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THE TRANSFER OF INFORMATION AS A PRINCIPLE OF MUSICAL CREATION: BETWEEN DATA AND MEANING (I)

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SUMMARY. This study explores how information transfer shapes contemporary musical creation. It examines the dynamic relationship between composer, performer, and audience, emphasizing that music is not merely a technical process but a continuous exchange of meaning. The study highlights Gustav Mahler's Symphony No. 1 and Rautavaara's *Cantus Arcticus* as examples of reinterpretation and contextual transformation. It introduces the Informational Transfer Device (ITD) concept, illustrating how musical ideas evolve through multiple agents. The paper also addresses the ontological role of information in music, drawing on Aristotelian causality and modern information theory. Furthermore, it explores perception, interpretation, and cultural context in musical reception, comparing these mechanisms to the Kuleshov Effect in cinematography. Finally, the study offers practical applications for composers and performers, demonstrating how informational transfer principles can enhance expressivity, audience engagement, and interdisciplinary artistic collaborations.

Keywords: Informational Transfer, Musical Communication, Composer - Performer - Audience Relationship, Interpretation and Meaning, Informational Transfer Device (ITD), Contextual Recontextualization

Introduction

The transfer of information represents a fundamental component in contemporary musical creation, serving as a process that mediates the relationship between the composer, performer, and audience. This phenomenon

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explains how music is created and perceived, emphasizing the flow of data and its transformation into a meaningful artistic act.

In an interconnected world where informational flows dominate all fields, music is at a critical point of reevaluation. The transfer of information is no longer merely a technical process but rather a foundation for emotional and intellectual communication between the creator and the recipient. This concept extends beyond the technological sphere, addressing not only how information is conveyed through musical notes but also how it is perceived, interpreted, and contextualized by the audience.

A key aspect of informational transfer in music is its intrinsic complexity: it does not involve merely a unidirectional flow from sender to receiver but also a feedback process, in which the audience itself influences musical creation. Consequently, the relationship between composer, performer, and audience becomes dynamic, based on continuous exchanges of ideas and emotions.

For example, the works of Gustav Mahler, though conceived within a specific cultural framework, are reinterpreted differently depending on historical context and contemporary audience sensitivities. A notable example is the third movement of *Symphony No. 1 in D major*, where Mahler reimagines the children's song *Frère Jacques* within the structure of a funeral march. Jeremy Barham describes the structural and thematic significance of the third movement of Mahler's *First Symphony*, emphasizing its relationship to the *Lieder eines fahrenden Gesellen* cycle:

The so-called 'funeral march,' the virtual slow movement, is also in a tripartite form. Mahler's symbolically pregnant, much-discussed use of the Brüder Jakob canon in the outer sections notwithstanding, the musico-poetic masterstroke of the movement (if not of the entire First Symphony) is the very literal derivation of the middle section from the second part of *Die zwei blauen Augen von meinem Schatz*, the closing song of the *Lieder eines fahrenden Gesellen*.

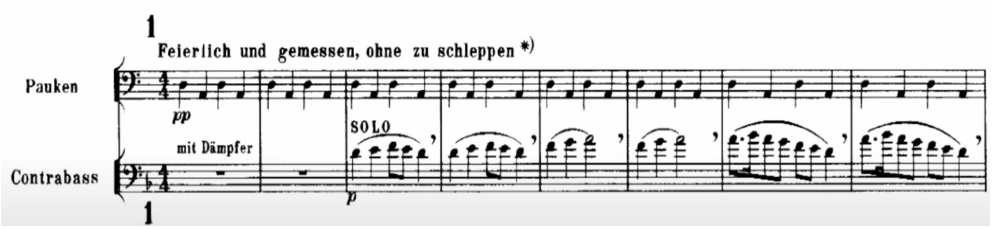
Unlike in the case of the first movement, here the borrowed musical material is not 'rested' from its context in the song cycle. Rather, the 'song without words' character of this episode and its structural placement explicate and resolve the ambiguity that was created at the end of the song cycle. There, the implied finality of the protagonist's escape from reality through sleep (or 'is this,' as Eichendorff/Strauss mused in Im Abendrot some sixty years later, 'perhaps, death?') seemed to have been contradicted by the cadential six-four chords.

Now, in the third movement of the First Symphony, the return of the 'funeral march' unambiguously signals a return to a painful but concrete reality.[2]

[2] Barham, Jeremy. *The Cambridge Companion to Mahler.* Cambridge University Press, 2007, p. 87.

Mahler's compositional and dramaturgical choices transform this familiar melody into an entirely new expression, which can be perceived as ironic, tragic, or absurd, depending on the listener's perspective. The audience of Mahler's time might have interpreted this work as a subtle form of social critique, whereas contemporary listeners may resonate with its universal dimension, reflecting on themes of alienation or melancholy.

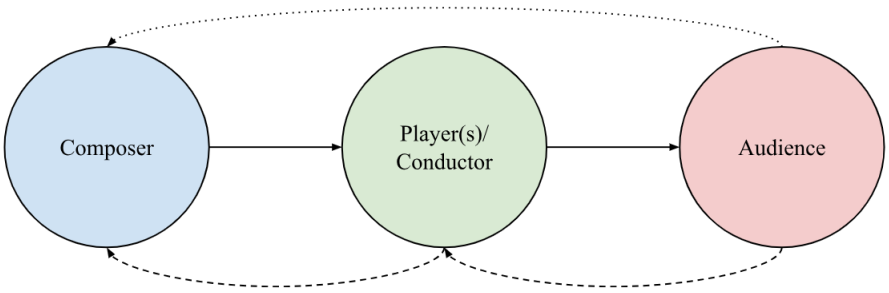
E. g. 1



Gustav Mahler, Symphony No. 1, third movement, m. 1-8

This interdependence highlights the significance of meaning as an essential dimension of informational transfer. While raw data can be transmitted with precision, a fundamental quality of music lies in the meaning attributed by listeners, who bring their own experiences and cultural backgrounds to the act of reception. Thus, although information can be defined in terms of quantifiable data, the meaning derived from this information involves interpretation, "contamination," experience, and contextualization, making informational transfer a central theme for contemporary musicians.

Figure 1



The bidirectional flow of musical information between the composer, performer/conductor, and audience. Solid arrows show the primary transmission of music, while dotted arrows represent feedback loops, emphasizing the interactive nature of musical communication.

Music is not merely an act of transmitting information from the composer to the performer and, subsequently, to the audience, but rather a dynamic process in which meaning is continuously constructed, modified, and recontextualized, as illustrated in the diagram above. The transfer of information in music involves a **complex relationship** between the composer, performer (or conductor), and audience, with each of these factors actively contributing to the shaping of the musical experience.

Thus, the composer initiates the flow of information through notation, content, expressive intent, and the formal construction of the work. The performer receives this information and transforms it—not only through technical execution but also through expressive choices that influence the audience's perception. In turn, the audience, with its own cultural and emotional background, becomes an active agent in defining the significance of the music. Moreover, this process generates a **feedback loop**, in which the performer and composer are influenced by the audience's reactions, and successive reinterpretations of a musical work may lead to new understandings and even modifications of the original score, particularly in the case of contemporary music.

This phenomenon can also be observed in *Cantus Arcticus* by Rautavaara, where the process of recontextualization is not limited to the mere inclusion of recorded bird songs but extends into a complex dialogue between these recordings and the orchestra. The composer not only integrates raw sonic material from nature but also reinterprets it through orchestration and the use of extended techniques, thereby endowing it with a new expressive dimension. Furthermore, the act of interpretation adds an additional layer of variability, influencing the final perception of the work through choices in tempo, articulation, and nuance made by the conductor and instrumentalists.

This interaction between sender, receiver, and musical communication media highlights the fact that music is not a fixed message but rather **a continuous construction of meanings,** in which information is inevitably **"contaminated"** throughout the processes of **interpretation** and **reception**. This perspective transforms the transfer of information into a fundamental principle of contemporary musical creation.

It can be asserted that the processes of musical creation and reception give rise to a phenomenon of **emergent meaning**—a quality that may distinguish music from non-music. This emergence results from a complex interaction between sender, receiver, and environment, generating something greater than the sum of its parts. However, the phenomenon largely remains a "black box," a mystery whose full understanding could lead to extraordinary technological advancements, as well as unsettling implications.

In this context, one may recall the device used by The Mule in Asimov's *Foundation*, specifically his instrument, the **Visi-Sonor**, which is capable of

manipulating human emotions and perceptions through a combination of sound and holographic images. This device amplifies the power of emotional influence, transforming simple sensory data into overwhelming experiences for the receiver. Similarly, the exhaustive understanding of emergent meaning in music may be compared to the way in which the Visi-Sonor transcends the technical nature of sound and image, generating a **total, awe-inspiring, and infinitely personalized reaction**.

Deciphering the mechanisms through which emergent meaning arises in music could pave the way for new forms of artistic interaction, radically transforming the way we understand and experience art.

Information: The Ontological Basis of Musical Creation

Etymologically, the term “information” derives from the Latin *informare*, meaning “to give form” or “to shape.” This notion has implied, since antiquity, a dynamic interaction between content and form, suggesting that any act of transmitting information involves a process of organization and transformation. Thus, information is not merely a set of raw data but an entity shaped by the environment and context in which it is generated.

The role of information in music can be related to classical philosophical frameworks, such as those developed by Aristotle, which describe four fundamental causes — **material, formal, operative, and final** — that are also applicable to musical art. According to this model, a musical work can be analyzed as follows:

Material Cause: The fundamental elements of a musical work include sound, timbre, rhythm, and any recordings or sonic objects used. For instance, in *Cantus Arcticus* by Einojuhani Rautavaara, the composer integrates recordings of Arctic birds as a unique raw material, blending them with the orchestra to create an unprecedented sonic atmosphere.

Formal Cause: Structure and form provide coherence to music. A classic example is the sonata form, with its exposition, development, and recapitulation sections, which organize thematic ideas into logical progression. In contrast, John Cage employs aleatory techniques, abandoning traditional formalism and exploring new ways of generating and perceiving form.

Operative Cause: The performer or composer serves as the driving force that brings music to life through the processes of creation and re-creation. In jazz performance, for instance, the artist improvises in real time, generating an

original musical discourse, whereas in the case of Stravinsky, meticulous control and orchestral precision reflect an approach that is both intentional and highly structured.

Final Cause: The purpose of music can be aesthetic, emotional, or intellectual. While Beethoven's symphonies aim to move and elevate the listener's spirit, the avant-garde works of Pierre Boulez often focus on the conceptual exploration of sound and the internal relationships within musical discourse. This dimension of the final cause is essential to understanding music not merely as a static object but as an active process that influences and transforms the listener's perception. As Boris Hennig emphasizes, "Formal causes are causes of things, final causes are causes of things insofar as they act and change. [...] Therefore, Aristotle often simply attributes final causes to things, where he could also speak of final causes of processes in which such things are typically involved."[3]

Thus, music becomes a vehicle for the transfer of information in various forms—from the composer to the performer and then to the audience. This perspective is essential for understanding how artistic ideas are transmitted and reinterpreted. For instance, Aristotle attributed an intrinsic nature to sounds, suggesting that their arrangement could reveal universal truths.

On the other hand, the modern perspective expands this view, emphasizing that information is a fundamental element of reality—a binding force that connects the artist and the audience through a continuous flow of emotions and ideas. As Christoph Adami explains, "Simply put, information is that which allows you (who is in possession of that information) to make predictions with accuracy better than chance. (…) Entropy (…) is just a word (…) to quantify how much is not known"[4]

In this sense, information is no longer perceived merely as a collection of data but as an active process of meaning-making that evolves over time.

Contemporary music, in particular, explores more diverse forms of informational transfer, such as the use of technology, multimedia interactions, or the incorporation of extramusical elements. These approaches not only expand the scope of music but also enhance its experiential dimension, creating new possibilities for artistic expression.

Therefore, music functions as a means of organizing and interpreting information, serving not only as a vehicle for emotions but also as a platform for the creation and exploration of fundamental meanings.

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[3] Hennig, Boris. *Aristotle's Four Causes.* Peter Lang, 2019, p. 45.

[4] Adami, Christoph. "What Is Information?" *The Royal Society Publishing, Philosophical Transactions of the Royal Society A*, vol. 374, no. 2063, 2017, http://rsta.royalsocietypublishing.org/content/374/2063/20150230. [Accessed 22 May 2017.]

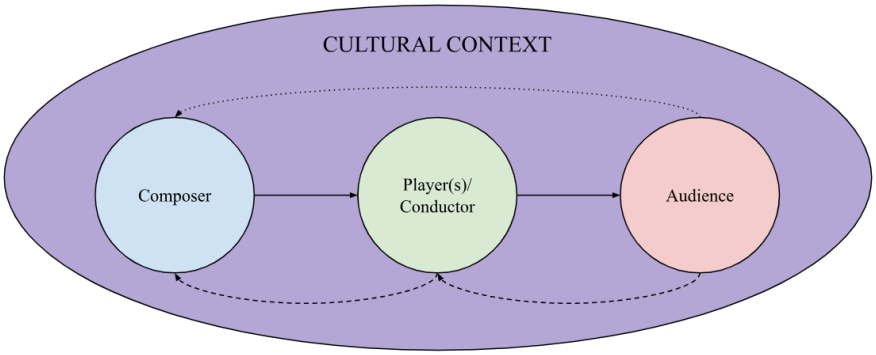
Characteristics of Informational Transfer in Music

Informational transfer in music is a complex process that relies on the interaction between the **transmitter** (composer or performer), the **receiver** (audience), and the **communication medium** (score, sound, or cultural context). This process does not follow a strictly linear trajectory but is instead shaped by a multitude of factors, including cultural influences, perceptual variations, and emotional responses. These elements actively contribute to the reinterpretation and recontextualization of musical meaning, ensuring that each performance and listening experience is unique.

Furthermore, the transfer of information in music is not a passive exchange but a dynamic interaction in which meaning is continuously constructed, modified, and adapted. Performers introduce their own expressive nuances, audiences bring their personal and cultural perspectives, and historical and technological developments further influence musical perception. As a result, the final meaning of a musical work is never fixed but remains open to transformation, making music a living and evolving form of communication.

Context and Its Influence on Musical Perception

Figure 2



The figure illustrates the bidirectional flow of musical information between the composer, performer/conductor, and audience, all operating within a cultural context. This context influences the creation, interpretation, and reception of music, shaping its meaning and impact.

An essential element of informational transfer in music is **context**, which determines how a musical work is perceived and interpreted. For example, *The Pines of Rome* by Ottorino Respighi evokes different imagery for an Italian listener, who is familiar with its cultural references, compared to a foreign audience, which may perceive it merely as an abstract sonic description.

This phenomenon is comparable to the **Kuleshov Effect** in cinematography, which demonstrates that the interpretation of an image depends on the context in which it is placed. Similarly, a musical fragment is not perceived in isolation but in relation to what precedes or follows it. For instance, a film scene accompanied by lyrical music may suggest romance, whereas the same scene, set against tense and dissonant sounds, can evoke a sense of danger.

Figure 3

The figure represents the first stage of the Kuleshov effect experiment, illustrating how the same neutral facial expression (right) can be interpreted differently based on the accompanying image (left). In this case, the image of food suggests that the man is experiencing hunger or anticipation, demonstrating how context influences perception and emotional attribution.

And if placed alongside the image of a withered leaf falling from a tree, the same expression may appear overwhelmed by melancholy, evoking the fragility of the passage of time and the inevitability of endings:

Figure 4

The figure represents the second stage of the Kuleshov effect experiment, where the same neutral facial expression is now paired with the image of a withered leaf falling from a tree. In this context, the expression may convey melancholy or contemplation, emphasizing themes of impermanence, nostalgia, and the passage of time. This shift in perception highlights how meaning is shaped by association, reinforcing the subjective nature of emotional interpretation.

This principle also applies to music, where sound is not interpreted in absolute terms but in relation to its surrounding context. A musical fragment may evoke a sense of calm or tension depending on what precedes it. In cinematography, the **editor's effect** is frequently employed by manipulating the soundtrack to alter the perception of a scene.

For instance, consider a scene in which a man walks down a dark street toward a woman's house. If this sequence is accompanied by **elegant and relaxed swing music**, viewers may interpret the action as a romantic prelude. In contrast, if the same scene is set against the **tense chords from *Psycho* by Bernard Herrmann**, it may instead signal the anticipation of a criminal act.

The Listener's Role in Constructing Meaning

The audience is not a passive receiver but actively contributes to the interpretation of music through the lens of personal experiences. A relevant example is the experiment conducted by Gene Weingarten in 2007, in which violinist Joshua Bell performed incognito in a subway station, and the majority of passersby failed to recognize him. This experiment demonstrates that the perception of music is influenced not only by the quality of performance but also by factors such as audience expectations, the environment, and the performer's status.

Another key aspect of informational transfer is the influence of a work's title. For example, if listeners are informed about the significance of Mahler's Symphony No. 1, which includes a minor-key variation of *Frère Jacques*, they may interpret the passage as tragic irony. Without this context, the same sonorities may be perceived as purely abstract.

Informational Transfer as a Dialectical Process

Informational transfer is not unidirectional but rather a dialectical process in which the composer creates the work based on their intentions (thesis), while the audience interprets it through the lens of their own experiences (antithesis), ultimately generating a unique final meaning for each listener (synthesis).

This dynamic is particularly evident in works such as *Black Angels* by George Crumb, where music functions not merely as a sonic vehicle but also as a commentary on the historical events that inspired it.

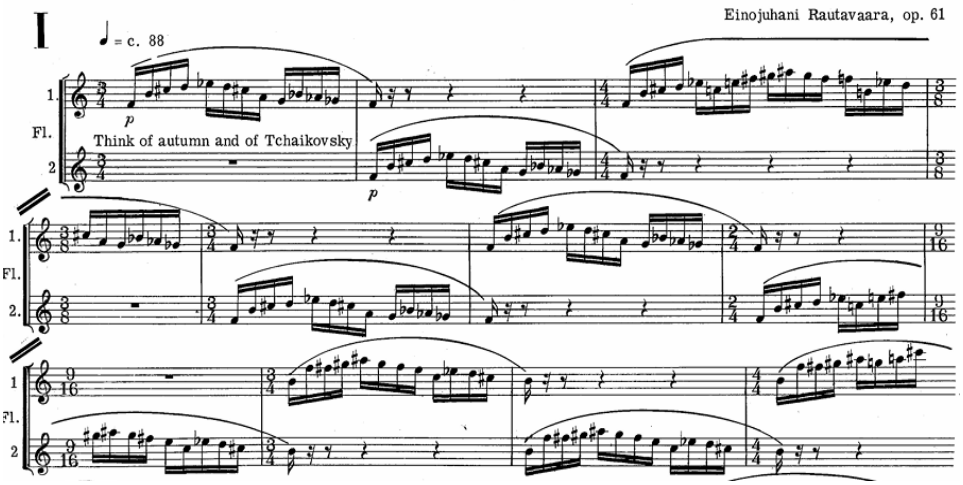
This interaction becomes even more complex when music intersects with other forms of art, such as film. A film's soundtrack is not merely an accompaniment but profoundly shapes the perception of the visual narrative. For example, the sharp, dissonant sounds in *Psycho* by Bernard Herrmann intensify the terror of a suspenseful scene, transforming the viewer's experience.

A relevant example of the interdependence between music and visual elements is *Cantus Arcticus* by Einojuhani Rautavaara. This work demonstrates that informational transfer goes beyond the mere technical reproduction of data, evolving into a deeply creative and meaning-generating process. By combining natural sounds with orchestral language, Rautavaara creates a bridge between nature and culture, offering the listener a syncretic experience.

As seen in the following example, Rautavaara uses every available resource, employing quasi-relative notation and extended techniques to faithfully replicate birdsong through orchestral instruments. The work begins with a fascinating interplay between two flutes, seemingly interweaving the hexatonic mode (Messiaen Mode I), creating the impression of a single, continuous instrument, devoid of breath.

This airy texture is accompanied by a written instruction from the composer: *"Think of autumn and of Tchaikovsky."* This suggestion amplifies the importance of informational contamination, as the composer believed that such notation would influence musical interpretation, forming a chain of meaning construction: composer (notation) → performer (following that notation) → audience (perceiving the interpreted music through the filter added by the composer).

E.g. 2

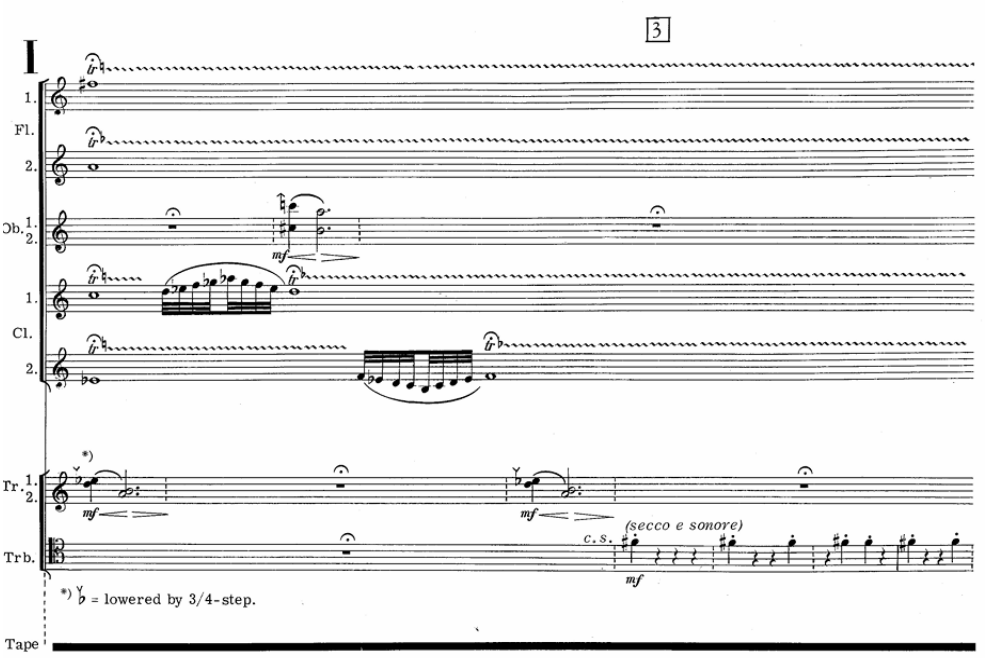


Einojuhani Rautavaara, Cantus Arcticus, m. 1-11.

After this initial section, oboes and trumpets are introduced, performing a musical signal that incorporates microtones, adding an extremely organic nuance to the orchestral passage (e.g. 3). The muted trombone appears to mimic the “quacking” of another type of bird, evoking an authentic sonic landscape. At the same time, the clarinet picks up a motif from the opening pages of the work, this time in the octatonic mode (Messiaen Mode II), establishing a strong thematic connection.

This approach, in which orchestral instruments become extensions of natural sounds, perfectly exemplifies how *Cantus Arcticus* blends nature and culture. Rautavaara moves beyond mere imitation of birdsong, transforming the orchestra into a medium that amplifies and poeticizes these sounds. The result is an immersive artistic experience that invites the audience to reflect and creates the sensation of being transported into a sublime natural landscape.

E.g. 3



Einojuhani Rautavaara, Cantus Arcticus, page 5, rehearsal mark 3.

This work demonstrates that informational transfer transcends the mere technical transmission of data, evolving into a deeply creative and meaning-generating process. It involves careful selection, reinterpretation through the lens of artistic sensitivity, and integration into a new context capable of transforming raw elements into complex aesthetic experiences. By combining natural sounds with orchestral language, Rautavaara creates a bridge between nature and culture, offering the listener a syncretic experience. Furthermore, this fusion can also be understood as a cultural response to the aesthetic trends of the 1960s and 1970s, a period dominated by avant-garde movements often characterized by abstraction and a lack of connection to nature. In this context, *Cantus Arcticus* challenges prevailing norms and opens the way for dialogue between musical styles and extramusical influences.

Informational transfer in music is a dynamic process, shaped by context, listener perception, and the relationship between various artistic elements. The meaning of a musical work is not fixed but rather the result of a complex

interaction in which the composer, performer, and audience collectively contribute to its final interpretation. This interdependence demonstrates that music is not merely an informational flow but a living phenomenon, continuously evolving through reception and reinterpretation.

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