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MUSIC AND THE ABSTRACT BRAIN

Abstract:
The beauty of music and the pleasure it gives us are both extremely pervasive across cultures and very difficult to explain. But there are reasons to believe that music and emotion are neurally interrelated through gesture and imaginary body schemas. Musical perception and performance may be at the origin of human language and symbolization; the esthetics of singing, playing and dancing creates symbolic meaning, which creates abstract thinking. The pleasure is preserved all the way 'up'.

Key words: Mental spaces, Rhythm, Beauty, Neuroesthetics

Music is a Kunstart, in German as in Danish, literally: a 'species of art'. This biological analogy – a 'species' of art is imaged as a living being – may have inspired our general History of Art. The underlying intuition about these beaux arts, the 'beautiful arts', may be the conceptual metaphor that BEAUTY IS LIFE; the kinds or types of aesthetic expression, thus conceptualized as animal species, "Arten", are maybe also seen as inscribed in a sort of genetic evolution, but basically, there is a conceptual zero-to-positive grading scale, spanning from 'not beautiful' = 'not alive', to 'very beautiful' = 'very much alive'.

Beauty is not only an ideological term or an outdated norm, but is a real cross-cultural and transhistorical phenomenon[1], an experiential fact about the human mind[2], the one that motivates the genre of objective phenomenology we call art criticism. Art really conveys beauty. Art is in fact 'good' when beauti-ful, and bad when not[3]. As mentioned, good art is praised for being metaphorically 'alive', and bad art is scorned for being 'dead'. Furthermore, it is a characteristic of the experience of art that this bio-critical evaluation of its objective source, the work of art, is a part of its perception, rather than an estimation by external normative parameters. There is an aesthetic perception, an Einstellung (a mental

[1] Beauty is experienced as related to art, but also to nature (landscapes, etc.) and to love (the beloved).
[2] The beauty of the beautiful is in principle the same experiential quality whatever be the culturally variable conditions under which it is experienced.
[3] Ugly is not the semantic opposite of beautiful; so, a work can be ugly and good art.

attitude) which in this and other respects differs from a non-aesthetic perception (of the same object), where there is no such inherent critical evaluation. The evaluation of art therefore does not mainly depend on external, circumstantial criteria[4], as some modernist schools inspired by Marcel Duchamp have claimed, but is primarily determined by the specific internal content of an aesthetic perception of art[5]. How the specific determination works is not clear to critics, though; and critics do not need to know it in order to judge perfectly well[6]. But one of the tasks of neuro-aesthetic research will be to elucidate this issue. The determination might of course work differently in different sense modalities; so, musical beauty does not have to depend on exactly the same neural processes as, say, pictorial beauty. But we still expect to see some important inter-aesthetic correlations. So, much of what I have to say about music also addresses the study of the other 'Kunstarten'.

In history of art, it is non uncommon to distinguish the spatial arts (architecture, sculpture, painting…), which create material objects, and the temporal arts (music, dance, poetry and the narrative genres: drama, fiction, film, video…), which create immaterial objects. Their respective histories do not always unfold in parallel; but their anthropology seems to be much the same. So, whether material or immaterial, these objects, the artefacts we call works of art (Kunstwerke), tend to attract and affect us in comparable ways, namely either as means of celebration of culturally important events or as 'self-celebrating' things, as activities important in themselves. So, music can hail a king, animate a military parade, accompany a declaration of love, or be played at concerts and, as chamber music, in intimacy, for its own sake. All of our 'species' of art use expressive signs that already serve evident cultural purposes as well as that of creating celebrative energy or pure beauty[7]; the arts are indeed often functional conveyors of pragmatic information, or give performative force to events of communal interest, at the same time as they are sources of aesthetic pleasure. But

[4] Institutional interest may enhance the aesthetic value attributed to a work of art; this effect appears to be caused by the increased attention shown to the work: the perceiver's attention is then heightened by the attention to it paid by other people.
[5] The Duchampian schools would call this view of things fundamentalist.
[6] An analogy to language: we do not need to study grammar in order to be able to speak our first language.

works of art always call attention to their own making, as to a manifestation of what artists will call pure form, the structural organization of the expression as such, as important in itself, and these objects display an 'auto-referential' insistence that makes them paradoxically be signs of themselves; this 'formalism' of art as such is another feature that makes aesthetic perception different from pragmatic perception, and perhaps the most important feature. One of the tasks of neuro-aesthetics will be to find the mechanisms underlying this variation in perception from pragmatic to aesthetic and formal.

As Susanne K. Langer[8] suggested, the aesthetic experience of form and the paradoxical feeling of the object being 'alive' in good works of art may be interrelated and cognitively constitutive. Artfulness may 'animate' the object and let us experience it as if it were a sort of autonomous animal, equipped with an autonomous consciousness, with mind and intentionality. As if it were an auto-referential biological structure, in fact. This strange aesthetic feeling is extremely strong in experiences of music. Music is said to 'breathe'.

If architecture presides the spatial arts, music probably presides the temporal arts in human evolution, all the way from the Neolithic to the historical cultures of Cro-Magnon civilization. Architecture[9] and music are both primary. We must build, and we must 'sound'. Furthermore, the optical and the acoustic aspects of our creations are intimately related; they apparently integrate whenever and wherever we perform a socially significant act: our habitats must resound, and our musical displays must fill our spaces and 'take place'.

Our embodied minds connect to each other in optico-acoustic spaces, where the gestures of our bodies seek to attune to each other. For our minds to obtain intersubjective attunement, establish communicative contact in time and space, and to produce or perceive art and formal structures, are perhaps one and the same. In that case, Beauty may by evolutionary and cognitive definition be the special quality ascribed to those phenomena, in particular cultural objects or performances that make human minds attune. We say, e. g.: "This music is

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[7] Beauty provides authority, it blesses and magnifies, and thus contributes to the validation of social or personal acts.

[8] S. K. Langer, Mind: an Essay on Human Feeling, Vol. 1-3, Johns Hopkins, Baltimore 1967, 1972, 1982; and Feeling and Form, New York 1953.

[9] Note that painting refers to architecture (cf. e.g. Urbino's La città ideale) and that scuplture presupposes it.

beautiful…" (instead of: "I like it"). The aesthetic judgment is grammatically impersonal, and in this Kantian sense, Beauty is represented as objectively given, probably because this 'feeling' when present is perceived as being shared by an indefinite number of minds as something that attunes them.

Accordingly, music (along with architecture) appears necessarily in the behavior of our species in relation to prominent elementary fields of shared activity in all societies, such as Work, Love, and Worship[10]: work songs, love songs, and hymns. Music and architecture are no doubt the two most important integrative semiotic factors of social life, besides language. But language would probably never work without them.

Brains specialize cognitively for space and for language, but also for music. Both are bodily grounded. If we accept to approach music through the classical triad: rhythm, melody, harmony, we might consider these three acoustic substructures as naturally grounded in three corresponding ways.

Firstly, musical rhythms involving beats performed in recursive numerical series (called bars) facilitate muscular motor coordination in collective (multi-body) doings, e. g. of the sorts mentioned (Work, Love, Worship), and typically those involving locomotion (legs and posture); people count and move together.

Secondly, tonal sounds arranged in sequences of pitch variations, also called melodic lines, help us coordinate gestures, as in rituals and communicative interaction, typically those involving movement of hands and arms; people sing or chant and gesticulate together.

Thirdly, maintained tonal clusters containing pitch intervals whose interfering formants produce consonance and dissonance, also called harmonic clusters, or chords, are directly related to our vocal and facial expressions of mood and empathic disposition, hence the double meaning of German 'Stimmung' (mood, tuning). People purr, hum, sigh, moan, groan, grunt or screech, scream, yell, bawl, shout, squall, squeal etc. at each other and their faces configurate accordingly, when they mean to let each other know what their mood and the shared situation are. This variation is even most often automatic

[10] But also in more complex domains like warfare and jurisdiction.

and hardly needs the subject's intervention, unless it is repeated, simulated, theatricalized, or quoted.

Music addresses our body in these remarkably concrete and direct ways, when heard. It might also be reported that when played, music appears to emanate from the body of the orchestra or the musician, and thus that it constitutes a significant metonymy for an embodied person, the one that the musicians take on as a role while playing, or the very person that the musician is[11]. We know from cognitive semantics, and as well from classical rhetoric, that metonymic representations of things, and in particular of individuals, are perceived as far more pithy than their referents, and that if perceived as representative of a person, they are more personalizing and even more 'alive' than the person herself: they are the person's signature. This particular authenticity-making phenomenon of metonymy and metonymic compression of personhood may explain the Langer-effect of vitalism in form. A style is a signature of (numerical) identity.

As to the corresponding activation in the brains of listeners and musicians, the processing[12] of tonal hearing and thinking appears to happen in specialized neurons in the superior temporal and some frontal regions of the cortex, particularly in the right side, but recent scanning studies (PET and fMRI) by R. Zatorre and his group show additional bilateral activity in occipital areas normally involved in visual processing, despite the absence of visual input[13]. Also parts of motor cortex are activated. And paralimbic areas that are active in emotional processing are shown to be involved in the evaluative aspects of musical experience.

This suggests that the auditory processing in music is integrated with spatio-visual imagery as well as with something like imaginary motion or gesture, and imaginary emotion. There is (in the referred experimental situations) only an acoustic input, but it triggers in the listener's mind a

[11] So 'playing' connects the musical and the theatrical meaning of the word.
[12] Cf. R. Zatorre et al. (ed.), The Biological Foundations of Music, 2001, The New York Academy of Sciences, Vol. 930.

multimodal imaginary activity implying scenarios in time and space, landscapes and architectural sites, possibly with persons that move, gesticulate, and behave emotionally – virtual scenes of embodied intersubjectivity. Music thus appears, as suggested by C. Trevarthen[14], to guide our minds into communitary attitudes, to prepare us for cooperation and expressive exchange based on empathy, shared attention and volition – attitudes that we 'share' with the imaginary musical gestalts themselves and then with each other. This imaginary aspect of musical hearing prepares our minds for a semantics of human interaction: our imaginary gestures and imaginary emotional states are 'meanings'. They possess imaginary reality, in the sense that what we experience when music is played, whether by others or by ourselves, is given immaterially but really, as a thought without a head, one that someone could have, including ourselves but independently of ourselves. "Sad" music heard by us when we are already sad makes us more impersonally and communally sad: it makes us feel like sharing that mood with others, and thus brings us comfort, even pleasure. Note that we easily ascribe emotional states to music; why this happens is a deep neuro-aesthetic question.

The neural 'imaginarization' of visual space-time, motion, gesture, and facial expressions, as associated with musical thinking and hearing, makes these meanings of tonal experiences appear to us as distinct from any individuals that might be factually having them here and now. As mentioned, they form autonomous gestalts or fantoms of possible people of whose presence they would be metonymies. In this sense we might in fact speak about musical disembodiment as a cognitively relevant phenomenon. I think it is probable that such a metonymically established disembodiment is an important prerequisite, if not the principal origin, of abstraction in general. Abstract (ownerless, just possible) ideas or forms are results of metonymic disembodiment; and they are then readily re-embodied in architecture and imagery in general, when music is performed and experienced collectively in socio-cultural locations, settings, and

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[13] R. Zatorre, D. W. Perry, C. A. Beckett, C. F. Westbury, A. C. Evans, "Functional anatomy of musical processing in listeners with absolute pitch and relative pitch", Proc. Natl. Acad. Sci. USA, Vol. 95, 1998 (http://www.zlab.mcgill.ca/docs/Zatorre_et_al_1998.pdf).

[14] Colwyn Trevarthen, "Musicality and the intrinsic motive pulse: evidence from human psychobiology and infant communication", Musicæ Scientiæ, Special Issue 1999-2000 (ESCOM European Society for the Cognitive Sciences of Music).

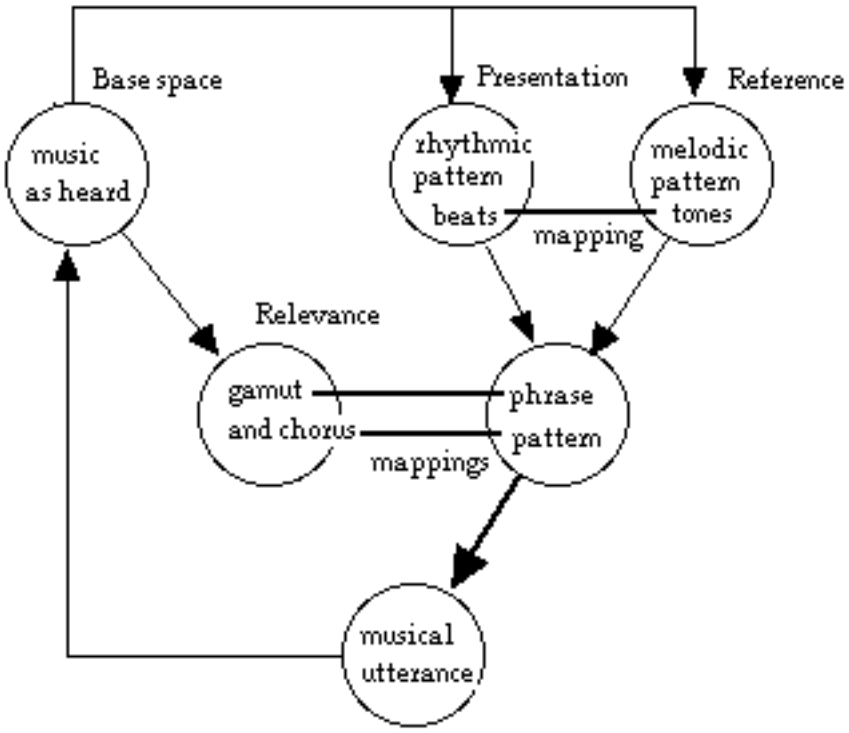
sites – as the ’meaning of’ that site. We then get the genius loci effect: the place is felt as having a ’spirit’ attached to it… Here, meaning migrates musically from our bodies into architectural receptors in space. Individual re-embodiment of meaning subsequently occurs, mainly in the shape of experiences of participation in the resounding collective activities that the architectural spaces hence determine and contain. This happens when we 'interpret' music. We then become fillers of the role of the 'genius' reembodied in the space of performance. By metonymy, our minds thus disembody and reembody, but the reembodiment has a generalized, communal gestalt, a principled activity or active principle in the place of the original source body; so, the resounding expression is now a sign of this principled thing, a filling of a role. It has become an abstract symbol. Symbolization[15] takes place.

Disembodiment:	BODY –> musical expression
Reembodiment:	ROLE performed as symbolic activity <–

Let me present a technical three-step version of this view of music and meaning in terms of conceptual integration and blending analysis, as developed by Mark Turner and Gilles Fauconnier, and then cast into a semiotic mould by the Danish school of cognitive semiotics (University of Aarhus). A conceptual blend has two mental spaces as inputs, one Presentational, the other Referential; the blend is stabilized by a binding process that ties and maps it to the schematic contents of a Relevance space.

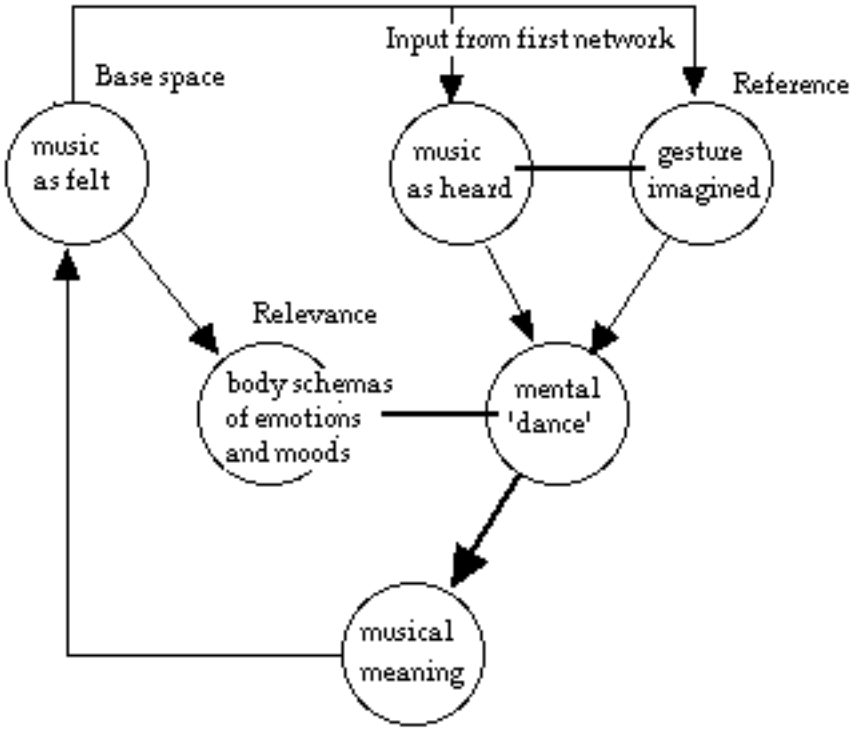
In a first, perhaps excessively simplified analysis, there is in the auditive perception of music – not of other, functional or pragmatic sounds – a first integration cycle, in which rhythmic forms (typically performed using some sort of percussion) and tonal forms (typically: voice or winds) blend into the melo-rhythmic phrase. Then this phrase blends with some harmonic pattern (a gamut and its possible chords, cf. string instruments) to form a complete 'utterance', which is projected to the ’Base space’ of ongoing experience.

[15] Symbolization is an effect of metonymy. This is a fundamental semiotic fact, I think.



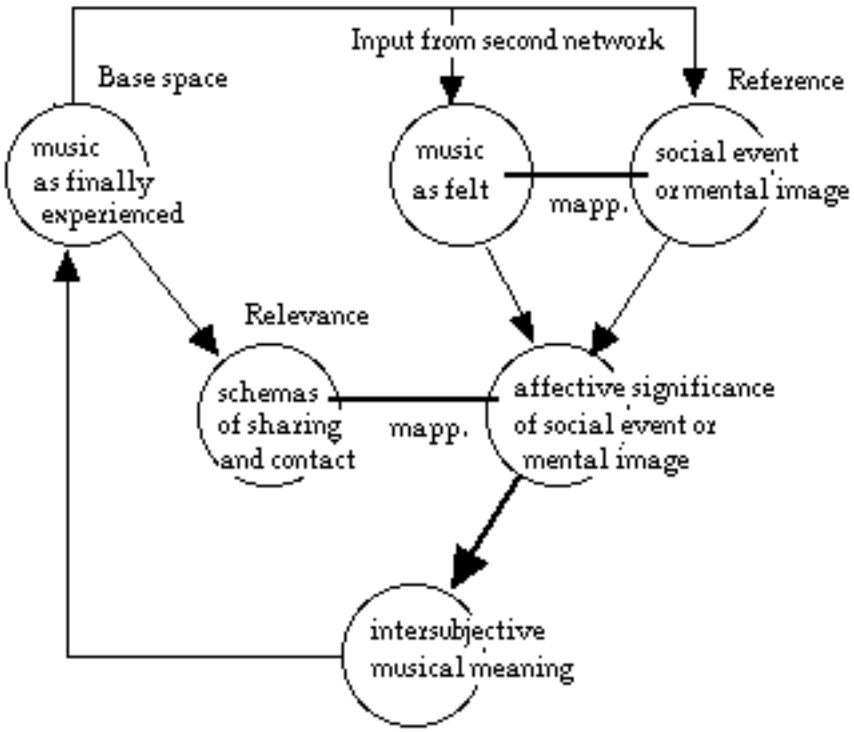
Beats in a rhythmic pattern are mentally mapped onto notes in a melodic pattern, and the 'note'beats' of the resulting phrase is mentally interpreted by a harmonic and temporal format (chorus) that make a series of phrases meaningful, so that they can form a musical utterance.

Then, in a second step, the integrated musical utterance, now as a Presentational Input, further integrates with the gestural and the emotional, semiotic components of imagination during the experience of hearing:



What we hear is mapped onto an imaginary process of possible gestures that our body could perform, if conditioned by affective states and its inherent schemas of motion and sound expressing such states.

Finally, in a third step, this result again integrates with the contextual social setting and its possibly celebrative circumstances, where the affective charge carried by 'music as felt' can be important for the actual attunement of the participants, their shared attention and subsequent memorization. The social setting is the workshop of abstraction:



At this stage of integration, the musical phenomenon, affectively invested, is mapped onto the occurring events in the experiencer's present situation – either social or mental (and instead of real events there could be a text or a fiction, as in film, whose meaning would then be accompanied by the music).

This third step has the same network design as the two first. Through the three steps, the series of integrations form a blending cascade. At the third level of this cascade, the perception of music has a referential content filled by the context of its performance. But as initially mentioned, sometimes there is no such definite situation of performance! Music is then just perceived as music in its own right. In these remarkable cases – originally marginal, I suppose, but systematically provided in modern cultures – where music is performed and enjoyed without an already significant 'resorbing' situation, the inherent reference space is simply left open. For most or all music practicians it is characterized by abstract figurations, often synaesthetic sensations, especially of colors linked to tonal entities, and existential thoughts. In critics and other specialized listener minds, it may be filled by poetic, philosophical or narrative discourse, or rather such discursive intuitions, sketches, and ideas. The best

description of the cognitive but non-conceptual state of mind created by forceful musical experiences of this auto-referential kind might be the tautological account: ”It means what it means”[16]. This tautology probably just states that such an impression-of-abstractness is being experienced. In the classical theoretical literature of aesthetics it was called the Sublime (das Erhabene). In this sense, beauty can be said to lead us to the Sublime, which is the Abstract as such If you will allow me another Kantian expression, it is also the realm of Freedom, in the sense that abstraction is the one operation which frees thought from the local necessities of life. Good art ’lives’ in the sense of an unimpeded embodiment: a feeling of ’possibility’. This is perhaps the ultimate sense and value of art. In music it is immediately accessible to us, and sometimes lets us take on the imaginary shape of baroque angels moving around in the universe on forceful wings of shining sound.

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[16] Cf. God’s tautology: SUM QUI SUM, I am who I am.