Music Dramaturgy and Human Reactions: Music as a Means for Communication

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Abstract. The main topic of this paper refers to how music communicates and to what it communicates, either considering or not the usage of modern technologies. Based on the categorisation of music dramaturgy proposed in one of his pasts articles [1][2], the author sets the main focus on what happens in the mind of listeners (perception) during a performance (and afterwards) of music rather than considering only the perspective of the creator (intention). Thus, the article not only connects the fields of neuroscience with that of semiotics, but also is a reflection from a philosophical perspective of how the dramaturgy of music affects the perception by arousing reactions (emotions and thoughts) in the audience.

Keywords: Dramaturgy of Music; Music semiotics; Neuroscience; Prototype Theory; Exemplar Theory; Multiple-Trace Memory model; Categorisation.

1 Introduction

The subject of music dramaturgy has been treated across time in different ways and from different perspectives; in the last two decades Landy and later Weale have performed a fundamental research in the field [3][4][5]. The research presented in this article, although related to Landy and Weale, focuses on music in a general and broader sense. Fundamentally, the research I have carried out so far [1][2] includes questions seeking for the clarification of, for example, how the relationship creator-listener works in musical situations or, what happens in the mind of the listener whilst perceiving a piece of music. The research presented herewith is therefore a further development of the classification of music dramaturgy presented in my article *Music and Technology: What Impact Does Technology Have on the Dramaturgy of Music?* [1]. Figure 1 summarises the complete typification of music dramaturgy proposed therein. For the current article though, the main subject focuses specifically on the relationship between music and human reactions, giving special attention to how the human brain reacts to musical stimuli.
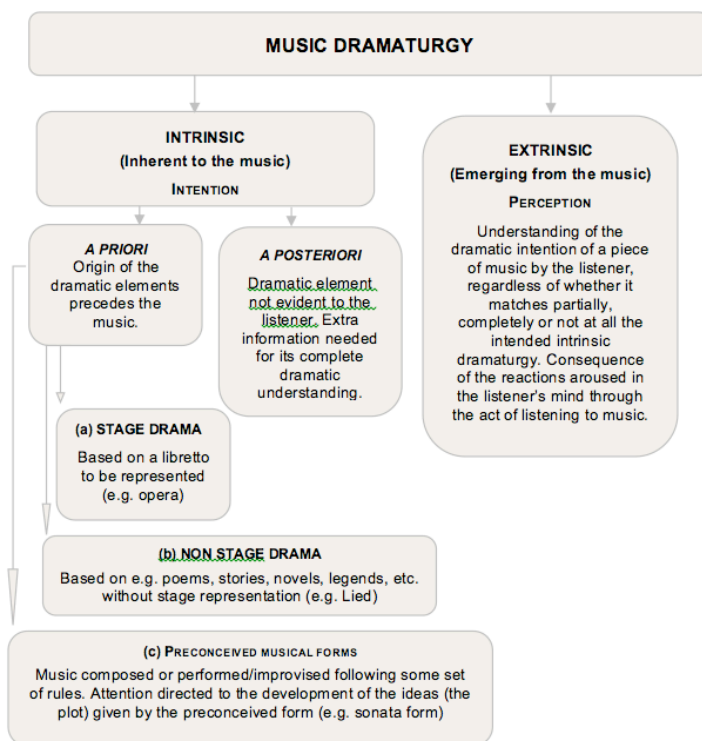
Fig. 1. Music dramaturgy: different types and subcategories.

2 Music as a Means for Communication: Musical Discourse and Human Reactions in a Musical Communication Chain

To begin with, it is important to define exactly what is meant with music and music dramaturgy in this context. Even though the concept of music has been defined and redefined across time, the following definition by Levitin is not only rather comprehensive and clear, but it also addresses my fundamental concerns as a composer, especially considering how human perception regards some sounds as musical or not:

> The difference between music and a random or disordered set of sounds has to do with the way these fundamental attributes combine, and the relations that form between them. When these basic elements combine and form relationships with one another in a meaningful way, they give rise to higher-order concepts such as meter, key, melody, and harmony. [6]

In [1], I have already defined the dramaturgy of music as:

> As we can see, the word 'dramaturgy' has its origin in the German word *Dramaturgie* and its roots can be found in the ancient Greek word *dramatourgia*. However, the main term to consider should be *drama*: its meaning is always related to the concepts of 'action' or 'event'. Aristotle, in chapter 3 of his *On the art of poetry*, describes drama as something 'being done'. The word dramaturgy implies the actual composition or

'arrangement into specific proportion or relation and especially into artistic form' as well as the knowledge of the rules for gathering these concepts onto a (normally) known and preconceived structure (originally, the Greek tragedy was meant hereby).

Ultimately, we can define the dramaturgy of music as the way in which the creator and the listener represent in their minds the flow of a musical occurrence (that is the development of one sonic-event coming from a previous one and leading to the next), which constitutes an entity (ontologically) that as such is unique in itself, as might also be its mental representation (psychologically); however, both cases of 'uniqueness' might not be most of the time quite the same, as we shall see later. The series of sounds organised according to the rules of each and every musical 'being' (the word 'being' is here used ontologically, meaning anything that can be said to *be* immanently, as not always might we refer to a composition when confronted to music-listening, mostly if we consider music from outside the western culture), are the events involving an 'interesting or intense conflict of forces', as seen above in one of the definitions of dramaturgy. And, as in the case of the original meaning of the word in ancient Greece, these forces do happen during a performance. The forces in place are the emotions/thoughts aroused by the sounds of the performance, which produce a mental representation of what is occurring in the piece of music: its emergent dramaturgy.

From this definition, we can infer, that the subject of human emotions is core to the field of music dramaturgy. Following the definition of music given above, the 'basic elements [that] combine and form relationships with one another in a meaningful way' are those which need to be communicated in a chain, so the next step is to present the communication process in a musical situation and all of the elements taking part in it. The following subsections give an explanation of the concepts of musical discourse, musical communication chain and human reactions.

2.1 Dramaturgy in the Musical Discourse: The Communication Process

Any imaginable type of music is capable of awaking in the listener reactions such as thoughts (i.e. mental representations of the sonic events and their subjective meaning) and emotions, all of which may or may not be in tune to the original intention of the creator of that particular music. Reception of music dramaturgy can only be possible if a communicative process is established. This process requires three elements for its existence: (a) actors involved in the communication process; (b) medium in which the dramaturgy will be carried; (c) human reactions.
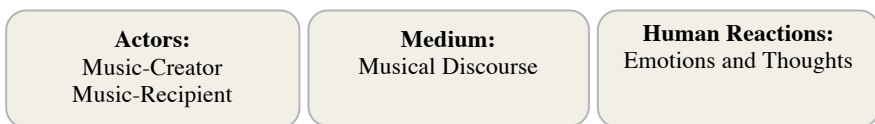
Actors: Music-Creator Music-Recipient	**Medium:** Musical Discourse	**Human Reactions:** Emotions and Thoughts

Fig. 2. Communication process in music: minimum elements required.

Hence, in order for music to be in a position to express something, a communicative process must be established. In this way the creator of a certain type of music (generally, but not exclusively, the composer), delivers through a process (the musical performance, meant here in a broad and generic way), a musical discourse containing the main intentions, which will be finally perceived by a human-recipient (generally, an audience of listeners). In this communication chain, the reception may or may not equal the original intention; moreover, the perception of the musical discourse can even result (as explained in [1]), in a rather opposite

understanding of the original intention conceived by the music-creator.

Whichever the response of listeners to music may be, this response is generally called *arousal* in psychology, which is defined as 'to rouse or stimulate to action or to psychological readiness for activity' [7].[1] According to this, the act of perception should produce in the listener diverse reactions, which can mainly be circumscribed to emotions and further thoughts or reflection of what has been listened to. Arousal is sometimes also referred to as activation [7].[2] A communication chain emerges from this concept as represented in Fig. 3:
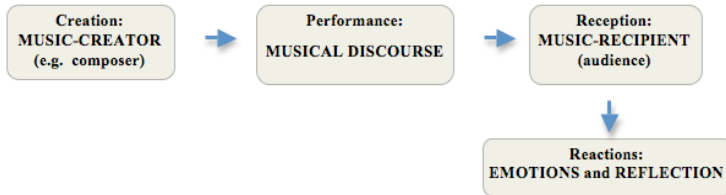

Fig. 3. Music's communication chain (first stage).

If the listener is not in a position to experience any reaction at all, this will imply, that either the event being listened to contained no message at all (i.e. there is no musical discourse present) or the listener is not in a position to understand the musical discourse as such. In the first case, the absence of arousal is due to an objective failure in the chain, as the object missing is outside the mind of the listener. In the second, on the other hand, the absence of arousal is due to a subjective failure in the chain, as the musical discourse exists, but cannot be understood by listeners due to diverse causes such as, for example, cultural background. This paragraph by Berio clarifies the matter further, mostly at the end:

> Music must be capable of educating people to discover and create relations between different elements (as Dante said in the Convivio, 'music is all relative'), and in doing that it speaks of the history of man and of his musical resources in all their acoustic, and expressive aspects. I'm interested by music that creates and develops relations between very distant points, and pursues a very wide transformational trajectory (....). The listener has to be aware that there are different ways of grasping the sense of that trajectory (....).[3]

If there is no arousal (a complete absence of any reaction), regardless of which of the two cases mentioned above is considered, the result will undoubtedly be a complete failure at the very core of the basic communication principle. If music should contain and express a certain type of dramaturgy [1], the first case should not be possible, as the musical discourse must be indeed present at every musical

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[1] Encyclopaedia Britannica Library - 2004: Arouse [7].

[2] Activation: also called arousal in psychology, the stimulation of the cerebral cortex into a state of general wakefulness or attention. Activation proceeds from various portions of the brain, but mainly from the reticular formation, the nerve network in the midbrain that monitors ingoing and outgoing sensory and motor impulses. Activation, however, is not the same as direct cortical stimulation by specific sense receptors, such as being awakened by noises. It involves, rather, a complex of impulses that are both internal and external to the body. (Encyclopaedia Britannica Library - 2004: Activation) [7]. See also Chapter 9 of [8], written by Simonton, which deals with the subject too.

[3] Luciano Berio: Two Interviews with Rossana Dalmonte and Balint Andras Varga [11].

manifestation, regardless of whether understood or not by the listener. The second case however, does happen and rather often; this is mostly due to diversity of the cultural backgrounds of different listener types. But, paraphrasing Berio, if people can be 'educated' in this sense, this case may only be circumstantial and not final.

Having said that, in the case in which the musical discourse is both present and understood as such by the listener, this implies the presence of a (musical) communication process and therefore, by reacting to these stimuli, listeners can connect an external musical discourse to their own interior and personal world (or *phaneron*, to use Peirce's terminology [9]) The next step will be their own understanding of the event. Landy, based on Nattiez adds the following:

> Nattiez has offered a useful definition of meaning for an individual apprehending that object, as soon as the individual places the object in relation of his [or her] lived experience-that is, in relation to a collection of other objects that belong to his or her experience of the world. [4]

The music-creator is who exposes the music work openly from the inside to the outside, as it is only outside the self that any work can be contemplated, regardless of whether by other listeners or by the him/herself.[4] As music is a temporal act *per se* (it happens *during* time), it can be inferred that a musical discourse cannot happen without the following two dimensions: space (the outside world) and time. The contemplation of a piece of music will happen inside each 'music-recipient' in a physical space during a determined lapse of time. It is through this contemplation that the dramaturgy of the musical discourse may become apparent. This implies that the recipient has to be acquainted with the type of musical discourse listened to, which brings us to the subjects of cultural background, expectation and mental contours[5]. As the brain adapts itself in a very early stage in life (as early as inside the womb), it stores information of the surrounding world in the long term memory, what helps later in life to recall well known contours (e.g. in music: harmony, melody, rhythm, etc.). This leads to expect due to previous knowledge similar results in new, never experienced before but yet similar musical contours. [6] The general cultural background of each individual will have similar results in how to imagine the music heard by relating to already learned contours. If the models or contours are known to the listener, the brain can predict and even be predisposed to understand the dramaturgy of a given music by comparing it with previous experiences. Cognitive science describes this as a mental schema: a framework within which the brain places (stores) standard situations, extracting those elements common to multiple experiences [6]. In music appreciation, familiarity (what creates the network of neurons in the brain forming the according mental schema) brings the listener's attention onto music styles that the brain may or may not recognise. Even if the listener will generally not be familiar to every piece of music listened, those mental schemas may guide the brain to form new neural connections to recognise new elements with which it is, partially or totally, not familiar. This expectation can be broken with surprise if new elements appear (elements unknown to the listener's brain), and depending on how they are combined in a piece of music, the schemas coming out of this appreciation may be stored in the brain and be recognised in future auditions of the same piece or even others, which share similar characteristics.

Therefore, expectation plays a crucial role in whether recognising or not what is

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[4] The creator can also be the end-recipient, when it comes to the reproduction of own music.

[5] Contour: 'the general form or structure of something'. Term used also, to determine some 'meaningful change in intonation in speech'. [10]

being listened to. Hence, it suffices to be in such a position as to perceive the musical discourse as a musical event and not as a mere conglomerate of sounds without any connection between them. The listener is required only to possess some basic information (mainly through expectation, regardless of its degree), which will enable him to recognise that he is being confronted with a musical event and not with something else. Here, the listener's cultural background plays an eminent role. The concept of what music is has changed through the passing of time; however not only time is of vital importance here, but also where (referring to style and culture) the music may have originated. Nonetheless, for listeners to understand a musical discourse capable of arousing emotions and reflections, all of which will develop a dramaturgy in their minds, it is a prerequisite for them to understand that what is being perceived is music and nothing else. Thus, the logical consequence is that this type of dramaturgy on the listeners' side is a subjective occurrence inside their minds originated in the act of listening. This, in spite of such a representation having its origin in an external source, the music itself, which, through the musical discourse carries an inner expressive intention given subjectively by its creator. This subjective intention though, does not need to be apparent (and in many cases, it may well not be) and is in many cases unknown to the listener. Berio's following statement sheds some light on the matter:

> My listener will have the possibility to understand the music in different ways: in a way, if he succeeds in deciphering the references; in another way, if he is not familiar with them.[6]

Following this idea (similar to Weale's concept of intention/reception [5]) and applying my personal reflections both as composer and music-listener, is that I proposed in [1] two main categories of music dramaturgy, which were summarised in figure 1 above. Thus, these categories two can be defined as:

- Intrinsic or inner music dramaturgy: the inherent message that the musical discourse carries within itself, which can be identified during the time of conception of any type of music, in which the creator models his intentions into a musical discourse.

- Extrinsic or emergent music dramaturgy: which is activated in the recipient's mind by the act of listening. This dramaturgy arises only through the contemplation of music and may or may not be the same dramaturgy carried by the music being listened to (the one intended by the creator). It becomes apparent only after human reactions have been aroused in the listener's mind. Figure 4 shows a complete chart of the communication chain, as explained in this section.
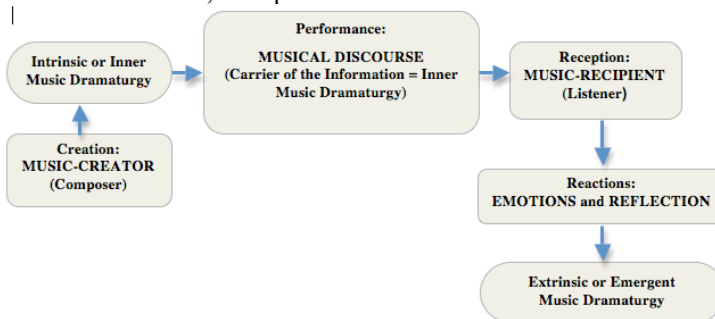

Fig. 4. Music's communication chain (complete chart).

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[6] Ivanka Stoianova. Luciano Berio. Chemins en Musique, Paris 1985 [12].

As already mentioned, music, opposed to some other types of art, depends for its existence on an external and objective time: it is a 'process'. The communication chart (Fig. 4) represents the process in which music happens, and it requires time to exist. Time however, may imply here a double connotation: there is an actual time, in which the performance of music occurs[7], and yet another, from the perspective of the listener, which must be regarded as a relative value due to the subjectiveness of the situation. This concept is linked to the philosophy of Henri-Louis Bergson. According to Bergson's (referring to time), *duration* is:

> [T]he development of a thought that gradually changes as it takes shape.... Time is invention or it is nothing at all. [13][14]

Moreover:

> For … the philosopher, time is a free-flowing medium that depends for its perception on what is filling it. In Time and Free Will (1889), Bergson said that time could not be evenly divided as by a clock, whose measurement dissolves time into tiny points in space. [14]

Further, to this, the concept of *event* cannot be ignored. An *event* is also a process and can refer to many fields, including those of philosophy. The following definition states that:

> Broadly understood, events are things that happen—things such as births and deaths, thunder and lightening, explosions, weddings, hiccups and hand-waves, dances, smiles, walks. Whether such things form a genuine metaphysical category is a question that has attracted the sustained interest of philosophers, especially in the second half of the 20th century. [15]

In the field of Philosophy, a definitive and unique definition of *event* does not yet exist, and multiple theories co-exist. According to Kim [16], events are comprised of three elements: object {x}, property {P} and time {t}; by combining them using the operation {x,P,t} Kim states that events are defined. From the point of view of perception, the structure of an event must be discerned by recipients, who will save in their memory a certain amount of information about the contemplated event (depending on factors such as attention, concentration, previous experiences, etc). The structure of the event can be seen as its 'dramaturgy'. If Kim's theory is transferred to music, then a musical event can be regarded as a continuum across time of different combinations of sounds-and-breaks {x} gathered with a particular purpose {P}, at a particular time {t} The purpose {P} has a meaning, which may substantially change if, for example, an alteration in the order of events occurs. Thus, and even though the constitutive elements may still the same, their order in time is different, with an impact on the manner that music may be perceived and understood, and therefore, different human reactions arouse.

The following subsections explain in detail the concepts of musical discourse and of human reactions, including emotions.

2.2 Musical Discourse

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[7] I refer hereby to the actual time outside our perception crafts. In the case of other types of art, such as plastics, even though a painting may induce some kind of dramaturgy, the painting in itself is ontologically timeless: the time of contemplation depends exclusively on a subjective act from the side of the recipient (for example, how long the recipient will be watching at it). In the case of music, there is an actual, objective time, determined by the duration of each performance.

Definitions of communication, such as 'an act or instance of transmitting' [10], include the concept of transmission. To transmit is usually defined as 'to send or convey from one person or place to another' [10]. In both cases, it is implicit that there is 'something' being transmitted. Caesar explains [17] that, in *A Theory of Semiotics*, Eco gives a special consideration to the relationship between the words 'communication' and 'signification'. Here, even though both concepts are different in their meaning, they are 'not mutually excluded' in the field of semiotics [17]. Further, Caesar makes clear, that the distinction on which Eco bases this concept relies on the fact that:

> …[S]emiotics is coexistence with signification which occurs only when the communicative act envisages a potential human addressee acting as an interpreter of the message (and not a receiver merely responding to a stimulus). [17]

This implies that a semiotic of signification can exist without a semiotic of communication, but not inversely. Therefore, Caesar deduces that Eco includes a human factor in the chain, given the fact that signification, according to Eco, cannot occur if there is no human addressee interpreting the message. It is in this sense that my views about music dramaturgy and its communication chain are presented here: my main semiotic interests in music composition are its semantic[8] and essentially, its pragmatic[9] values, rather than its syntax[10].

In music, the message interpreted by the addressee in the communicative act is the musical discourse, the main object of transmission in a musical situation. To discuss the musical discourse, it is of advantage to look at the definition of both words first.

Discourse has several definitions, depending on the usage of the word. Related to music, these two definitions may be the closest: 'formal and orderly and usually extended expression of thought on a subject' or 'a mode of organizing knowledge, ideas, or experience that is rooted in language and its concrete contexts' [10].

The expression of thought or the organisation of ideas rooted in language exists through signs and symbols, which confer to the discourse its syntax and semantic aspects. This means, that by referring to musical discourse, we enter the domain of musical semiotics. Nattiez's writings are arguably the main source to look for the concepts of musical discourse and musical semiotics.

> In contradistinction to human language, musical discourse does not strive to convey clear, logically articulated messages. For this reason, we may well ask whether one can speak of such things as "musical narrativity". … Musical discourse inscribes itself in time. It is comprised of repetitions, recollections, preparations, expectations, and

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[8] Semantics is basically the relationship between signs and what they refer to. 'The word "semantics" itself denotes a range of ideas, from the popular to the highly technical. It is often used in ordinary language to denote a problem of understanding that comes down to word selection or connotation.' (http://en.wikipedia.org/wiki/Semantics) [18]

[9] Pragmatics is the relationship between signs and their impact on those using them. 'Studies how the transmission of meaning depends not only on the linguistic knowledge (for example, grammar, lexicon, etc.) of the speaker and listener, but also on the context of the utterance, knowledge about the status of those involved, the inferred intent of the speaker, and so on.' (http://en.wikipedia.org/wiki/Pragmatics) [18]

[10] Syntactics refers to the relationship between signs in formal structures. 'The study of the principles and rules for constructing sentences in natural languages. In addition to referring to the discipline, the term syntax is also used to refer directly to the rules and principles that govern the sentence structure of any individual language...'.
(http://en.wikipedia.org/wiki/Syntax) [18]

resolutions, and in the realm of melodic syntax. [19]

Applied specifically to music, the discourse should therefore be the means of carrying the musical expression. However, the expression intended by the music-creator may or may not be understood by the listener as conceived, depending on each particular case. However, without a musical discourse it is impossible to establish the required communication act, as there would not be any element (message) to be communicated. This does not imply though, that a music discourse will make a particular composition more accessible or even will determine a unique and universal view to that particular piece of music (thus, determining the pragmatic level of its semiotic contents). On the contrary, this means that, on the one hand, each listener will understand the same composition and/or performance differently from others (with a wide degree of variation among them); on the other hand, as this understanding is absolutely tied to the cultural environment and personal background of each particular subject, it may not connect at all with the intention of the composer/creator. Nattiez says:

> If the listener, in listening to music, experiences the suasions of what I would like to call the narrative impulse, this is because he or she hears (on the level of strictly musical discourse) recollections, expectations, and resolutions, but does not know what is expected, what resolved. The listener will be seized by a desire to complete, in words, what music does not say, because music is incapable of saying it. Such things are not in music's semiological nature. [19]

Yet, the clearer the musical discourse of a piece of music (in its syntactic and semantic dimension), the better the reception that may be obtained from the original intention assigned to that music. In any case, communication (regardless of the level and degree of its understanding) has been established when a musical discourse is present, provided it can be understood as such. The understanding of it presupposes therefore the existence of Eco's 'addressee' [17].

Music has been contemplated in the past from rather diverse angles. Kivy [20] explains how to interpret Aristotle's definition of the Greek word μνμησιξ (*mimesis*, meaning imitation), when applied specifically to music. He starts by quoting Thomas Twinning's interpretation of this word in his 1789 translation of Aristotle's *Treatise on Poetry*. Kivy agrees with Twinning, that the word imitation should be understood as what was actually meant in its own time, closer to 'expression' rather than the modern concept of 'imitation'. As Kivy quotes from the Shorter Oxford English Dictionary, the definition for the word imitation is to 'copy' or to 'reproduce' and, moreover, it is a 'counterfeit' or an 'artificial likeness'. Associated with this, Kivy also explains Aristotle's claim in his *Politics VII* (1340a): here, what music does imitate is in fact 'emotions and states of human character'. [20]

2.3 Human Reactions

Listeners react to the musical discourse in distinctive ways; these reactions include emotions. Unfortunately, the word 'emotion', which is generally associated with feelings, thoughts and behaviours, is quite ambiguous in meaning, and depending on which line of research is followed, a different understanding of the very concept of emotion will arise. Some lines of research have made synonyms of the words emotion and feeling. Furthermore, there seems to be neither an established procedure nor an agreement in the research community so far to define the number

and nature of a standard set of different categories of emotions [21]. For the purpose of this article however, I shall treat hereby emotions and thoughts as separate entities.

In spite of this ambiguity, listeners' reactions, specifically emotions, need further analysis because, even if emotions may be present in the majority of cases throughout the entire listening process (and, most likely, also beyond), they can be either the first reaction to the act of listening (previous to any rationalisation) or the reaction to some reflection about what has been listened to. This distinction can affect the entire communication process, and therefore, the perception of the musical discourse. Music is listened to at the very first stage through the senses (mainly through the sense of hearing), and this first reception arouses almost immediately in the listener some type of reaction, in many cases, an emotional reaction, which can be extremely variable depending on each particular situation.

Some musical materials such as chords and melodies in western tonal music tend to produce some common emotional reactions in (at least) western audiences: just as an example, minor chords or even tonalities seem generally to be associated with a sad or melancholic mood, arousing a similar type of reaction. A piece of music, however, is a complex combination of different musical materials, such as chords, harmonies, melodies and even layers of sound. From the perspective of music semiotics, these elements isolated constitute the syntactic 'signs' of the musical narrative. When gathered together, the tension created by those elements is what may produce the understanding of and reflection on what has been listened to; after that, an emotional reaction may follow, which may not be the same as it could have been for particular elements of that piece (such as isolated chords, melodies, etc.), but an emotional reaction that arises from listening to the entire work. In other cases however, that tension may resolve directly in emotions, which then may influence the ulterior understanding of a work of music and are therefore prior to any reflection or thought. Hence, two situations can be distinguished, which I regard hereby as first and second cases of arousal in music perception:

- reflection/thoughts ➔ emotions (first case) and
- emotions ➔ reflection/thoughts (second case)

Both cases relate to the empathetic listening behaviour by Delalande [22][1].

Sometimes, however, the arousal of emotions in the listener's mind may not happen after reflection. In this particular situation, the dramaturgy that emerges is solely the consequence of reflection. The opposite however (no reflections after the emotions), is indeed rare, as our brain has evolved in such a way that it is programmed to imagine stories, thus reflecting on what it experiences. Muller [23] refers to the research in the 1970s and 1980s by Roger G. Schank, who examined the issue of how human beings think and further, how those thinking processes influence our behaviour; through this research, Schank attempted to develop artificial intelligence programmes for computers. This research concluded with the idea, that the human brain is programmed to think in terms of stories. Quoting from Muller's article:

> A human brain may receive thousands of pieces of information daily. Most of it we can't retrieve, even minutes later, while other information can stay with us for years, and we can easily recall it. Why? Because the information that we tend to remember is presented in the context of a story about the information, person, or event. [23]

In the cases in which emotions happen after reflection, they can however vary with the audition at different moments or situations (for example in a different mood) of the same piece of music (thus, with the same musical discourse). In these cases,

emotions can even induce the listener to a different understanding. Therefore, emotions can either be the consequence of the reflection on what was heard or the trigger to an interpretation. It mainly depends on the personal background and state of mind of each listener for one case or the other to happen. Furthermore, in the second case, thoughts can trigger further emotions, which may vary in some degree the former understanding, and changing it accordingly. The chain can go indefinitely. Thus, emotions can be two-fold, as they may predispose listeners to understand the music in a particular way by defining or at least influencing how, the musical intention can be perceived or they may be the result of that understanding. The understanding that emerges in the recipient's mind can change from time to time depending on moods, cultural background, experiences of life, expectation, and so on, producing different reactions in the same person at different times, even in cases in which, the same piece of music (even in the same interpretation, or same recording) is being listened to.

Research in the area of emotional reactions to music situations shows that in the last hundred years it has concentrated mainly (in some cases even exclusively) on the parameter melody. This can be observed in several cases, such as the writings by Budd [24] or Cohen (in [8], Chapter 11), even though the latter includes film music from a perspective that does not treat solely the melodic aspect. However, developments in music since the Italian Futurism in 1909, where other musical parameters rather than melody constitute the essence of some music, seem to be rather ignored or left aside. I refer here to cases such as electronic, acousmatic and interactive music: all these types not only work mainly based on concrete sounds and noise, but quite often their most likely constitutive musical parameters are timbre or sound spatialisation. Moreover, my disagreement with these analysis on music and emotions (such as Simonton's in [8], Chapter 9) relies on the fact, that they do not only focus on the essence of the emotional reaction over melodic aspects of the music alone (ignoring other music parameters, such as harmonic tensions or timbre), but also, that this view implies to put the weight of the reaction on the music rather than on the listener. According to this view, syntactic, semantic and pragmatic values of music semiotics seem to be merged in the message and the messenger, with no regard to the fact, that its significant (pragmatic) value can only be analysed considering the addressee of this message, the listener.

In some writings on music-analysis, some authors link their personal view of a work with the biography of its composer. Charles Fisk's connected the famous left hand thrill in bar seven of Schubert's B flat piano sonata with the composer's supposed homosexuality [8]. This is actually a classic example of dramaturgy of music happening within the listener's mind universe (its own *phaneron*, to use Peirce's jargon [9]). In this case, the listener is Fisk himself. He does not speak about his emotions hereby though, and obviously, his vision of the work can cause major differences in the appreciation of Schubert's sonata in other listeners. He conceives his analysis as a 'story' 'a naively poetic description of what happens in the music' [25]. Fisk concludes his article with the sentence 'What Schubert's last Sonata might hold for me', adding the two last words to the title of the article.

To summarise this section: human reactions are always related to the pragmatic aspect of musical semiotics, that aspect directly linked with the understanding of the link between the musical signs (musical syntactics) and their combinations (musical semantics) in a musical discourse. This is closely related to Peirce's seminal work in the field of semiotics: according to Peirce, signs cannot have a definite meaning,

because meaning ought to be qualified continuously [7] [11]. A musical discourse can be therefore understood only *pragmatically*, that is, after being experienced, and that experience conducts to human reactions of different type, of which emotions is one of the most common, but not the only one.

2.4 Mind Games: Categorisation and Memory Retrieval

Back in 1953, in his work *Philosophische Untersuchungen*, Wittgenstein discussed the matter of categorisation [18][12]. As Levitin explains [6], Wittgenstein took the category **'game'** and demonstrated that there is no unequivocal way of describing the word, and that this category could be subscribed to many different items, which all could be recognised as such, but which may not have a direct connection among themselves. This is against the way Aristotle analysed categories. In the Aristotelian thought, *"categories were assumed to be a matter of logic, and objects were either inside or outside a category"* [6]. This means, that they have to be clearly defined, and no fuzzy boundaries among them should exist. Game was Wittgenstein's chosen category to challenge classical categorisation, but that can indeed happen with any other. In other words, what for Aristotle could only be black or white (something belongs or not to a given category), it lost after Wittgenstein its absolute meaning, to turn into a more comprehensive way of dealing with categorising, with the addition of all nuances in-between that the Aristotelian analysis was missing. Wittgenstein proposed that not definition but family resemblance is what characterises category membership [6].

Wittgenstein's approach to categorisation was further developed in the 70s by Rosch [26], with the Prototype Theory, which allows categories to have fuzzy boundaries: objects could be part of many different categories at once, depending on how the object is understood or considered. This theory suggests *"the constructivist view, that an abstract generalization of the stimuli we encounter becomes stored"* [6]. In other words, the abstraction of experience in the form of a prototype or tendency is what it is stored in the brain. This abstraction is contrary to record-keeping memory theories, which say that every single action in our lives is stored in some part of the brain.

Smith et al [27] proposed another view with the Exemplar Theory, based in the storage of specific instances (the 'exemplars' of the name). This theory puts the accent on the residual trace in memory, a record-keeping based theory. The main feature of this theory is that it brings *context* to the discussion: "Under it, details and context are retained in the conceptual memory system" [6]. This is the reason why this theory proposes that new information will be normally evaluated by comparison to existing categories and how closely the new information resembles already known members of the existing category.

From 1997 onwards, research by Nadel [28] (among others), proposed a consolidation model, best known as Multiple-Trace Memory model (MTT), in which, both models seem to converge. MMT explains how the hippocampus is involved in both the storage and retrieval of episodic memory (vital therefore for understanding any kind of dramaturgy), while the neocortex is in charge of semantic

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[11] Encyclopaedia Britannica Library - 2004: Peirce [7].

[12] 'Categorization is the process in which ideas and objects are recognized, differentiated and understood'. http://en.wikipedia.org/wiki/Categorization [18].

memory (what has also an impact on how to understand the dramaturgy of events). MTT actually takes elements from both the Prototype and the Exemplar models. Levitin explains, that

> [I]n this kind of models, each experience we have is preserved with high fidelity in our long-term memory system. Memory distortions and confabulations occur when, in the process of retrieving a memory, we either run into interference from other traces that are competing for our attention" …. "or some of the details of the original memory trace have degraded due to normally occurring neurobiological processes". [6]

MTT models indicate that potentially every single memory can be encoded in our memories. And this happens in many parts of the brain, not exclusively in one or two, what would explain why people suffering from amnesia, can remember some aspects of their lives and complete forget about others.

In any case, one of the most interesting issues about MTT models is that they do preserve *context*, that is, not only the exact information of retrieval, but also the context in which it was acquired. This should be vital to the issue of dramaturgy of music and the way a listener categorises what is being listened, to elaborate a story of its own. As seen in section 2.2, the brain is specially fitted to create 'stories'. The left part is mainly the one in charge of that function, and probably the region called orbito-frontal cortex [6]. Therefore, from the point of view of neuroscience, we might say that dramaturgy of music is the story that our brain imagines, a story triggered by the act of listening to music. Just like we instantaneously normally 'invent' a story of someone we just met by reading the facial expressions, so do we too, when we listen to music. And if the human brain does indeed deal with categories at all times –and that is the way we come to understand the world every instant, by ordering our thoughts in different 'files'– this process of categorisation cannot be the exception while listening to music.

The subject of categorisation with regard to music dramaturgy can be linked with the Intention/reception project (IR) by Weale. This project "*situates its primary point of departure in aspects of Landy's research, in particular the issues of access and appreciation in E/A art music. It includes the development, enhancement and expansion of two of his concepts: the 'something to hold on to factor', and 'dramaturgy' in E/A music*" [5]. Even though this definition refers only to electroacoustic music, it can be actually used for any other type of music. I am mostly interested hereby in the concept of '*something to hold on to factor'* and its link with the dramaturgy of music, as it appears to be directly related to categorisation. *"Simply put, the 'something to hold on to factors' (SHFs) are those factors that a listener uses to make sense of and appreciate a particular work"* [5]. Landy made a list of these with different categories [3][5]. In 2005, Weale established a new way of categorising the SHFs [5], enhancing the list proposed by Landy in 1994.

Weale [5] puts the 'dramaturgic information as a SHF'. I would hereby argue that this view seems to imply that the only way to understand the dramaturgy of this music is through the 'dramaturgic information' given by the author of the piece(s) in this research. Whilst in my own categorisation [1], I do not deny that most pieces do have a dramaturgic intention, and that it is vital for a piece of music to be understood as close to its author's conception as possible, I also explain [1], that the emergent dramaturgy in the listener's mind does not need be the one intended at all (and in many cases, it may not coincide at all). However, I totally agree with Landy and Weale in considering the title of the piece a SHF. Their research shows results that seem to prove that the title is a big help in orientating listeners in what they are

about to listen to. However, this does not mean that the title would reveal the entire intention of the piece. And further, it does not mean that this help would always be an aid to find a close understanding of the intended content; it is just a tool of orientation. My own categorisation of emergent music dramaturgy (Fig. 4), situates emotions and thoughts before the emergent dramaturgy in the communication chain, implying that the cultural and emotional baggage of the listener will interact with the input and produce a dramaturgy of its own. MMT, as explained above, seem to support this view.

This said, SHFs can only work, if the brain –while listening to music- react by categorising what is being listened to with previous experiences (regardless of their context). This is directly related to the way information is stored in the brain, as categorisation cannot happen without a known and recognisable background. Memory theories are also linked to categorisation, as we saw above. Levitin explains with quite clearly selected music examples the two main ways of analysis: the constructivist theory (close to Prototype Theory mentioned before), which considers memory as an abstract generalisation of past experiences stored in the brain and not an accurate storage of all of them as the record-keeping theory accounts for (Exemplar Theory) [6]. One of Levitin's examples in favour of the constructivist view, is that people are able to recognize a piece of music in different versions, even transposed to other keys, instrumentation, tempo and variations of its rhythmic (or even form) structure. On the other hand, contextual exemplars do exist while listening and ordering the listened experiences, and are also important. In this way, it is clear that MTT are more flexible models, as they try to incorporate both views, the constructivist (abstract) and the record-keeping.

To explain how the role of categorisation can be linked to understanding music's dramaturgy and human emotions, yet a further, deeper view into the brain's structure is needed. It would appear, that perception and imagination share the same area of the brain. Since the mid 90s and using the help of EEG[13], Janata, doctor in the fields of cognitive neuroscience and neuroethology, studied the relation between imagination and how the brain perceives sound. Janata explains [29]:

> 'Memories of previous sensory input and accumulated knowledge of how the sensory environment behaves are capable of shaping our perceptions of incoming sensory information. Similarly, moment-to-moment sensory input is capable of reshaping stored representations, especially when the recent information doesn't match our expectations'.

Levitin describes an experiment [6], in which he also took part. Janata placed sensors measuring electrical activity from the brain across the surface of the scalp of different test subjects.

> "… Petr and I were surprised to see that it was nearly impossible to tell from the data whether people were listening to or imagining music. The pattern of brain activity was virtually indistinguishable. This suggested that people us the same brain regions for remembering as they do for perceiving". [6]

SHFs may be therefore closely linked to memory issues and could be related to the brain reaction discovered by Janata and Levitin, because the fabrication of stories, as defined above, needs imagination, and listening would appear to share the same part of the brain as imagination. A further categorisation by the brain –whilst listening to music– of a particular SHF by the means of the contextualisation proposed by MTT should follow, linking different categories stored in the memory (and their contexts), to form a particular new story. This process should describe the

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[13] Electroencephalography

way we imagine music while listening to it (or even after) and therefore, the process in which music dramaturgy emerges in perception and/or in memory and produces, as a consequence, diverse human reactions. It must be clarified though, that in the *I/R project*, this should apply only to 'reception', not to 'intention'.

4 Conclusion

The semiotics involved in the musical discourse, mostly its pragmatic values, leave an imprint in the human brain and produce what it is called human reactions. These are mainly constituted by thoughts and emotions.

The paper gave a thorough view of the effects those pragmatic values can have on the human brain, by including and explaining the concepts of mental schemas [6], the impact of expectation on them, the different theories about how the human brain categorises (and retains) what it perceives (and considered the MMT model [28] as the most adequate so far to explain those phenomena) and the innate ability of the human brain to imagine stories reflecting its experiences. Emotions and thoughts are therefore included in all of those reactions of the brain to the surrounding world.

With regard to music listening in the field of music dramaturgy via a musical discourse, emotions have been categorised in two ways: either they may predispose the music-recipient to understand the music in a particular way (awake thoughts about what has been experienced emotionally) or they can be aroused by a previous understanding (reflection/thought) of that music. That means, that if the listener is not immediately emotionally involved during the reception of a musical discourse, then thoughts invariably will emerge, as we saw in how the human brain is always prepared to; therefore they are the reaction of the understanding of that particular music. In any of those cases they define (or at least influence) how, during the act of listening, the perception of the music's intrinsic dramaturgy.

Although the two cases exposed in section 2.3 are explained as being completely different, this is so only for the reason of categorisation and clarity. Thus, the most likely situation is that of a rather mixed situation (therefore closer to Wittgenstein rather than to Aristotle), in which the first option may be closer to reality than the second or inversely, the second closer to the first, but never completely and absolutely isolated. As described by Levitin [6] after his experiment with Janata, it is nearly impossible to tell the difference in the data if people were listening to or simply imagining music. The reason given, is that *apparently imagination and listening share the same part of the brain*. Despite the fact, that emotions are simultaneously aroused by other reasons, the main interest of this article relies on the fact that those emotions are linked to that musical imagination.

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