Musical Time Theory & A Manifesto

Musical time is a topic referred to by an impressive amount of studies which unfortunately get to– and are assimilated by– the musical community in a very small proportion. When I speak of musical time I do not pertain to bar-rhythmical theory, a topic that musicians are generally well aware of, but to its very perceptual and cognitive foundations around which there has been gathered enough information for a synthesis to be attempted at.

Since 1975, the time scholar J.T. Fraser, in *Of Time, Passion, and Knowledge,* decried the fact that Psychology studies on temporal perception reveal a highly fragmented picture, upon whose contents „we do not have any assurance" that it could be rearranged into a singular and coherent whole. Fraser's observation remains valid even in the eventuality that someone dared to synthesize the efforts made during the past 150 years by psychologists, psychophysicists, by countless experts in experimental and cognitive psychology and by musicians who were preoccupied, not only at an aesthetic or formal level, by the musical time problem. However, an „organic" picture, 100% interdependent in its constitutive parts remains a hardly achievable goal since the very perception „works" on several layers: I won't resume here the endless debate on whether or not there is a „temporal organ", similar to the other human senses – I will only remind the fact that temporal perception does not differ, in its multi-layered complexity, from other sensory experiences. For that matter, the same way visual perceptions are processed by our brain as a complexity of data belonging to several categories of information (color, luminosity, distance, perspective, motion, contour etc.), the *same* way our temporal perception works, since there we can discern the simultaneousness, at the level of stimuli-interaction, of several categories of information such as: instantaneity, integration (Gestalt), succession, inertia, duration, subjective grouping (on several layers), taxonomies such as accent vs. non-accent (thesis-arsis) etc. – to which we can add all the attributes that could define the integral character *(Epstein, 1995)* of our temporal experiences.

In the following chapter I will try to outline the essential chapters of a possible musical time theory manual that would, on the one hand, motivate the gathering in one book of all the temporal perception phenomena that are relevant from a musical point of view – thus undermining the fragmentary character of their study decried by J.T. Fraser – and, on the other hand, finally place the significance of musical time theory somewhere in the vicinity of the classicized musical disciplines such as Harmony, Counterpoint, Musical Forms etc. Musical time theory *does* deserve such a vicinity.

Before anything, I assume that the language and style in which the manual should be written would be comprehensible to any average musician who has never been in contact with the terminological exigencies of the disciplines that helped temporal perception phenomena be revealed and theorized.

I The Chapters Of The Manual

I.1. The temporal scope

Before anything, I think it is essential for musicians to know between which IOI (inter-onset interval) values can they express themselves temporally. Therefore the first section of the manual should introduce the human temporal scope, i.e. between IOI approx. 100-126 ms *(Fraisse, 1956, 1982)* and IOI approx. 1500-2000 ms *(Repp, 2000)*. It will be then explained that beyond the last IOI value our temporal scope does not end abruptly – it is just that the *perception* of the isochronality of a row of pulsations gives room to the *estimation* of the isochronality of a row of pulsations *(Fraisse, 1964),* in such a way that around IOI 2000-3000 this estimation reaches the maximum duration of the perceptual present *(Pöppel, 1996; Fraisse, 1964; Ornstein, 1969 et al.),* beyond which, finally, short-time memory (or: immediate memory) starts to give room to long-time memory *(Woodrow, 1951)*. Again, it is adviceable that all this indispensable terminology be explained thoroughly the moment it pops up along the pages of the manual.

It is also important to be shown that, from the point of view of musical practice, IOI values larger than approx. 1500 ms are hardly usable and, because of that, they won't be properly studied in the manual. Perhaps a short description of the experiments that have led to the above IOI values would be appropriate.

As concerns the upper limit of our temporal scope it will be mentioned that it is not a physical limit (humans being able to produce, over short timespans, isochronal pulsations faster than IOI approx. 100-126 ms), but the limit whence we start to conspicuously lose control over the isochronality of pulsations *(Peters, 1989; Wing & Kristofferson, 1973)*.

I.2. Accent-nonaccent (thesis-arsis)

This topic also should be included among the first sections of the manual. It will be shown that the thesis-

arsis dichotomy significantly depends upon the point, within the temporal scope, where it is located. Therefore the manual should introduce the Gestalt concept and the minimum duration of an acton *(Clynes, 1989)*, both necessary to explain the fact that within an IOI shorter that approx. 200 ms there cannot be more than one accent, this IOI defining the border between the holistic and the analytical perception of inter-stimuli intervals *(Friberg & Sundberg, 1995; Fraisse, 1964)*. It will also be shown that towards the other end of the temporal scope the thesis-arsis and arsis-thesis relationships become irrelevant since their perception goes beyond the phenomenon of temporal integration *(Pöppel, 1996; Fraisse, 1964)* of stimuli.

Finally, this section of the manual should define all the accentuation categories: from subjective accentuation, top-down accents *(Pöppel, 1988)*, the accent of intensity (stress), of duration (agogic accent), the subjective accent of melodic climax, specific to the perception of fast isochronal tempi *(Pogorilowski, 1994)* and the prosody accent *(Epstein, 1995)* etc.

I.3. Isochronal tempi and perceptual thresholds

The main body of the manual should explain the qualitative differences, at the level of perception *(Fraisse, 1964)*, between the various categories of isochronal tempi, as they are delimited by different perceptual thresholds. Thus, by starting from any of the boundaries of the temporal scope, all these thresholds will be minutely mustered, including a short presentation of those thresholds situated beyond the temporal scope, such as the simultaneity threshold *(Pöppel, 1988)*, the temporal order threshold *(Repp, 2000; Hirsh, 1959; Pöppel, 1988)*, the threshold whence we start experiencing duration *(Fraisse, 1964; Stroud, 1956)*, the threshold whence, at the level of auditory perception, we pass from vibration to pulse *(Fraisse, 1964)* or, in other words, from multiplicity to instantaneity (of stimuli perception – *Stockhausen, 1959; Backus, 1964; Koenigsberg, 1991; Reiner, 2000)* – and then to succession, the place where we entry the temporal scope.

That being done, the manual will describe the duration of the minimal acton seen as a Gestalt type of integration-interval for perception data. That will be then correlated with the theories regarding the minimum duration of the perceptual present (of the „now" – *Pöppel, 1988; Epstein, 1995; Clynes, 1989, Moelants, 2001 et al.)*. This duration, seen as a perceptual threshold (around IOI 200 ms), will also be correlated to the data regarding the way we experience durations depending to the quantity of information *(Ornstein, 1969; P. Fraisse & R. Fraisse, 1937)*, that enabling us to tell how many (musically relevant) pulsations can define a Gestalt-type perception. Hence we can define an entire series of isochronal tempi faster than IOI approx. 200 ms (up to the upper limit of the temporal scope – i.e. IOI approx. 100-127 ms). At this point the manual should also mention the entrainment phenomenon (or the pulsatory inertia – *Pogorilowski, 1994)*, extant in the case of fast isochronal tempi (IOI approx. 100-325 ms), and describe some of the experiments that led to its discovery (e.g. „the Julliard experiment" – *Beek, Peper & Daffertshofer, 2000)*.

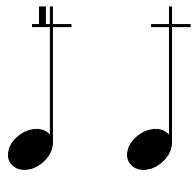
The next perceptual threshold to be described in the manual is that specific to the resonance (at the level of our central nervous system) in the perception of musical pulse *(van Noorden & Moelants, 1999)* – at an average IOI approx. 500-550 ms. Here is the place for the following theories to be mentioned: the optimal duration of attention-shift rate *(Mager, 1925)*; the point whence we start to experience the duration-as-such of the stimuli *(Fraisse, 1964);* the subjective delimitation of the border between fast and slow tempi *(Katz, 1906; Frischeisen-Köhler, 1933; Vierordt, 1868; Oléron, 1952 ş.a.);* the indifference interval *(Woodrow, 1934; Wundt, 1886);* the complete duration of perception process *(Fraisse, 1964);* the preferred tempo *(Eck, Gasser & Port, 2000; Fraisse, 1982; van Noorden & Moelants, 1999 et all.)* – all these being situated in– and defining– the area of this important and vast perceptual threshold. Given the complexity of its description (cf. supra), the manual should tackle it systematically, from one end to the other: from „the fastest isochronal tempo in which we still can subjectively experience stimuli as isolated events" (i.e. not grouped in thesis-arsis or arsis-thesis structures – at IOI approx. 430 ms – *Pogorilowski, 1994)* – up to the other end (IOI approx. 700 ms – *Fraisse, 1964)* whence we start experiencing duration-as-such and temporal gaps *(Fraisse, 1964; Pogorilowski, 1994)*.

Finally, this essential section of the manual will describe the last perceptual threshold that is relevant from a musical point of view, i.e. that defining the lower limit of the temporal scope (IOI approx. 1500 ms). Here is the place to take into consideration the theories pertaining to the transition from *perception* to *estimation* in assessing the isochronal character of perceived tempi (cf. supra). It will necessarily be mentioned here that, at this end of the temporal scope, our ability to produce isochronal tempi does not disappear abruptly, but gradually, up to the maximum durational limit of the perceptual present (IOI approx. 3000 ms – cf. supra), after which our *perception* of the isochronicity of tempi definitely „melts down" into *estimation* because the law of temporal proximity (expectation) ceases to function *(Fraisse, 1982)*.

I.4. The perceptual notation of musical pulsations

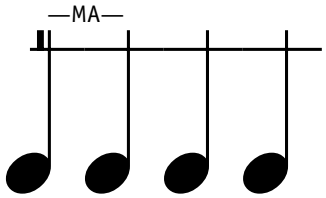
All the above phenomena would be better illustrated if the manual benefited from a dedicated notation to serve the use of pulsations in the spirit and terms of human temporal perception. Since 1994 I proposed to the musical community such a graphical system – i.e. the zeuxilogic notation – whose very basic features I will describe in the following paragraphs.

First of all, both thesis and arsis pulsations will be notated differently, unlike the case of the bar-rhythmical system, where these values were deduced from the context.

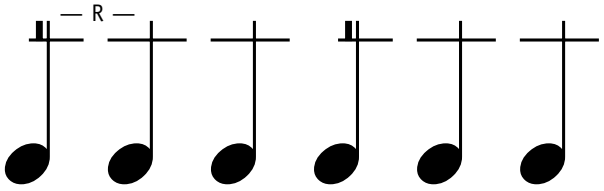


thesis arsis

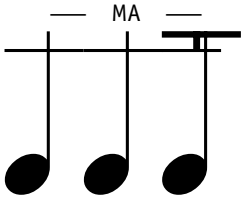
Isochronal tempi are notated by marking, above the first two pulsations, the perceptual phenomenon whence a specific IOI has been deduced – in this case (see below) we deal with the minimum duration of an acton (MA), IOI = approx. 200 ms (cf. supra).



When the IOI of a isochronal tempo is situated in the area of the resonance (R – cf. supra) of musical pulse perception (IOI = approx. 500-550 ms), or below, towards the lower limit of the temporal scope (IOI = approx. 1500 ms), pulsations are being notated separately.



The same way, whenever pulsations are grouped in a Gestalt type structure (cf. supra), that will be revealed graphically by means of a differently notated thesis pulsation (which is singular in all Gestalt type structures).



arsis arsis thesis

The idea is that all the temporal perception phenomena described in subchapter I.3 benefit from a graphical image in such a way that musicians will be able to: imagine semiographically the different pulsatory structures they perceive, communicate those they create and rely upon an „alphabet" – that is open towards improvement and possible complexifications –, proper to the musico-temporal domain. In the absence of a specific semiography, musical time theory will continue to develop in a perpetual (and, paradoxically, highly cybernized) „pre-Gutenberg" era.

II A Manifesto

The weird idea of a manifesto occurred to me the moment I realized that the manual described in the previous chapter may become a success only if it were the outcome of a collective academic effort or if it were tackled separately, by a *number* of authors – in such a way that musicians would either benefit from the advantages of an already debated/convened theoretical apparatus or make a personal opinion by confronting various points of view.

Years ago, when I was just starting to study a number of Musical Harmony manuals, I noticed an essential thing, namely the fact that *nobody,* after a mere attentive reading of these manuals, would be able to turn on the radio on, say, a pop music station, and then start to name the harmonic sequences he or she hears. Assimilating a system that is largely based on an educated perception (i.e. the case of the tonal-functional system) is a matter of time, effort and practice. It is the same way that the temporal „grammar", derived from the theoretic frame of the perception phenomena described above, needs to be educated, alphabetized and assimilated, with effort, over a considerable period of time. Such a deed becomes a virtual impossibility in the absence of a manual and in the absence of an overt and programmatic interest dedicated to its accomplishment. This absence is somewhat compensated, on the one hand, by the bar-rhythmical theory (which is a great accomplishment, but it does not sufficiently represent our pulsatory-temporal competence) and, on the other hand, by the more and more fragmented picture decried by J.T. Fraser (cf. supra).

Today, a otherwise gifted musician who does not know Musical Harmony (say, a pianist) is considered to have a problem. In the same time, an University Professor of musical theory who has no idea of the temporal perception phenomena mustered in the previous chapter (phenomena which are inherent to the way musicians handle discrete time structures) – is, due to the contemporary academic context, considered to be a professional musician. I find that intriguing

not insomuch because that professor would not be a professional musician (by today's standards, he actually *is),* but because this state of things can last for another thousand years. That happens because, at the moment, musicians *do not know* that, in a way that is very similar to pitches, musical pulsations too conceal a proper and intrinsic grammar which is as musically bidding and painstakingly assimilable as the tonal-functional system or the grammar of a rich exotic language. But, before expressing themselves by means of this pulsatory-temporal grammar, musicians should at least know what this grammar is based upon. In this respect, I find it essential that – in a few, or a hundred years, when everything I state here will have ceased looking bizarre – musicians should:

- be able to consciously perceive and produce all the (theoretically convened) isochronal tempi within the temporal scope (and even intermediary tempi)
- be able to describe the perceptual phenomena and perceptual thresholds anent to all these isochronal tempi
- know most of the phenomena linked to the perception and production of pulsatory structures that are not necessarily part of the theory of isochronal tempi perception: i.e. the theory of the passages from one isochronal tempo to another (something similar to the harmonic modulations), the theory of non-rhythmical pulsatory structures etc.
- have notions of pulsatory grouping theory: from Gestalt structures to prosody and chunking *(Kramer, 1988)*
- be able to use the perceptual notation of musical time in order to explain / convey / create discrete time structures

Coming back to the first paragraph of this chapter, let us now assume that a single author would dare to write the manual in question. In the absence of any collective debate, how on Earth could he or she know how many isochronal tempi within the temporal scope should be defined? Centuries ago, perhaps it was the good old common practice to create the 12 note system and perhaps that happened because there was more than one mind to convene that a 24 note system was too unwieldy and a 7 note system too simplistic. Mutatis mutandis, from a musico-temporal point of view, we can do an awful lot of things. In this respect, the bar-rhythmical system is too simplistic, whereas our overall ability to produce discrete time shapes is too large to unify in a consistent and useful theory. Think of that.

With this manifesto I intend to submit to the musical community the stringent necessity of a musical time theory manual, as imagined above.

Unfortunately, musicians preoccupied with the temporal dimension of their metier received an unfair blow once with the premature passing away of two brilliant minds: professors David Epstein (Massachussets Institute of Technology) and Jonathan D. Kramer (Columbia University). These two musicians, through personal merit and their excellent stand in the academic world, could have coagulated the necessary efforts for the elaboration of the discussed manual of musical time theory – a theory based on temporal perception phenomena and a manual to open bridgeheads towards musical performance and composition.

Yet, I am convinced that there are other musicians who could support such a project. Indiana University and the University of Ghent (Belgium) are only two of the places where musical time theory, in the past decades, has not been overlooked.

Those who found this manifesto interesting and those who would like to ask questions are free to contact me:

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