CHROMOPHONIA: SYNAESTHETICS AND THE SYNESTHETIC THEORY AND ARTWORKS OF JORGE ANTUNES

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Abstract. Visual music and synesthetic art-works chronology accounts (*synaesthetics*) usually focus the history of art and aesthetics in Europe and North America, mostly refering to artists that have produced their works in such circuits. However, as often noticed in contemporary art accounts, Brazilian artists have played a key role in bringing in the unity of the body and the whole sensorium into contemporary arts, since the early 1960s, in a manner radically distinct from their peers in Europe and United States. Among Brazilian artists who can be related to synesthetic artworks narrative, Jorge Antunes is specially interesting and underdiscussed. Since de mid-1960's, he's brought singular and original contribuitions for this field. Specially worth to be noticed are his "chromophonic" compositions and his theory of correspondences between colors and sounds, exquisite in many aspects.

Keywords: Jorge Antunes, synesthesia, synaesthetics, chromofonia

I- INTRODUCTION

Since the 1960s, Brazilian composer Jorge Antunes developed avant-garde musical work in which one of the most distinctive aspects is the relation among colors and sounds. It is a lifetime production with plenty of synesthetic aspects, which hasn't up to now been noticed by accounts on synethesia in arts, which usually focus on events and artists in Europe and North-America. In the very begining of my research career, I was inspired by one of Antunes' books, *A correspondência entre os sons e as cores* (*The correspondence between colors and sounds*), which unexpectedly called my attention in a small and somehow decadent "anything goes" shop (not a book shop at all!) in 1990. Two years later, in my undergraduate years in the Cinema School of São Paulo University, it occurred to me that Antunes' ideias could inspire strategies for writing original musical-scores for cinema, and this is the official starting point of my involvement with the topic of synesthesia, which eventually became the subject of my master dissertation (BASBAUM S., 1999) and also a small book (BASBAUM S., 2002), besides several other articles and lectures. I shall briefly present here aspects of Antunes' trajectory, his original thesis about colors and sounds, describe one of his *chromofonic* works and derive some conclusions about his aesthetic contributions, which are not trivial at all: in 2002, as a celebration of his 60th birthday, a book about his work brought articles from the most important avant-garde composers working in Brazil nowadays, such as Gilberto Mendes, Ricardo Tacuchian, Flô Menezes and Silvio Ferraz – all internationally renowed. They acknowledge his pioneer work in electroacustic music in Brazil, and the amazing scope of his production. (ANTUNES, 2002)

II - PRESENTING: JORGE ANTUNES

Jorge Antunes was born in Rio de Janeiro, in 1942, in the lower-middle-class neighborhoods of Santo Cristo, far apart from the famous Zona Sul (South Zone) coast, which made Rio de Janeiro internationally known. His father, who supported his family as an antiquarian, was also an amateur painter, who carried his son along with him on sundays, when he practiced painting landscapes. From this, one should expect a premature involvement with painting, and maybe a boy painter. It happened, however, that, although enjoying painting, Antunes manifested very early his desire to learn music, which eventually found a way through an old XVII century Maggini violin, an instrument his father acquired for him in a deal when he was already 15. Nevertheless, his involvement with color and painting remained as a trademark of his compositional work, as we shall see, not only in his chromofonic music, but also in his scores (see, for example, KUBOTA, 2002).

Besides his artistic inclinations, Antunes also had a cousin who managed a small school for radio technicians. Having received a scholarship to study

there, "at 15 (1957), when he started violin classes, he was also making money and helping the family budget by fixing radios to his neighbours and friends" (VALLE, 2003:49). Those were radio days: as noticed by his biographer, Gerson Valle, at that time radio was the main communication device in all Brazilian homes. Thus, since his early days, Antunes was able to bring together a feeling for arts, experiencing the worlds of colors and music, and the world of electronics: a mix of backgrounds which eventually made him a pioneer of electronic music in Brazil.

When it came the time for college studies, a young Antunes decided to study Physics, aware of the difficulties to live as a musician in Brazil. However, while carrying his studies, he also got in the Music College to study violin. The first by-product of such scope of interests was his first "scientific" manuscript, *The correspondence between colors and sounds*, written in the years of 1962/3, and presented for the Premio Jovem Cientista (Young Scientist Prize), in Brazil, in 1965. In this work, after equating sounds and colors as vibratory phenomena, Antunes would speculate about vibratory relations among all phenomena in the whole universe. Such appendix, considered, at the time, by the jury, much too "mystical", and not "scientific" (VALLE, 2003:50-1) cost him to be declassified in the context. Right or wrong, the mystical appendix has been cut when he issued the monography as a book, in 1982, almost 20 year latter. This is the edition I purchased a copy in 1990.

In 1961, after attending a concert on avant-garde electroacoustic music, organized by the great Brazilian conductor Eleazar de Carvalho, featuring the French composer Henry Pousseur and the great avant-garde pianist David Tudor, Antunes became fascinated with the possibilities of electronic music. His ease in dealing with electronic devices and his physics background made this austere territory unusually comfortable for him. In 1962, he had already built a small studio at home, and by the late 60s he had already written and recorded several electronic pieces and eventually music became his main field of work.

III. CHROMOFONIA: A THEORY OF SOUND-COLOR CORRESPONDENCES

Jorge Antunes has an enormous scope of compositional work, from symphonic pieces to small formations, electronic and mixed compositions, operas, compositions for children, etc... He's written several books, and is an always surprising, tireless worker and creator since his early days, having developed instruments, notation techniques and acoustic experiments; he's also won several international awards and fellowships. For the targets of this paper, I'll focus only in a brief description of his work concerning colors and sounds.

Most well known resources of visual music and synesthetic art-works history – for example William Moritz (1986), Jorg Jewanki's works (for ex. *Color-Organs*, un-dated), the impressive catalogue of the Visual Music Exhibition at the Museum of Contemporary art of Los Angeles (BROUGHER et al, 2005), Birgit Schneider's (2011) beautiful article (recently translated to Portuguese by myself, in 2013), or Jean-Yves Bousseur three volumes (1993;1998; 1999) dedicated to the relations between music and visual arts; or even exhibitions such as the one curated by Don Bacigalupi, in the San Antonio Museum (BACIGALUPI, 1994) – to name a few –, are centered in the history of art and aesthetics in Europe and US, refering to artists that have produced their works in such circuits. Those articles, exhibitions and books constitute such a body of research already done around such artworks, that we may take it as field in itself, which I shall name *synaesthetics*. And we verify that this growing amount of *synaesthetics accounts* does not know much about what has been done outside European and North-American circuits.

However, as often noticed in mainstream contemporary art accounts – eg. Guy Brett (2004), Ricardo Basbaum (2006) – Brazilian artists have played a key role in including the body and the whole sensorium in contemporary arts, since the early 1960s, in a manner radically distinct from the way it has been done by their peers in Europe and in the United States. Among Brazilian artists that can be included in a broad multisensory artworks' narrative, one should certainly count not only the now well known works of Lygia Clark and Helio Oiticica (BASBAUM S., 2005; 2012), and their mate Ligia Pape, but also names not so often quoted, which may be meaningfull in an inventory of synaesthetics artworks and the desires behind them. Abraham Palatnik (born 1928), for example, has produced in the early 1950s his first *Kinechromatic*, light-canvases with moving colors, that, nevertheless silent, are surprisingly close to often quoted Thomas Wilfred's *Lumias*, usually considered referential works in terms of Synaesthetics artists.

It is well known how, in the context of early post-modernism, new art-strategies seemed to be demanded to supersede an apparent exhaustion of pure, autonomous painting avant-gardes: in the late 1950s, John Cage already enacted multimedia happenings, and in the early 1960s, conceptual art was emerging, challenging the traditional notion of "art-object". In Brazil, in 1966, Helio Oiticica has presented his very first *Penetráveis*, multisensory *installations* – even before this kind of artworks had a concept to define them as such. In this same year – in fact *before* Oiticica –, Antunes had staged his installation *Ambiente I* (Environment I) in the XV Modern Art Exhibition. Labelled by Antunes himself as "Integral Art", for it was intended to involve all five senses, such work was explicitly labeled by Antunes as "synesthetic". In his book *A correspondência entre os sons e as cores*, he writes:

"[T]he present work [*The correspondence between colors and sounds*] in its first version, was written in 1965, precisely in a time in which certain synesthetic musings had lead me to propose the foundations of that which I've called *Integral Art*. At the time, I've composed and built *Ambientes*, *Cromofonias* and

Cromoplatofonias. Working simultaneously with colors, smells, flavours and tactile elements, I've developed some musical works with visual elements to be staged in concert rooms, and some visual works with sound elements to be presented in visual arts exhibitions. (ANTUNES, 1982: 7).

However, the directions taken by his work privileged music: in 1967, Antunes was invited to bring to the prestigious Villa-Lobos Institute, in Rio de Janeiro, his particular laboratory of electronic music. There, he promoted the very first courses ever organized in Brazil on the techniques of Pierre Schaeffer and Karlheinz Stockhausen. However, those were politically dark times in Brazil: the country was submitted to a Military Dictatorship (which lasted 21 years: 1964-1985), and it happened that the government considered, as often happens in such regimes, revolutionary aesthetics to be subversive. Thus Antunes, along most of his colleagues, has been fired, choosing to self-exile in Argentina. From this moment on, he'll dedicate his artistic efforts mostly to music. After spending some years in Paris, in the pretigious Groupe de Recherche Musicale – under the supervision of Pierre Schaeffer himself – he came back to Brazil as a PhD. and got a position in Brasilia's National University, in 1973.

Especially relevant here, then, is the *Cromophonic* theory Antunes developed, about the relations between colors and sounds, mentioned above, and which is present throughout his career, since his very first experiences with electronic sounds. Indeed, his first small home studio was already named "Antunes' Studio of Chromo-Musical Research" (later, in the Villa-Lobos Institute, it would be named "Center of Chromo-Musical Research"). With simple apparatuses, including a wave-generator built by himself, he composed, in 1964, *Fluxo Luminoso para Sons Brancos I* (*Luminous Flux for white sounds I*); and in this very same year *Three Cromofonic Studies*: *Study for Green and Red Circles*; *Study for Blue and Orange Spirals*; *Study for Yellow and Violet Points"*. (One cannot but notice how much such titles converge with the kind of imagery described by color-hearing synesthetes!). All of these compositions make use of his chromofonic theory. Since then, the theory has been applied in several of his compositions, among them the *Cromoplatofonias I, II, III, IV* (from 1965 to 1978); *Popularium Progressum Mass* (1967); *Three Events of white light* (1967), *Cromorfonetics* (1969), *Scriabina MCMLXXII* (1972), *Ultraviolet Catastrophe* (1974), *Elegia violeta para Monsenhor Romero* (1980), and, as we shall comment, *Miró escuchó Miró* (1998). Anselmo Guerra de Almeida summarized some aspects of chromophonia:

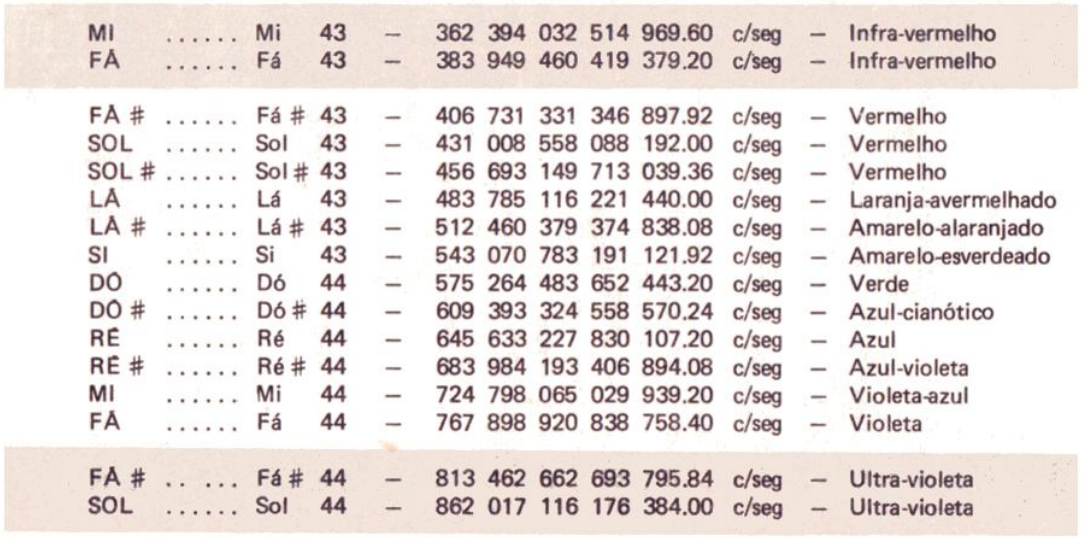
"according to the cromophonic technique, the structures and the timbric constitution, as much as the melodic structure, are organized according to visual arts concepts. Elements of temporal universe are mapped onto spacial projection, where sound objects are treated as colored kinetic forms which evolve in space". (GUERRA DE ALMEIDA, 2012:129-30)

(It is interesting to notice that Antunes has also written a referencial work in Brazil about new forms of musical notation, and that, for him, his scores are as much a work of art as the music they are supposed to register or that interpreters should derive from them) (see ANTUNES, 1989).

Thus, *chromophonia* and *chromophonic* compositions are based on his original theory of correspondences between colors and sounds, exquisite in many aspects. The core of the theory relies on the assumption that colors and sounds are both *vibratory* phenomena. Thus, if you have, say, an F# at 46,249 Hz, and another F# at 92,498 Hz – times 2, one octave above – , why shouldn't we suppose some kinship of the original F# vibration and another vibration 43 octaves above, 4,0673 X 10^{14} Hz – a frequency in which we find red light? This lead us to a table of correpondences of exactly one octave in the visible light spectrum, from F# to F; below the F# we would have infra-red lights, and above the F ultraviolet lights (**fig. 1**). Given his physics background, Antunes is well aware of the fact that sounds are mechanical waves and light is at the same time both electromagnetic wave and particle, but he's going to solve this contradictions through a peculiar reasoning.

First of all, he argues, there's the psychological phenomenon of the *octave*: we recognize a natural similarity between these frequencies which are related by a reason of two: we even give them the same name! If you give to a female singer, and to a male singer, a single line to do *solfége*, the male singer will much likely sing it one octave below the female singer, given the characteristics of their speech organs. It may be argued that this is a cultural phenomenon: that we learn to recognize octaves because we're exposed to scales since we start to learn music in early ages. However, if you make the same experiment with a child, without musical education, and tell him/her to reproduce, say, a low *E*, "we can be sure, beforehand, that no child will answer 'This sound is too low, I cannot sing it!'. We verify that many children will sing it one or two octaves above" (ANTUNES, 1982: 24). Thus, he writes, perception of octave similarity is *natural*, not *cultural*:

"[H]uman beings establish an intuitive relation, whose existence is evident since the remotest times of musical history, between the notes which maintain among its frequencies a multiplicity factor equal to a power of 2, and which, by sharing something in common, receive the very same name. When music started to manifest a line which was not purely melodic, evolving towards polyphony, in its first steps, with the *Organo* and the *Fabordão*, this intuitive feeling of the octave became the cornerstone of the building of harmony. It is such octave intuition, taken as a phenomenon related to the notions of rhythm and



MI	.....	Mi	43	–	362	394	032	514	969.60	c/seg	–	Infra-vermelho
FÁ	.....	Fá	43	–	383	949	460	419	379.20	c/seg	–	Infra-vermelho
FÁ #	.....	Fá #	43	–	406	731	331	346	897.92	c/seg	–	Vermelho
SOL	.....	Sol	43	–	431	008	558	088	192.00	c/seg	–	Vermelho
SOL #	.....	Sol #	43	–	456	693	149	713	039.36	c/seg	–	Vermelho
LÁ	.....	Lá	43	–	483	785	116	221	440.00	c/seg	–	Laranja-avermelhado
LÁ #	.....	Lá #	43	–	512	460	379	374	838.08	c/seg	–	Amarelo-alaranjado
SI	.....	Si	43	–	543	070	783	191	121.92	c/seg	–	Amarelo-esverdeado
DÓ	.....	Dó	44	–	575	264	483	652	443.20	c/seg	–	Verde
DÓ #	.....	Dó #	44	–	609	393	324	558	570.24	c/seg	–	Azul-cianótico
RÉ	.....	Ré	44	–	645	633	227	830	107.20	c/seg	–	Azul
RÉ #	.....	Ré #	44	–	683	984	193	406	894.08	c/seg	–	Azul-violeta
MI	.....	Mi	44	–	724	798	065	029	939.20	c/seg	–	Violeta-azul
FÁ	.....	Fá	44	–	767	898	920	838	758.40	c/seg	–	Violeta
FÁ #	.. ...	Fá #	44	–	813	462	662	693	795.84	c/seg	–	Ultra-violeta
SOL	.....	Sol	44	–	862	017	116	176	384.00	c/seg	–	Ultra-violeta

Figure 1. Original *chromophonic* pitch to color correspondences, with light frequencies (Hz): *E = infra-red*; *F= infra-red*; *F#=red*; *G=red*; *G#=red*; *A= red-orange*; *A#=orange-yellow*; *B=greenish-yellow*; *C=green*; *C#=greenish-blue*; *D=blue*; *D#= violet-blue*; *E=blue-violet*; *F=violet*; *F#=ultraviolet*; *G=ultraviolet*. These are the frequencies of the basic piano pitches (*A1=440Hz*), times 2^{43} (or 2^{44}). Notice that this octave projection of frequencie values defines a precise octave cicle in the light spectrum. (ANTUNES, 1982: 29)

frequency, and not as something restricted to auditory phenomena, that take us to associate sounds and colors" (ANTUNES, 1982: 24-5).

However, it is well known that, along a fundamental sound which we recognize immediately, other sounds, its *overtones*, also vibrate – musicians are aware of experiments than can be done with a piano to demonstrate the overtone series. Thus, we know vibrations may induce other mathematically related vibrations in vibrating systems. Antunes thus argue that auditory and visual nervous circuits are physiologically close to each other. In such circumstances, it is reasonable to suppose that

"[T]he passing of a nervous influx through the auditor nerve, in the form of an electric current, will naturally generate a magnetic field around it. This magnetic field may induce a nervous influx in the optic nerve. In other words, we may say that (…) The proximity of both nervous circuits may cause that, when excited with a frequency of 349,23 Hz (F3), the optical nerve may resonate and get excited by an electric oscillation of 767,9 X 10^{12} Hz, a frequency which is an overtone to 349,23 Hz and corresponds to the color Violet." (ANTUNES, 1982: 34).

Thus, he is suggesting is that the correspondence between a *pitch* and a *color* is not established at the level of the physical phenomenon itself, but is induced physiologically, through harmonic resonance of nervous circuits. Naïve as it may sound nowadays – in which the paradigm of brain studies based on neuronal connections and activities, recorded by Magnetic Resonance Imaging and PET-scans – Antunes' theory, conceived in the early 1960s – when neuroscience was much more incipient – is quite ingenious: after all, aren't there around theories which advocate understanding of brain activities through rhythmic oscillatory patterns (see BUSZAKI, 2007)? So, why not take in account ressonance as an hypothesis? Also interesting is to notice that Antunes was posing this kind of questions much before the "boom" of synesthesia research, in the 1990s. Other surprising observations and insights follows in Antunes' theoretical work. For example, one often hears that perception of colors cannot be compared to pitch perception, since, for example, a trained ear may distinguish every pitch in a chord, while it is not possible to distinguish which hues have been used to compose a certain composite color: once you mix yellow and blue, you have a green, and that's all you see; while if you have, say, a C7, a trained ear will easily recognize the C, E, G and Bb pitches. However, this is not so: as Antunes notices, a single note in any instrument is already the mix of different amounts of overtones, which gives that note its peculiar timbre quality. Thus, there's no such an experience of a *pure sound* as opposed to a *composite* color: instruments sounds are already composites in themselves.

His most amazing insight, however, and his favorite (as confirmed by Antunes in a recent email exchange), is the similarity among the experience of complementary colors, and the perception of the pitch interval of 5ths:

"[A]s professionals that form and conduct amateur choirs, and that take part in tests and selection of such amateur singers, know, we are used to find individuals

that confuse the sounds that constitute a perfect 5th (…). This lack of hability to distinguish between, say, a *C* and its perfect 5th, a *G*, has an analogy in visual perception: Some daltonians are unable to distinguish *red* from *green*. Well [in the proposed table], *G* corresponds to *red*, and to *C* corresponds *green*" (ANTUNES, 1982:30).

This amazing finding can be somehow compared to the common dimensions of perception long ago demonstrated by Lawrence Marks in the 1970s, and recently re- stated by him (see MARKS: 1978, 2011).

But still Antunes keeps a final surprise for the readers of his short book. After finishing his research, and having proposed an original table of correspondences between colors and sounds, it seems to have come to his hands a "private" document, restricted to studies of members of Rosacrucis Order in Brazil. This document, he writes, presents "a table of Cosmic Vibrations, accompanied of a musical keyboard with the *Number of Cosmical Vibrations and their relations to Colors, Chemical Substances and Vocal Sounds"* (ANTUNES, 1982:15). The table provided by the Rosacrucis document (**fig. 2**) coincides entirely with his own table – once you take in account that the Rosacrucis A3 (tunning reference) is considered as 427 Hz, while Antunes' A3 is 440Hz. Thus, one cannot refuse possible mystical implications of his theory.

Nota	Freqüência	Cor
Sol	384 c/seg	Vermelho-Escuro
Sol #	403 c/seg	Vermelho
Lá	427 c/seg	Vermelho-Alaranjado
Lá #	452 c/seg	Alaranjado
Si	480 c/seg	Amarelo
Dó	512 c/seg	Amarelo-Verde
Dó #	538 c/seg	Verde
Ré	576 c/seg	Verde-Azul
Ré #	604 c/seg	Azul
Mi	640 c/seg	Azul-Violeta
Fá	683 c/seg	Violeta
Fá #	718 c/seg	Violeta-Vermelho

Figure 2. Rosacrucis pitch-to-color correspondences (*A1=427Hz*): *G=dark-red*; *G#=red*; *A=red-orange*; *A#=orange*; *B=yellow*; *C=greenish-yellow*; *C#=green*; *D=blue-green*; *D#=blue*; *E=violet-blue*; *F=violet*; *F#=violet-blue*. (ANTUNES, 1982:15)

IV. MIRÓ ESCUCHA MIRÓ

After having briefly examined Antunes theory, it should be of interest to consider, even if briefly, at least one of his chromophonic works, and his carefully designed scores. The piece I'll very briefly present has been composed in 1998, when Antunes received, from the Spanish government, the Estancias Prize. This work is 8'46" long, and is inspired by a Juan Miró's painting *Sin título* – an enormous canvas (aprox. 10 X 6 mts) in the Museo de Arte Reina Sofia, in Madrid. Named *Hombres tristes y sin título rodeados de pájaros en noche amarilla, violeta y naranja*, it's a three section piece, divided according to pedal-notes associated to dominant colors for each: (1) B - yellow; (2) E - violet; (3) Bb - orange. The choice for pedals – which, in this composition, are textural variations of the section's chosen tonal center – allows the composer to create background textures inspired by Miró's work. According to Antunes, Miró's backgrounds, when looked closely, unveil a web of intercrossed subtones, which he wants to evoke with the pedal textures. To develop other aspects of the composition, Antunes made a selection of Miró's pictograms – figural elements employed by the Spanish artist throughout his carrer, in different paintings – which are translated into musical gestures, events that take place over the textural background (GUERRA DE ALMEIDA, 2002:134-5). Thus, both colors and graphic elements are translated into sounds, according both to his chromophonic and studies developed specially for this piece. (**fig. 3**)

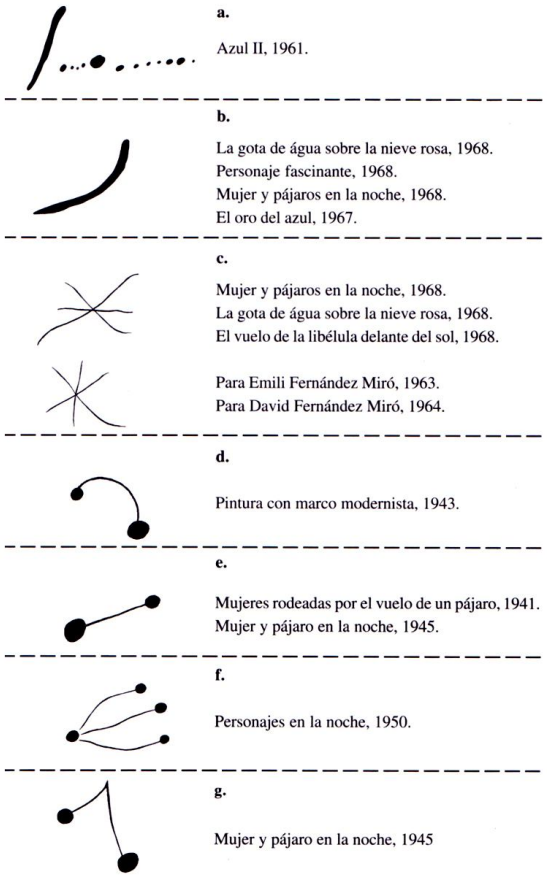


Figure 3. Antunes studies of Juan Miró's pictograms, used in *Hombres tristes y sin título rodeados de pájaros en noche amarilla, violeta y naranja* (1998). (GUERRA DE ALMEIDA, 2002: 135)

V. TRANSITORY CONCLUSIONS

Jorge Antunes, as recognized by all his peers, is not only a pioneer of electronic music in Brazil, but a tireless worker, a prolific composer and thinker – and also a very active citizen, involved in political causes, having even been candidate to the Brazilian senate, through the leftist party PSOL. His many international awards also testify the worldwide recognition of his achievements in his lifetime. In what concerns colors and sounds, one should notice the claim for universality of Antunes's correspondences: while his table of correspondences between sound and color frequencies happens to be surprisingly identical to Rosacrucis's documents, which he didn't know when he started his research, it is widely recognized that synesthetic people and synesthetic artists have many and many different styles of correspondences, so that one should not vindicate the possibility of any universal scheme. However, to vindicate some kind of superior unity between perceived phenomena is common feature in most synaesthetics propositions in art, most notably in the XIXth and early XXth centuries (BOUSSEUR, 1998; BARBOSA, 2007). No matter how materialist Antunes theory may present itself, suggesting straight psychological bonding emerging through nerve resonance, it remains connected to Hoffman, Wagner or Scriabin in such vindication of a higher level unit – which is, anyway, something proposed by all mystical traditions human cultures have ever developed. By doing this, bringing together a materialistic version of such lost unity aspirations, and proposing a particular table of correspondences – similar to the Rosacrucis table –, Antunes seems to wish for a complete and unequivocal unity between art, science and spirituality that sounds a bit romantic or utopian, if not disturbing. One cannot but remember Brazilian contemporary art critic Ronaldo Brito brilliant synthesis, concerning the role of artistic propositions in contemporary world, in what relates to attempts in stating any absolute thruth: "Thus, contemporary art makes itself as art: it builds true illusions, and destroys the dellusions of Thruth" (BRITO, 2001:215). In a world desperate for pluralism and understanding, I regard this as wise.

However, none of such questions may diminish both the originality, richness and relevance of Jorge Antunes' work. It can even be argued that the amazing scope of his production is in itself quite plural. I myself am indebted to his *chromophonic* insights, which inspired my own *chromossonia* theory (BASBAUM S., 2002). Certainly, mystical aspects of his work give to it a mystical touch which is characteristic of most synesthetic art developed before contemporary times, and even in many multisensory works in digital culture: most of these works seemed to evoke a lost unity of cosmos and perception, both fragmented in Modern times. Above all this, his chromophonic compositions stand still, on their own feet, as compelling, consistent, and truly immersive sensual experiences: great works of art created in our times.

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REFERENCES

ANTUNES J. (1982), *A correspondência entre os sons e as cores*. Thesaurus.

ANTUNES J. (org.) (2002), *Uma poética musical, brasileira e revolucionária*. Sistrum, Brasília.

BACIGALUPI D. (curator) (1994), *Synesthesia: Sound and vision in contemporary art*. San Antonio Museum of Art, San Antonio.

BARBOSA S.H. (2007), "Del Romanticismo al simbolismo. Orígenes del pensamiento sinestésico em las artes". *Actas del II Congreso Internacional de Sinestesia, Ciencia y Arte.* Fundación Internacional Artecittà, Granada.

BASBAUM R. (2006), "Within the organic line and after". In ALBERRO A., BUCHMANN S. (eds): *Art after Conceptual Art.* MIT Press.

BASBAUM S. (1999), *Fundamentos da cromossonia – Sinestesia, arte e tecnologia.* Dissertação de mestrado. Pontifícia Universidade Católica, São Paulo.

BASBAUM S. (2002), *Sinestesia, arte e tecnologia – fundamentos da cromossonia*. Annablume / FAPESP, São Paulo.

BASBAUM S. (2005), *O primado da percepção e suas consequências nos ambientes digitais.* Tese de doutorado. Pontifícia Universidade Católica, São Paulo.

BASBAUM S.(2012), "Sinestesia e Percepção Digital". *TECCOGS*, Número 6, Janeiro - Julho/2012. http://www4.pucsp.br/pos/tidd/teccogs/artigos/2012/edicao_6/9-sinestesia_e_percepcao_digital-sergio_basbaum.pdf

BOUSSEUR J-Y. (1993), *Sound and the visual arts*. Dis Voir, Paris.

BOUSSEUR J-Y. (1998), *Musique et arts plastiques – Interactions au XXe Siècle*. Minerve, Paris.

BOUSSEUR J-Y. (1999), *Musique et beaux-arts*. Minerve, Paris.

BRETT G. (2004), *Carnival of perception: Selected Writings on Art*. Institute of International Visual Arts.

BRITO R. "Do moderno ao contemporâneo – o novo e o outro novo". In BASBAUM, R. (org.) (2001), *Arte contemporânea Brasileira – texturas, dicções, ficções, estratégias.* Contracapa, Rio de Janeiro, (pp 202-15).

BROUGHER K., Strick J., Wiseman A., Zilczer J. (orgs.) (2005), *Visual Music: Synesthesia in art and music since 1900.* (Catalogue) The Museum of Contemporary Art, Los Angeles.

BUSZAKI G. (2011), *Rhythms of the brain.* Oxford University Press, Oxford.

GUERRA DE ALMEIDA A. "Hombres tristes y sin título rodeados de pájaros en noche amarilla, violeta y naranja". In ANTUNES J. (org.)(2002), *Uma poética musical brasileira e revolucionária.* Sistrum, Brasilia.

JEWANSKI J. *Color Organs.* at http://www.see-this-sound.at/print/69 (non-dated)

KUBOTA M. "Incursões pioneiras de Jorge Antunes no domínio da aleatoriedade". In ANTUNES J. (org.) (2002), *Uma poética musical brasileira e revolucionária*. Sistrum, Brasília.

MARKS L. (1978), *The unity of the senses – interrelations among the modalities*. Academic Press, New York.

MARKS L. (2011), "Synesthesia, then and now". *Intellectita*, 2011/1, 55, pp 47-80.

MORITZ W. (1986), "Abstract Film and color music". In TUCHMAN M. (org.) (1986), *The spiritual in art: abstract painting 1890-1985* (catalogue). Los Angeles County Museum of art/ Abbeville Press Publishers.

SCHNEIDER, B. (2012), "Sobre olhos ouvintes e ouvidos videntes: uma estética midiática de relações entre som e imagem" (On Hearing Eyes and Seeing Ears: A Media Aesthetics of Various Relationships between Sound and Image. Translated by Sérgio Basbaum). *TECCOGS*, Número 6, Janeiro - Julho/2012. http://www4.pucsp.br/pos/tidd/teccogs/artigos/2012/edicao_6/4-sobre_olhos_ouvintes_ouvidos_videntes-birgit_schneider.pdf

VALLE, G. (2003), *Jorge Antunes – uma trajetória de arte e política*. Sistrum, Brasília.