records each pull of the chain as a line of data including length, inclination, and direction (Morel, 2023, pp. 121-128). Even small procedural details are revealing: the surveyor is instructed to check his writing table while the magnetic needle settles, and then to repeat the observation before entering the result. Such manuscripts allowed techniques learned in mines and offices to be passed on to new practitioners while remaining tied to the craft world that gave them meaning.

This account is important because it challenges the assumption that print necessarily represented a more advanced form of technical instruction. In Morel's narrative, manuscript culture appears as flexible, selective, and closely adapted to practice-bound instruction. A manuscript could be copied for a student, adjusted to local circumstances, supplemented by drawings, and kept within a circle of trusted users. Its authority rested less on public authorship than on recognized training, experience, and use. It depended on the reputation of teachers, the credibility of experience, and the ability of the text to guide recognizable operations.

The case of Nicolaus Voigtel further clarifies this point. His Geometria subterranea gave printed visibility to material that had long been shaped by manuscript practice (Morel, 2023, pp. 138-143). Yet Morel avoids a simple story in which print replaces manuscript or secrecy gives way to openness. Even after Voigtel's book, becoming a competent surveyor still required training, practice, and access to a professional culture that could not be fully captured by print. The issue is not that manuscripts were more "authentic" than printed books, but that manuscript and print supported different forms of technical authority.

Morel's discussion of manuscript culture deepens the book's larger argument about knowledge production. Technical knowledge became stable when writing was embedded in practices of teaching, copying, correction, authorization, and use. Handwritten manuals, copied diagrams, and administrative registers made technical operations durable

without making them fully public. In this sense, manuscripts were working instruments of instruction and authorization rather than passive containers of subterranean geometry.

If manuscript practice made subterranean geometry teachable, maps made the underground visually available for comparison, planning, and judgment. Chapter 5 is therefore central to the argument of *Underground Mathematics*. Morel treats mining maps as instruments for rendering the underground intelligible, rather than as illustrations appended to technical practice. Shafts, galleries, veins, concessions, and drainage works were transformed into lines, sections, scales, labels, and spatial relations. The result was a visual language capable of making hidden structures available to people who could not inspect them directly.

The example of Johann Berger's Freiberga subterranea is especially important. Morel presents it as an ambitious cartographic undertaking grounded in subterranean geometry and shaped by Abraham von Schönberg's administrative ambitions. Berger's drafts make the technical work of mapping unusually visible. Before the map became a pictorial representation of underground space, the path of a gallery was constructed from numbered data points; in the draft plan of the Holy Father gallery, for instance, the "angles of this gallery" were listed and points such as 5, 10, and 15 were marked for clarity, while figurative lines indicating the gallery, hut, and winch were added afterwards (Morel, 2023, pp. 167-168). This example shows that the map was not simply an image of the mine, but a working surface on which measured data could be organized, checked, and used. Its significance therefore lies not only in its detail, but in the work it was meant to perform. It allowed routes, pits, and prospective works to be compared within a coherent view of a mining district. The map was both a representation of underground space and a tool for planning and administrative judgment.

Morel is particularly good at showing how such visual forms acquired authority. Mining communities had long relied on direct inspection, local testimony, written reports, and repeated measurements. A map acquired force only when it could be read alongside these older practices. It required conventions of reading, confidence in surveying procedures, and administrative support. This is why the political setting of Chapter 5 matters. The rise of mining cartography was linked to efforts to reform, supervise, and finance mining operations. Visualization was therefore closely connected to administrative supervision.

The force of Morel's analysis lies in his refusal to treat maps as transparent windows onto the underground. They were selective constructions designed for use. Their value depended on what they made visible and what they simplified. A technical map condensed complex underground relations into a form readable by surveyors, officials, investors, and rulers. It organized the mine as an object of judgment, rather than merely reproducing it. This makes the chapter one of the strongest parts of the book: it shows with particular clarity how visual representation could transform uncertainty into a basis for decision.

There is, however, a small tension here. Morel's discussion makes clear that maps were crucial to the history he reconstructs, yet the visual materials themselves are not always easy for readers to examine in detail. Since the argument depends heavily on cartographic mediation, larger or more legible reproductions would have helped readers

follow the technical work performed by these images. This does not weaken the argument, but it does show how much a history of visual knowledge depends on the visibility of its own evidence.

Overall, the chapter on mapping gives the phrase "measuring the invisible" its most concrete form. The underground became knowable because it could be drawn, scaled, annotated, compared, and used in planning. Maps converted subterranean space into a visual field of relations, linking measurement to administration and representation to decision-making. In Morel's account, mapping created a form through which hidden space could be inspected, trusted, and administered.

A further strength of *Underground Mathematics* is its treatment of measurement as both technical operation and social procedure. In this context, accuracy was not a purely internal mathematical value. It mattered because underground surveying was tied to property, labor, investment, safety, and jurisdiction. A measurement could determine where a concession began, whether a gallery crossed a boundary, how underground work should proceed, or whether a technical claim could receive administrative recognition. Numbers acquired force when they were produced and received through recognizable procedures.

The ritual and legal dimensions of *Markscheidekunst* are therefore central to Morel's account. Morel shows that mine surveying combined instruments and calculation with public acts, witnesses, local customs, written confirmation, and institutional acceptance. A mathematically correct measurement became trusted only when it was performed in a recognizable and accepted manner. The authority of subterranean geometry thus depended on a sequence of actions through which technical results became socially recognizable.

Measurement produced trust through procedure. Instruments generated readings, surveyors interpreted them, witnesses and officials confirmed the act, and documents preserved the result. Maps and records then allowed measurements to be checked, recognized, and used. Morel's point is that reliability in early modern mining was built through linked technical, social, and documentary operations.

The book's larger significance lies in showing how technical authority emerged where measurement, documentation, and institutional recognition met. Mining communities needed reliable numbers, but they also needed shared vocabularies, accepted forms of documentation, and procedures for resolving disagreement. Subterranean geometry became powerful because it transformed uncertain spatial relations into claims that could be checked, disputed, certified, and used.

This also explains the significance of the book's religious and ceremonial materials. Sermons, rituals, and public acts of witnessing might seem peripheral to mathematics. Morel shows that they belonged to the moral and social world in which mathematical practice gained legitimacy. Geometry was associated with precision, fairness, order, and legitimate procedure. In mining communities where economic interests and spatial uncertainty were deeply intertwined, measurement became part of the broader moral and social order of mining.

Seen from this angle, one of the book's most valuable achievements is to make trust visible as an achievement of procedure, documentation, and institutional judgment. The

underground became knowable through the coordination of instruments, maps, manuscripts, testimony, and administrative judgment. It became credible through procedures that connected measurement to testimony, inscription, visualization, and administrative judgment. Morel's history of subterranean geometry is therefore also a history of how technical evidence became acceptable within a community.

The strengths of *Underground Mathematics* also suggest a few further questions. The first concerns technical language. Morel repeatedly shows that subterranean geometry depended on specialized terms, practitioners' vocabularies, and forms of communication that were not easily accessible to outsiders. These linguistic practices mattered because they shaped who could learn, explain, authorize, and challenge surveying practices. Yet the book might have developed this dimension more explicitly. A more explicit account of technical vocabulary would have strengthened the connection between language and authority in the history Morel reconstructs.

This is less a criticism of omission than a response to the richness of the materials Morel presents. Morel gives readers many materials through which language can be seen at work: the naming of roles and procedures, the translation of craft practice into written instruction, the tension between learned terminology and practitioners' speech, and the movement from local expression to administrative record. These materials invite more sustained reflection on how technical words stabilized practice and authority. In a culture where hidden space had to be measured, described, copied, mapped, and certified, language was part of the practical apparatus through which knowledge became usable.

A second question concerns visual mediation. Morel's treatment of mining maps is one of the strongest parts of the book, although the visual evidence is not always easy for the reader to examine. Since the argument depends on plans, sections, diagrams, and cartographic detail, larger reproductions or more extensive visual commentary would have helped readers follow the technical work performed by these images. This does not weaken Morel's analysis; it reflects the difficulty of writing a history in which images are themselves central to the argument.

A third question concerns the conceptual and geographical boundaries of subterranean geometry. Morel's decision to focus on the mining regions of the Holy Roman Empire gives the book its depth and coherence. At the same time, the category of subterranean geometry remains somewhat difficult to delimit as a historical object. Was it primarily a German artisanal tradition rooted in *Markscheidekunst*, or can it also describe a broader family of quantitative mining practices across regions? Morel's study does not need to answer this question exhaustively, but the issue matters because it affects how we understand the portability of technical vocabularies, procedures, and evidentiary forms beyond the settings in which they acquired authority.

These questions are modest in comparison with the book's achievement. They arise because Morel has recovered a technical culture rich enough to support further inquiry. A book that reduced subterranean geometry to calculation alone would not raise such questions. *Underground Mathematics* raises them because it shows measurement, language, image, and record working together. Its remaining open questions therefore point less to weakness than to the generative character of the study. Morel has made a

once-obscure mathematical practice visible. The book also shows why its vocabularies, images, procedures, and boundaries deserve further attention.

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