



## Universidades Lusíada

Gonçalves, Clara Germana Ramalho Moutinho

### **"Breaking the cage" : tradition and innovation in Marcos Novak's architecture-music relationship**

<http://hdl.handle.net/11067/5949>

#### **Metadados**

**Data de Publicação**

2021

**Resumo**

This paper discusses how tradition and innovation cross and confront each in the thought of Marcos Novak and in his ideas for a new architecture - liquid architecture - which is conceived as a hybrid discipline, which he calls archimusic and which emerges from the fusion of architecture and music....

**Tipo**

bookPart

Esta página foi gerada automaticamente em 2024-04-27T06:43:10Z com informação proveniente do Repositório

# “Breaking the cage”: Tradition and innovation in Marcos Novak’s architecture-music relationship

Clara Germana Gonçalves

Faculdade de Arquitectura e Artes da Universidade Lusíada de Lisboa / Centro de Investigação em Território, Arquitectura e Design (CITAD), Lisboa, Portugal

This is an Accepted Manuscript of a book chapter published by Routledge/CRC Press in Tradition and Innovation on 2021, available online: <https://www.routledge.com/Tradition-and-Innovation/Monteiro-Kong/p/book/9780367277666>

# “Breaking the cage”: Tradition and innovation in Marcos Novak’s architecture-music relationship

Clara Germana GONÇALVES

CITAD, Universidade Lusíada, Lisbon, Portugal /ISMAT, Portimão, Portugal /ATINER, Athens, Greece

E-mail: claramoutinho@gmail.com

ORCID: 0000-0002-1236-5803

## Abstract

This paper discusses how tradition and innovation cross and confront each in the thought of Marcos Novak and in his ideas for a new architecture - *liquid architecture* - which is conceived as a hybrid discipline, which he calls *archimusic* and which emerges from the fusion of architecture and music.

**Keywords:** Architecture-music relationship, Marcos Novak, archimusic, liquid architecture

## 1. Architecture and music

Throughout the 20<sup>th</sup> century, and in particular, in recent decades, several architects have manifested a desire (an ancestral desire from the point of view of the classical tradition in architecture, though now assuming different designs) of creating a relationship between architecture and music. Associated with that desire is another one: that of finding epistemological unity. There are different approaches to this question in addition to the intimate relationship between architecture and music: a relationship between architecture and science, as is the case of Steven Holl (b. 1947) and Daniel Libeskind (b. 1946); and between architecture, music, and science, as is the case of Marcos Novak (b. 1957), to name just two. It is through this relationship between architecture, music, and science, and using the example of music that Marco Novak has reflected on the future for architecture. (Gonçalves, 2008)

In reality, the genesis, development, and dissolution of the relationship between architecture and music are related to science. One could refer here to a trilogy of architecture-music-(science)mathematics. Ever since Antiquity, this relationship, first put forward by Pythagoras (ca.570-ca.500/490 BC), has been a presence, one referenced by many thinkers – by Plato (428/7-348/7 BC), Vitruvius, (ca.80/70 BC-ca.15 BC), Saint Augustine (354-430 AD), Boethius (470/75?-524), Saint Bernard (1090-1153), Saint Thomas Aquinas (1224/25-1274), Alberti (1404-1472), Daniel Barbaro (1513-1570), Zarlino (1517-1590) and Palladio (1508-1580), to name the most important of them. This relationship was based on the idea that the work of art should reflect God’s wisdom; accordingly, the work itself should be a *microcosmos* conceived as an image of the *macrocosmos*. During the Renaissance, the idea that

architecture should follow music – or rather harmony/theory of music – as in music the cosmic laws were revealed – was fervently recommended by Alberti, Barbaro, Palladio, and others. In the 17<sup>th</sup> century, in particular, with Claude Perrault (1613-1688), this link began to weaken, and the relationship between architecture and music became somewhat more superficial; it even disappeared altogether, to some extent. The following centuries were, in this respect, marked by a certain degree of resistance (as is the case of Nicholas-François Blondel (1617-1686), Charles-Étienne Briseux (ca.1680-1754), Jean-Philippe Rameau (1683-1764) (See Pérez-Gómez, 1990), but the link between the two disciplines was almost definitely lost. However, in the 20<sup>th</sup> century, several authors – amongst them more architects than musicians, but including some thinkers from outside both disciplines, such as Paul Valéry (1871-1945) – began to look again at this ancient relationship. Le Corbusier (1887-1965) is a very well-known example, as he reveals in his writings on Modulor or in his partnership with Iannis Xenakis (1922-2001). (Gonçalves, 2008)

Raul Lino’s (1879-1974) thoughts on this matter, which are of interest here both because he was an outlier in Portugal and his thoughts were paradigmatic, reflect on the abstract link – the emergence of laws on the forms inherent to each of the disciplines – which always united architecture and music. He distances them, on the one hand, in terms of their formal expression down through history –despite possible affinities, there is no reason to expect synchronic correspondence

between Architecture and Music (Lino, 1947, p. 17)<sup>1</sup> –, but also unites them in terms of both their essence and their structure:

Every work of art is a victory of the mind over matter. But Music is a winged Victory, like the Victory of Samothrace, that roams the spaces of sidereal time in all directions, while Architecture is like the Apterios Nike of the Greeks, forced to trudge the ground, and follow the slopes of terrain. (Raul Lino, 1947, p. 45)<sup>2</sup>

Where the analogy manifests itself is in the formal part of the two arts, whose structures are remarkably similar. To begin with, both dispense with extrinsic motives. Architecture is “musicized” using only its own intrinsic elements, and Music is also shaped exclusively by its particular architecture. So, there is this perfect parallelism of metric and rhythm translated to space and time; it is the correlation between the two: design<sup>3</sup> – melody, color – timbre, proportion – harmony.

So, one can say that Architecture is Music executed in the space and that Music is Architecture built in time. (Lino, 1947, pp. 52-53)<sup>4</sup>

Coming from another generation, Spanish architect José María García de Paredes (1924-1990) follows the same line of thought:

I believe that an architect has to feel very at home amongst musical themes, as these themes from the Arts, Music – the ordering of sounds in time – and Architecture – the ordering of matter in space – have many areas of affinity and contact. There is also the fact that both are creations that are abstract by their very nature, based on strictly physical and mathematical concepts and laws, the execution or interpretation of which is carried out by persons other than their creators. For this reason, both the musician and the architect use mediums that are parallel in terms of expression – the score and the plan – the development of which, up until reaching the instrumental “*particelle*” and the detailed blueprints of the execution project, reaches truly extraordinary points of similarity. (García de Paredes, 1986, pp. 16-17)<sup>5</sup>

Daniel Libeskind does not typify the relationship between the two areas and accepts the multiplicity of aspects under which the relationship can be seen. For Libeskind (p. 51), the relationship between architecture and music is extremely profound, as it is exceedingly difficult to imagine. For this reason, most people think that either it does not exist, or it exists only from the conceptual point of view. Libeskind argues that it is neither solely conceptual nor merely practical. In his opinion, if music is connected to immateriality, to a lack of tactile vestiges, and architecture to weight, to mass, to public activity, then it is that polarity

that has led different authors to think about which of the two influences the other.

Steven Holl can be presented as a paradigm of the contemporary architect who, alongside his incessant quest for new design concepts, new methods, new idioms, new building processes, still has the “classic” ambition of steeping architecture in an ideal conceptual context, at times marked by the symbolic, which corresponds to a desire (in fact: desire and manifestation) to treat knowledge as a whole. Multidisciplinarity, as an adopted method, is amply known. Nevertheless, it takes the universalist ambition out of architecture (Holl, 2006, pp. 174-175). Here one can name a few other aspects that all contribute to this debate: using an illustration of Kepler’s (1571-1630) cosmological model, published in *Mysterium Cosmographicum* (1596), Holl proposes what he terms a “thought-to-feeling bridge” (Holl, 2006, p. 144); in explaining his design for Pace Showroom (New York, 1986), he uses the word counterpoint (Holl, 1991, p. 91); he designed the Stretto House (Dallas, USA, 1991) based on Béla Bartók’s (1881-1945) Music for Strings, Percussion and Celesta (1937) (Holl, 1994; widely published); drawing an analogy between space and light, he proposes the equation material x sound/time = material x light/space (Holl, 1994, p. 56); in the chapter titled “Working with doubt” in *Parallax* (Holl, 2006), where one of his thoughts is to consider that allowing for differing possibilities in architecture calls for open thinking, comparable to the new science, Holl illustrates this idea with scores by John Cage (1912-1992) and Cornelius Cardew (1936-1981).

Although there are changing variables, two essential lines emerge in understanding the parallelism between architecture and music. One relates to the structural and compositional aspects of which the connection to mathematics is an integral part – to conceptual aspects and the very definition of both disciplines; the other compares aspects related to the presentation and perception of the two disciplines – i.e., it relates to materiality. It is the former that has been shaped by the long tradition that dates back to Antiquity and carries most of the theoretical corpus on the theme of architecture-music. Whilst there is no vast or consolidated body of literature on this subject matter, several authors (as mentioned above) have devoted some attention to it (Gonçalves, 2008).

## 2. The role of mathematics

In the article “Computation and Composition,”<sup>6</sup>

<sup>1</sup> [Free translation]

<sup>2</sup> [Free translation]

<sup>3</sup> Note that the English term *design* is more comprehensive than Portuguese *desenho*.

<sup>4</sup> [Free translation]

<sup>5</sup> [Free translation]

<sup>6</sup> One should point out that the term “composition” is in itself elucidative. It can be used for the two realities – architectural and musical – simultaneously. Whilst it is not common in Portugal, the Spanish recognise Composition as a discipline.

Marcos Novak (1994b) relates, in a theoretical approach (while also explaining how he does this in the actual research he carried out), architecture and music from essentially two viewpoints: in the first viewpoint, a *modus operandi* that is very similar (if not identical), i.e., the same technique, is used in both disciplines, making them, from that viewpoint, almost indistinguishable; and in a second viewpoint, a dialogue in which each of the disciplines searches in the other for correspondences and the lack thereof, in the respective definitions and disciplinary statutes, in the related concepts and jargon and also in the respective forms of evolution. If from that dialogue new perplexities and possible new forms of evolution emerge, the relationship as a whole – *modus operandi* and the dialogue – will give rise to a new discipline to which Novak gives the name of *archimusic*.

In the common *modus operandi*, Novak uses L-systems, isosurfaces, and numeric fields. The operations that take place in this *modus operandi* – which are common to both architecture and music – are constituted from matrices of two and three-dimensional numbers. Mathematics, which here presents itself as an intermediary discipline between architecture and music, is involved in this process; it does not have a symbolic or ordering character<sup>7</sup>, but an instrumental character<sup>8</sup>. These are ideas that are indeed subjacent to the article's title ("Computation and composition"). The term computation assumes that mediatory character and composition the indication that the author does not differentiate architectural "practice" from musical practice.

Novak's "design" method is based on a structure of parameters: the measurements of the various entities are in relation to and dependent on each other (it is not about defining measurement a, b or c, but the relationships between the respective measurements). And he evokes Grecian temples as an example of the construction based on parametric design. (Novak, 2006, p. 24)

In establishing the dialogue, the close relationship between architecture and music, which has been thus developed, through mathematics, he can refer back to the Pythagorean/Platonic tradition, even if he does not share its metaphysical or symbolic character. In the text "Breaking the Cage," Novak (1994a) stresses the fact that whilst the architecture/music relationship has long-

established origins, if one is to reflect on it then it is necessary to take into account the changes that have since taken place:

When I speak of architecture and music, I am not evoking the ghosts of Pythagoras and Palladio, nor am I referring to the ideal, a *priori* order of the "Music of the Spheres," or some kind of facile superficial architectural and musical impressionism or expressionism. I am interested in architecture and music as grounds for the present and poetic processes for the making of the future; especially in those areas that are just now opening to examination. I am not interested in the stable core of the known, but in the turbulent edge of the barely conceivable. (Novak, 1994a, p. 69)

And he stresses the idea that:

Xenakis claims that we are all Pythagoreans. Perhaps this is so, since we are obviously still enamored with numbers. Most of our conceptions about the relationship of architecture and music are remnants of Pythagorean belief. The most prevalent conception is concerned with the static balance of fixed, perfect parts, eternal because desiccated, desiccated because imagined to preexist in an ideal, immaterial world. (Novak, 1994a, pp. 69-70)<sup>9</sup>

### 3. "Breaking the cage": *liquid architecture* and *archimusic*

Novak justifies the choice of music: "[M]usic has reinvented itself in far more profound ways than architecture dared" (Novak, 1994a, p. 69).

For Novak to speak of architecture and music at this stage in the history of music is to issue a challenge to architecture, for it implies that architecture must confront itself, find a parallel to music and do better than each of the emancipations that music has seen, thus preparing itself to go beyond its own conventional definitions, just as music did in the 20<sup>th</sup> century. One must ask architecture:

[w]hat does it mean to carry architecture through a parallel series of emancipations? What is the architecture of dissonance? What is a stochastic architecture or an architecture of non-intention? And if these are the questions that have already been grappled with, what are the questions still to come? (Novak, 1994a, p. 70)

It is fundamentally important to forget the law of gravity, which has been the backbone of architecture down through history. (Novak, 2006, p. 24)

Novak (1994a, p. 69) believes that not only has music reinvented itself in much more profound ways than architecture has ever dared, but it has

<sup>7</sup> Just as one continued to use it during the 18th and 19th centuries, when mathematic rules no longer represented any form of connection to nature or any other manifestation of a transcendental nature, but they did have in common with that other perfect world the desire for and distrust of ordering. (See Pérez-Gómez, 1999)

<sup>8</sup> See note 7.

<sup>9</sup> Xenakis (1971, p. 73) declared: "We are all Pythagoreans."

also evolved and left many concepts behind. To associate architecture with music under the auspices of the Pythagorean/Platonic tradition is to associate it with a cadaver of a cosmological musical tradition that is long since dead. The history of music tells of many fundamentally important emancipations that took place in the 20<sup>th</sup> century: the emancipation of the dissonance, with Schoenberg (1874-1951); the liberation of sound, with Edgard Varèse (1883-1965); the emancipation of stochastic music, with Iannis Xenakis (1922-2001); and the emancipation of the non-intention, with John Cage (1912-1992). Long before architecture began discussing the notion of the *fold*, Pierre Boulez (1925-2016) wrote, in a musical setting for a poem by Stéphane Mallarmé (1842-1898), *Pli Selon Pli* – literally ‘ply upon ply’ or ‘fold upon fold.’ In 1958 John Cage composed *Fontana Mix*, the score for which consists of several transparent and independent levels of lines, points, curved lines, and surfaces rearranged for each musician. Years later, Bernard Tschumi (b. 1944) designed the Parque de La Villette (1982-1988) using a series of independent levels of points, lines, and surfaces. (Novak, 1994a, pp. 69-71)

Technology also went through significant developments: in terms of height, one evolved from the tonal to the chromatic, from the tone to the semi-tone, to the quarter-tone and any fraction of the octave; as far as duration was concerned, one could go as far as 1/48,000s; in terms of intensity, one could go from pianissimo to a 20bit resolution (roughly 1 million possibilities in between silence and maximum intensity). These aspects meant that traditional music theory became obsolete, not least because it was no longer possible to apply it to the vast majority of audible sounds. (Novak, 1994a, p. 70)

Novak (2006, p. 24) refers to the specific case of Iannis Xenakis, who, when he composed music on computers, challenged music itself. This is what Novak aims to do in relation to architecture: “compose architecture with computers” and challenge architecture itself, i.e., the very definition of architecture.

By adopting science and technology, music confronted and attempted to resolve the problems generated by this situation long before

architecture. These are the reasons that lead Novak to argue that one should try to understand the future of architecture through the present-day situation music is in.

Novak understands that we are at the dawning of the era in which architecture will liberate itself from the matter; because, in its true essence, architecture transcends matter; the intuition that still allows us today to see architecture as “frozen music.”<sup>10</sup> or music as “molten architecture,” comes from that ancient and profound understanding, that, in essence, architecture is more than construction and music more than sound. In this aspect, again, according to Novak, music, and in particular, music composed on a computer, has a lot to teach this new “liquid and gravity-free architecture.” (Novak, 1994b, pp. 64-65)

Liquid architecture is an architecture that breathes, pulses, leaps as one form and lands as another. Liquid architecture is an architecture whose form is contingent on the interests of the beholder; it is an architecture that opens to welcome me and closes to defend me; it is an architecture without doors and hallways, where the next room is always where I need it to be and what I need it to be. (Novak, 1992, p. 272)

Architecture, in turn, will give back to music its most significant challenge – emancipation from sound<sup>11</sup> and, accordingly, linear time – thus inspiring “new navigable music of places.” (Novak, 1994b, pp. 65-66)

The notion of “liquid architecture” is linked to his type of built design by means of an algorithm with control parameters, meaning that when something is changed in one entity, then the rest is also changed. More than just the object, one designs the process that is to generate that object. One can say that it is more process design than object design *per se*. According to Novak, it all has to do with a precise understanding of the notion of proportion. A design<sup>12</sup> cannot be just anything, it must have specific relationships (2006, p. 27)<sup>13</sup>. This is an idea that also harks back to the idea of composition. In other words, in the final analysis, one has returned to Raul Lino’s reasoning: by associating harmony and proportion (see above).

Novak (2006) proposes a transfer of domains. He understands the two disciplines as having been constituted in space and time, with space dominating in architecture, and time in music. In

<sup>10</sup> Whilst it has been widely spread, and attributed to Goethe (1749-1832), the true authorship of this expression is not clear. According to Hugh Honour (1979, p. 119), the idea spread from Germany to the rest of Europe via Mme de Staël (1766-1817). The original expression in German was *erstarrte Musik*, which literally means frozen or petrified music. Schelling (1775-1854) used it at a conference in Berlin in 1802, though it was not published until 1859. In a notebook Friedrich Schlegel (1772-1829) also described, around 1800, architecture as *eine musikalische Plastik*. The term *gefrorene Musik* was first

used by a newspaper in Berlin in 1803, in a satirical way. It was Mme. de Staël who first used Schelling’s expression in London, but to express her doubts about it. The term entered the English language via Byron (1788-1824), who mentions it in *The Bride of Abydos* (1813).

<sup>11</sup> So, Novak establishes the correspondence between matter and sound and, upstream of that, space and time.

<sup>12</sup> See note 3. Interesting how the vocabulary itself induces the search and questioning of concepts.

<sup>13</sup> [Free translation]

other words, architecture built in matter, and music in sound. What Novak proposes is that in architecture space (where the matter materializes) be annulled and instead dominates time and, vice-versa, in music time (where the sound materializes) be annulled and instead dominates the space. It makes no difference if one is dealing with architecture, music or sculpture, or anything else. It is all a continuum (Novak, 2006, p. 36).

Using precisely the relationship between architecture and music, Novak wants to liberate both disciplines, and architecture in particular, from the strong tradition in which they are based. In fact, his aim is not only emancipation from tradition but also a disciplinary redefinition that erases the boundary that exists between the two.

Together, architecture and music will stand as the arts closest to the functioning of the human cognitive and affective apparatus. The computer will act as the bridge allowing us to truly enter the intimate structures of the two arts for the first time. In dataworlds, buildings flow, and music is inhabited. Architecture and music are bonded into a new discipline: archimusic. (Novak, 1994b, p. 66)

The proposals put forward by Novak are worthy of immediate reflection. Amongst others, the usual questions arise: is unbuilt architecture not also architecture? Are drawings architecture? In this specific case, are the objects that Novak creates in his virtual world architecture? It is also pertinent to ask in relation to music: is a piece of music that, whilst written, has never been heard, still music? Generally speaking, is it necessary for something to be concretized in real life for it to *be*? Whilst opinions diverge, it would seem from the outset easier to accept the unperformed musical piece as music than to accept that a set of drawings that did not give rise (at least as a possibility) to a built work as architecture. This question undoubtedly has to do with the issue of reproduction in both disciplines. This reasoning also brings one to ask the question: has the idea of the need for construction in architecture, not more to do with the visual than with the act of construction itself? In other words, it questions the primacy of the visual (for which the underlying idea was that of architecture as one of the “fine arts” (an idea that emerged in the 17<sup>th</sup> century) where the visual character superseded the intellectual exercise). Let us turn to the case of the musical piece. If a particular piece was never premiered, does that mean it is not a piece of music? It would seem that architecture has a greater need to be “built” than music does to be “played.” And yet another argument: is it possible to compose a piece of music with ultrasounds even though the human ear can never hear it? Is that music? Or is a piece of architecture built with non-

visible materials (for example, gases) architecture? Novak aims at a gravity-free architecture. Proceeding from the notion of gravity, one could ask: what is “musical gravity?” Disappearing in time? Sound gravity... Novak “constructs” virtual objects that are not subject to gravity. In music, today, one can (cannot?) play a sound without anyone being able to hear it.

Novak (2006, p. 36) invokes Aristotle (384-322 BCE), who was able to build a taxonomy while living in a world without categories of knowledge. A taxonomy that is, in Novak’s opinion, problematic – even though all modern universities still use it in their organization. He calls attention to the fact that even though the divisions are convenient, the world is much more fluid than the system recognizes. It is necessary to find a way to challenge the structure. The divisions that exist are epistemological; it is the structure of the present. Something is missing in that structure that has to do with the issue of proportion. A dynamic model that sees everything in a continuum; proceeds from anything we know and from poetics (*poiesis* (2006, p.30)). It is the missing element in the universal structure. To try to organize ourselves in a world that is not taxonomic but is in constant change, the strategy of which is to make things, put them into the world.

A fundamental issue emerges here: do material incapacity (to materialize), and human incapacity (to learn from the senses) impede or prescribe the creative act?

Constructing gravity-free architecture, just like composing a piece of music where space is the medium, would seem, from the outset, to be impossible. Novak speaks of “creating worlds” (2006, p. 35); worlds lived in through virtual reality. For him (2006, p. 24), the “electronic space” is “meaningful and valid.”

Some new paths are now opening up for architecture. The conventional architectural theories<sup>14</sup> are already being questioned as new technologies such as three-dimensional scanning, volume rendering, particle-based prototypes are developed. And if the traditional theories do not accommodate these new possibilities, they will do so even less for future developments.

One can say that Novak’s stance is similar to that of Schoenberg – who Novak greatly admires – when the latter recognizes that his knowledge derives from tradition and then negates tradition without failing to underline that it is precisely in tradition that his capacity to challenge it resides.

I am convinced that eventually people will recognize how immediately this ‘something new’ is linked to the loftiest models that have been granted us. I venture to credit myself with having written truly new music,

<sup>14</sup> Note that the author refers to the theory with a technological slant. The changing in paradigm referred to

by Pérez-Gómez (1999). The connection to mathematics is not metaphysical but technological.

which, being based on tradition, is destined to become tradition. (Schoenberg, 1975, p. 174)

Hanno-Walter Krufft reminds us that for Saint Augustine, “music and architecture are sister arts, both based on number: ‘They have forms, because they have numbers’” (Saint Augustine as cited in Krufft, 1994, p. 36).

#### 4. Tradition and innovation

Novak’s admiration for Xenakis is also an impulse to go beyond his work. To follow music – as recommended by Alberti or Palladio, during Renaissance – may be seen as a tradition. Using technology to innovate is also an old-fashioned idea. But, how to innovate otherwise.

Tradition and innovation appear in Novak’s thinking as things that are linked to each other but need to be continuously renovated. Strangely enough, this reasoning is not uncommon throughout history: after all, and paradoxically, to be modern is a tradition, and tradition first emerges as something modern. Schoenberg has written about this theme (see above).

Perhaps the most audacious of Novak’s ideas are, on the one hand, the challenge to look at architecture from outside the discipline, and try to find new paths towards the future; and on the other, to envisage other epistemological paths that support these ventures into the future, and believe in them.

## Acknowledgments

This paper was funded by National Funds through the FCT – Foundation for Science and Technology, under Project UIDB/04026/2020

## Bibliographical References

- García de Paredes, Jose M<sup>a</sup>. (1986). *Paseo por la arquitectura de la música* [A walk through the architecture of music]. Madrid: Real Academia de Bellas Artes de San Fernando.
- Gonçalves, Clara Germana. (2008). *Arquitetura: Diálogos com a música: Conceção, tradição, criação*. [Architecture: Dialogues with music: Conception, tradition, creation] (Unpublished doctoral thesis). Escola Técnica Superior de Arquitectura, Universidad de Sevilla, Seville, Spain.
- Holl, Steven. (1991). *Anchoring: Selected projects 1975-1991*. New York: Princeton Architectural Press.
- \_\_\_\_\_. (1994). Stretto House. *Pamphlet Architecture*. Architecture as a translation of music [Special issue]. Martin, Elizabeth (Ed.). (16), 56-59.
- \_\_\_\_\_. (2006). *Parallax*. New York: Princeton Architectural Press.
- Honour, Hugh. (1979). *Romanticism*. New York, N.Y.: Harper & Row.
- Krufft, Hanno-Walter. (1994). *A History of architectural*

- theory: from Vitruvius to the present*. New York, N.Y.: Princeton University Press.
- Libeskind, Daniel. (2001). *The space of encounter*. London: Thames and Hudson.
- Lino, Raul. (1947). *Quatro palavras sobre arquitetura e música* [Four words on architecture and music]. Lisboa: Valentim de Carvalho.
- Novak, Marcos. (1992). Liquid architectures in cyberspace. In M. Benedikt, M. (Ed.), *Cyberspace: First steps* (pp.272-285). MIT Press.
- \_\_\_\_\_. (1994a). Breaking the cage. *Pamphlet Architecture*. Architecture as a translation of music [Special issue]. Martin, Elizabeth (Ed.). (16), 69-71.
- \_\_\_\_\_. (1994b). Computation and composition. *Pamphlet Architecture*. Architecture as a translation of music [Special issue]. Martin, Elizabeth (Ed.). (16), 64-67.
- \_\_\_\_\_. (2006, Outubro). Da arquitetura flutuante à produção do extraterrestre: Entrevista a Marcos Novak [From floating architecture to the production of the extra-terrestrial: Interview with Marcos Novak]. *Nada*, (8), 21-37.
- Pérez-Gómez, Alberto. (1999). *Charles-Etienne Briseux’s musical analogy and the limits of instrumentality in architecture*. Lincoln, Nebr: The University of Nebraska-Lincoln.
- Schoenberg, Arnold. (1975). National music. [1931] In Leonard Stein (Ed.), *Style and Idea: Selected writing of Arnold Schoenberg* (pp.172-174). Berkeley and Los Angeles, Cal.: University of California Press.
- Xenakis, Iannis. (1971). *Musique, Architecture*. Tournai: Casterman.