Alessandra Capanna

Research

Via della Bufalotta 67
00139 Roma ITALY
alessandra.capanna@uniroma1.it

Keywords: music, architecture,
Daniel Libeskind, Bela Bartók,
Steven Holl, Peter Cook, Ernest
Bloch, golden section

Music and Architecture: A Cross between Inspiration and Method

Abstract. This paper is one of a set of lessons prepared for the course of “Theory of Architecture” (Faculty of Architecture – “La Sapienza” University of Rome). The didactic aim was to present – to students attending the first year of courses – some methods for the beginning stages of design and their applicability to any kind creative work. The brief multimedia hypertext quoted at the end of this paper was carried out in collaboration with the “LaMA” (Laboratorio Multimediale di Architettura) as a test for new educational tools applied to first our “e-learning” experiences.

Introduction

The analogies, coincidences, affinities and bonds existing between architectural and musical compositions have been the object of research since ancient times. Traveling through the history of this theme is very interesting, especially when it is possible to identify the social and cultural aspects that are interpreted in the different forms of composition: pictorial, poetic, musical and architectural. In this regard, for those who are interested in the study of the ways in which the contemporary architect works, one question appears central: How do projects (often very well known and in some way part of the collective cultural memory) that are explicitly declared to derive from musical pieces, pursue that intent? The academic approach seems to fluctuate between scientific operative methods and an aesthetic method, where a subdivision between the practical and theoretic spheres is still acceptable.

A study structured in this way is part of a larger reflection on the critical reading of an architectural project aimed at decoding the graphic signs and their motivations, expressed or implicit, conscious or unconscious, which are part of a group of symbolic memories and of intermittent recollections of the most powerful icons of our academic formation. The same symbols also belong to other fields of knowledge, and the capacity to de-codify them globally is part of the architect’s long formative journey. Hypothetically, this journal is never-ending, in that it does not simply constitute a basis of indispensable knowledge for the architect in training, but becomes an essential part of the development of each individual architect’s personal way of working, and of how abstract ideas are translated into the concrete spaces of everyday life.

The goal of this present paper is to study three works of architecture that explicitly refer to works of classical musical rather than to vaguer generic principles of harmony and musicality, for which a serious comparative analysis becomes more difficult. Each of the three works takes a different approach to its particular musical theme.

Music as Inspiration

Daniel Libeskind’s analytical work operates in the field of architecture’s second invariant, defined by Bruno Zevi as the study of asymmetry and dissonance that is realized

in the conscious application of a design method which results, on one hand, from the illogical chains produced by liberal associations of the mind and, on the other, from the logic of the deformation as a singular case of the variation of the composed theme, of the topological order, of the deconstruction. A direct consequences of this is what is defined as a rarefaction or dissolution of the architectural sign, which in reality leads to an abstraction that is often extreme, but also to a closure that architecture shares with all other forms of artistic expression.

The consequential and inevitable reduction to silence in “compositional writing” has been compared to other, more recent musical forms where the paroxysmal crescendo of the sound are contrasted by sudden long pauses, both metaphoric expressions of the contemporary condition. These concepts may be expressed in a slightly cryptic way in a collection of drawings that Libeskind entitled “Chamber Works”,¹ in the same cryptic way that some contemporary scores adopt a system of notes without the staff.

Fig. 1. Chamber Works, drawing by Daniel Libeskind [1983]. Image courtesy of Daniel Libeskind

The title “Chamber Works” in itself evokes a “chamber architecture” in the same way in which we might speak of “chamber music”, a complete composition in all its parts, realized through the use of a reduced number of elements, only those absolutely necessary to give body to the logic of the written text. The two series of these drawings, the horizontal and the vertical, form a continuum of graphic inventions that Kurt W. Foster [Libeskind 1991] defines as “spatial music”, a kaleidoscopic collection of lines and symbols that represent the same double axial structure of sounds; melody and/or chords, horizontal and/or vertical structure, regulated by the common principle of liberal variation (fig. 1).

This methodological process, experimented in the pictorial form in “Chamber Works”, is also applied in the project of the extension of the Berlin Museum with the section dedicated to the Jewish Museum Department [Libeskind 1992], where even in a constructed architecture the permanence of a design idea derived from the chance vicinity of apparently heterogeneous graphical points, is realized.

The topological deformation of the six-pointed star in the plan of the Berlin museum, the figure that generates the idea of the place, is the Star of David, transformed from a neutral symbol of religious faith into the memory of the holocaust through the alteration of the traditional geometry. This star, disjointed and no longer recognizable, becomes the path through the museum (figs. 2, 3, 4, 5).

Fig. 2. Aerial model of the extension to the Berlin Museum with the Jewish Museum Department. ©SDL. Image courtesy of Studio Daniel Libeskind

Fig. 3. Plan view of the model of the extension to the Berlin Museum with the Jewish Museum Department. ©SDL. Image courtesy of Studio Daniel Libeskind

Fig. 4. Realistic zinc model of the extension to the Berlin Museum with the Jewish Museum Department. ©SDL. Image courtesy of Studio Daniel Libeskind

Fig. 5. Topological transformation of the Star of David in the plan of Libeskind's Berlin Museum with the Jewish Museum Department. Drawing by the author.

The non-musical realization of the word as used by Schönberg, would be the respective voice of the non-architectural symbol as experimented in “Chamber Works” and reiterated in the Berlin extension, both burdened by numerous symbolic accents, both relative to each composed construction in itself and involving the destiny of the artistic expression in a more general sense, as well as in the interpretation of the theme of remembrance.

In this particular case, the architect quite diffusely recounted (see, for instance “Between the lines” in [Libeskind 1997]) all the reflections and personal studies on the musical work that he transferred to the project. Therefore, the physical space and sound are in a reciprocal relationship because the one inspired the other, even if it depends on constitutive laws that are not easily shown to correspond, with the exception of the particular association of the deconstructive style with the dissolution of the order introduced by the dodecaphonic music. This is not so much a generic study of chaos as it is an interpretation of disharmony as a new order, different from that of the classical order where harmonic laws dominate.

Music as Image

Peter Cook is the author of design experiences imbued in ideals that began with the historical group Archigram.

In the early 1980s he was involved in transferring the graphic form of Ernest Bloch’s concert for violin into the composition of the plan of an ideal city:

A simple exercise was the interpretation of a piece of a violin concerto by Ernest Bloch. Not a piece that I know, but one that looked tempting on paper. The notes become towers, the staff becomes a street, the supporting markings become walls. Around the time, I had set a series of short projects for students on idea of “music” as a direct architecture ... [Cook 1992].

Fig. 7. Bloch City with towers arranged on musical staves. Image courtesy of Peter Cook

Fig. 8. Street view of Block City. Image courtesy of Peter Cook

Fig. 9. The measures of the concerto by Bloch that provided the layout for Peter Cook's Bloch City.
Image courtesy of Peter Cook.

The notes on the staff represent the planimetric position of tall cylindrical skyscrapers while the musical lines are the urban highways of the "great march" [Cook 1985] (figs. 7, 8, 9).

As support for the melody, the extension of the staff is virtually infinite, and represents the basis of the fluent character of verbal and sound expression: it provides a road in space and time to the completion of the musical experience.

The spatial and temporal continuation, acquired in architecture as an evolution of perspective representation that fixes only an instant of the perception, is commonly obtained by using the composed figure of a path along which knowledge of space is accumulated as a succession of events. Rather than an indistinct, empty place, the road is the urban connection that confers continuity even in the presence of strong discretizing elements of caesura.

Bloch City's urban highways are three parallel staffs, cut diagonally by a fourth that appears as a link with some other place outside this system, which remains open and extensible both in the horizontal direction for its possible transcription of the whole concert, but also in the vertical, hypothesizing the representation of the entire polyphonic body of the orchestra.

From the geometric-mathematical point of view, we can see that internally the system is entirely lacking in continuous solutions, while it tends toward an external left and right limit with regard to the written beginning and end of the physical space, represented by silence.

The substantial disregard of this project for the natural and, in the final analysis, hypothetical context, strongly underlines the idea that the musical *continuous* and the spatial *continuous* of architecture both have the same nature, described by the same discrete graphical elements, by the same punctuation marks, by the same syntactic colouring. This is evident in this case because the project re-proposes an identical architectural and musical graphic composition, but it also makes a limit case evident in the correspondence that is obviously realized in the common compositional writing in both fields by using the traits that are characteristic of each.

The dividing "bars" of the beats are represented as bridges, rhythmic separations that acknowledge the units of space and time by establishing a correspondence between the musical measure – the beat – and the formal urban unit – the neighborhood.

The notes are re-interpreted as towers in a knowing formal transposition: it is in fact possible to note that this concert piece is full of chords and triplets that constitute the vertical structure or harmony of the text. In contrast to the continuous horizontal movement of the melody, even from a figurative point of view, Bloch City's tall buildings clearly represent the vertical aspect of harmony; they also reproduce the tall building's discrete and punctual form and the notes united in chords.

The symbol of expression repeated on all the accompanying chords (left hand of the script for the piano, lower staff in the figure) indicates a *tenuto* sound, meaning that the notes have to be held for the entire length of its value and also slightly accentuated: this fact highlights a formal discontinuity in the execution on the piano of a succession of harmonic sounds which is well expressed in the project of the isolated figures of cylindrical towers whose form, other than being the same as the notes in their modern representation – no longer quadrangular as is found with the ancient *neum* – is, in itself, closed, repelling, concluded; they do not formally admit any continuity with other geometric figures.

The connecting symbol, superimposed on the staff, is the indication that reunites this discontinuity, denoting the need to "play" the indicated piece as a whole. The continuous linear buildings, containing offices and studios that trace the form and the position of the buildings are therefore syntactically and formally precise.

Music as Method

This line of study, undertaken on an ideal level by Peter Cook, bringing suggestive ideas that derive from other horizons to the field of architecture, is also pursued and verified in the concrete reality of Steven Holl's construction in a home in the green country spaces of Texas that interprets the continuous and discontinuous tonal properties of the horizontal and vertical structures.

The Texas Stretto House condenses the temporal and spatial scansion of one of Bèla Bartòk's most singular concerts, "Music for String Instruments, Percussions and Celesta" [Bartòk 1937] (fig. 10).

The composition in four movements presents a clear distinction between heavy, discontinuous percussion elements and the lighter string elements, where sound flows without interruption.

Fig. 10. Bars from "Music for String Instruments, Percussions and Celesta" [Bartòk 1937]. Mirrored form. Drawing by the author

The building, made up of four distinct yet related parts, represents the structural co-presence of alternating heavy and light elements: heavy orthogonal walls, primarily containing the service areas, and light curved metallic roofs connecting them.

The inversion of the theme in the work by Bartòk, not so much for the *fugata* structure as for the tonal substance, is the beginning of the second movement; the violins assume a discrete character with their *pizzicato*³ entrance, while the piano, a chord instrument that is struck, comes in with a melodic phrase, connected; an inversion which is well expressed in the guest house, an autonomous volume where the walls become soft, curved, continuous, while the roof becomes heavy and material.

However, these perceptive similarities are only the most evident traits of a precise, constant and knowledgeable transcription of the musical work into the architectural design, a composition where the opposing themes of continuity and discontinuity are already expressed in their entirety in the first movement, and are repeated obsessively (and on different levels) throughout the course of all four movements.

It is interesting above all to observe how the *stretto* modality is pursued by sliding the entrances of the *fugato* theme up until the re-uniting finale.

For the entire length of the piece, the *fugato* style is manifested with an increasing intensity up until the entrance of the celesta, an architectural instrument which Bartòk used to explore compositions regulated by the golden ratio, to arrive at a successive, sudden

decrease in the intensity in the finale, where the theme, only slightly modified, is presented in a mirrored form, going back to the original tonality.

The Stretto House travels the same temporal and spatial course: the sliding of the entrances can be read in the passages created in the walled masses; the architectural thickening of the central part corresponds to the orchestral thickening/broadening obtained by the gradual entrance of an ever increasing number of instruments; the central insertion in one of the most intense movements of the physical image of the harmonic relationships that define the cut of the windows in the two lateral views, recalls the entrance of the celesta where the tonal passages are of interest – the “distances” between one note and another – corresponding to the measure of the geometric relationships that run between the rectangles set in the windows (fig. 11).

Fig. 11. Comparison of Bartók's specular composition and Holl's Stretto House.
Drawing by the author

The rapid emptying of the built masses that ends with the symbolic hollowness of the last patio on the top floor, where a pool and a flooded room completely reflect the thematic structure, giving an identical ending to the composition. The final walled element visualizes the others, imprisoned in the construction, and in its reflection, it depicts the theme in its entirety.

Formally, the internal construction of the two works are of great interest, because they are both proportioned according to the golden ratio (fig. 12).

The study of these harmonic measures runs throughout the entire oeuvre of Bartók and is identifiable in “Microcosmos,” an academic compilation for piano, as well as a particular exercise composed at various levels in “Music for String Instruments, Percussions and Celesta.”

The 89 measures in the first movement are divided in two golden segments: from the gradual crescendo, from the *pianissimo* in the beginning of the composition reaches the

fortissimo apex at the end of bar 55, to the *diminuendo* which leads to *pianissimo* after the last 34 bars, to the more internal subdivision in golden measures of the timbered pushing and releasing the *soft pedal*, executed in decreasing progression; bars 34-21, 21-13, 13-8.⁴

In Steven Holl's house, a first division in anthropometrical measures, (expressed in the foot/inch system), of the areas within the blocks of walls, is simply repeated in the voids and solids on both the ground and upper floors, and recalls the measures 21+13 feet that are typical of the Fibonacci series. A timbered internal division of the solids and voids of the main façade is easily deduced by the golden drafting process of the decomposition as studied in Hanning, known to us by the rich epistolary rapport with Le Corbusier. It is also possible to see a more general harmonic disposition of the glass walls composed of rectangular windows.

Fig. 12. Identification of the golden section in the plan and elevations of the Stretto House. Drawing by the author

A first effect is created by making the slight variations in the quota of the vertical section coincide with the inclines and declines of the *fugata*: this coincidence becomes rigorous by simply “counting” in the first passage, the different levels (that go up and down) from the entrance to the living room and the art gallery, and another in the second, in the interior where there is another inversion to reach the study/studio.

Even the voices, in the *fugata*, show an alternation of inclines and declines, in the entrances: the second, the fourth, the sixth and the eighth, ... each enters a fifth higher than the last, while the third, the fifth and the seventh, all go down a fifth.

Finally, the arrangement of the rectangular walls is not left to chance: the reciprocal position corresponds graphically exactly to the beat as it is found in the figure that is expressly cited by Steven Holl in a watercolour connected to this project.

The beat in question is an ulterior re-proposal of the main theme, performed in this case by the second cello.

There is one last observation to make regarding the superimposition of the longitudinal views of the curving roofs which lie on different floors: the figure reminds us of the composition of different musical phrases produced contemporarily by the various instruments. In the continuous counterpointing of the “Music for String Instruments, Percussions and Celesta,” the voices of different violins and other strings overlap, each occupied with the execution of its own piece. In the continuous counterpointing of the Texas house, the timbre of the architecture is realized synchronically as though to sew it back together using the symbolic roofs in the form of a musical bond made tri-dimensional; the relentless discontinuous presence of the walled boxes.

Multimedia Architecture⁵

We can see that the most evident characteristic linking the projects that have been discussed here is their close relationship to music. The nature of their reciprocal bonds, as well as the reasons behind their mutual connections, are quite diverse. They substantially belong to two broad categories. The first of these tends to establish similarities or even equivalents in the exterior expression by imitating the formal characteristics. It is therefore a form of translation from one language to another.

Instead, the second category contains works that acknowledge the same compositional rules. These are not always easily identifiable if the observation is limited to their exterior aspects, and because of this it is necessary to look deeper, at the compositional structure, ordering concepts, and structural logic, and to see if, and to what degree, these elements are the same in both the architectural and the musical works.

In the different cases, the cause of these correspondence is sometimes believed to depend on the mutual dependence of the logical/compositional structure deriving from mathematical laws, intended not so much as a body of rules aimed at calculation but as general criteria to give logical sense to the procedures of organized thought.

Each composition, whether it be musical, architectural, or artistic in the broad sense – comprising the most extreme fringes of abstractionism – consists in identifying one theme, in its simple or complex repetition, by using the technique of variation, in the intentional ordered or casual arrangement, continuous or discontinuous, of the different elements in the final constitution of this complex operation into an entity that is the complete work.

The physical effects, the similarities, are more immediately recognized than the demonstration of their logical, mathematical origins.

A very useful tool for this, but also for a more precise verification on what has been expressed here with concepts that are not always easily discernible, is the computer utilized to elaborate hypertext structures able to take advantage of its simultaneous potential and multimediality in the analyses of those architectural structures that may be defined as multimedia.

The musical pieces to which the designers refer are not always easily identifiable: we find ourselves in the position of having to accept the designer's declarations, which are sometimes full of poetic references.

The process of comparative analysis is therefore long and sometimes lacking in objectivity. The simultaneousness of seeing and hearing that which is created by a hypertext instrument is therefore necessary as a means of comparison.

This method has been adopted for the Texas Stretto House. The brief hypertext which was realized includes all of the elements of study identified, compared and described above with regard to Steven Holl's work (figs. 13, 14, 15).

The result seems more clearly exhibited, and most of all, accessible even to those who are not accustomed to staffs, eighth-, sixteenth-, thirty-second- and sixty-fourth-notes, to musical timbres and harmonic constructions, disharmonies, dissonance, thematic inversions, and all that is part of the musical lexicon. This form of expression is sometimes verbally very similar to that which is used in an architect's common language, rich in metaphors, metonymies, meta-languages and every sort of symbolism and speculation that tend to the limits of abstraction.

Fig. 13. Extracts from the multimedia analysis of Holl's Stretto House. Slide by the author

Fig. 14. Extracts from the multimedia analysis of Holl's Stretto House. Heavy elements – orthogonal brick walls – kettledrums. Slide by the author

Fig. 15. Extracts from the multimedia analysis of Holl's Stretto House. Light elements – metallic roofs – violins. Slide by the author

Notes

1. A set of twenty-eight drawings done by Daniel Libeskind while he was the head of the Architecture Department at the Cranbrook Academy of Art in Bloomfield Hills, Michigan.
2. The double identification of the reduction to silence by using the term "word", which in the German language is monosyllabic, is not banal. On one hand, the evident linguistic symbolism pursued in the reduction of the number and the variety of phonemes in a quantitative "diminuendo" expressed the impossibility to communicate, on the other, the analogy that is not exquisitely formal, but structural, with the way in which most of the musical compositions are concluded – defined by Libeskind as a reduction to silence – that often occurs by reiterating the note that returns to the tonal theme which alone, plays for the entire length of the last beats, tied into a singular, last and final afflatus.
3. The "Bartók pizzicato" consists of elevating the chord and then suddenly releasing it; the effect thus obtained is more intense than the light pizzicato that is commonly used by playing the chords of the strings as you would a guitar.
4. Explicit referral to the Fibonacci succession 1:1:2:3:5:8:13:21:34:55:89... is found in [Szabolcis 1956].
5. The multimedia presentation was a *Macromedia Director* production, originally created in 1995 with an Apple system Mac, now "unreadable", but "translated" into a more static *PowerPoint* presented at the recent conference "Sound and Image", Aula Magna in the Facoltà di Medicina, 30 May 2008.

References

- ALEXANDER, C. and P. EISENMAN. 1983. Contrasti sul concetto di armonia in architettura, *Lotus* 40. Architettura e musica. 1981. *Casabella* 473.
 Atti del Convegno "Musica, Spazio, Architettura". 1995. *Quaderni della Civica Scuola di Musica* 13.

- BARTÒK, Bèla. 1937. *Music for String Instruments, Percussion and Celesta* (score). Series: Philharmonia 201.
- COOK, P. 1985., Le laboratoire d'image. *Techniques & Architecture* **358**: 96-101.
- COOK, P. 1993. Six Conversations. *Architectural Monographs* **28**.
- DANDREL, L. 1990. Vers une architecture sonore. *Architecture d'Aujourd'hui* **268**.
- FUTAGAWA, Y. 1993. Steven Holl. *GA Architect* **11**.
- HOLL, S. 1993. Costruzione in quattro parti. *Lotus* **77**.
- KANDINSKY, W. 1979. *Point and Line to Plane*. New York: Dover Publications. (Original pub. *Punkt und Linie zu Fläche*, Weimar, 1923).
- LIBESKIND, D. 1983. *Chamber Works*. <http://www.daniel-libeskind.com/projects/show-all/chamber-works/>
- . 1985. Le traces de l'invisible. *Technique & Architecture* **358**.
- . 1991. Countersign. *Architectural Monographs* **16**.
- . 1992. *Extension to the Berlin Museum with Jewish Museum Department*. Berlin: Ernst & Sohn.
- . 1997. *Radix-Matrix*. Munich-New York: Prestel.
- MEYER, L.B. 1967. *Music, the Arts and the Ideas*. Chicago: University of Chicago Press.
- SNIJEDERS, C. J. 1985. *La Sezione Aurea. Arte, natura, matematica, architettura e musica*. Padua: Franco Muzzio.
- SZABOLCIS, Bence 1956. *Bèla Bartók, Sa vie et son oeuvre*. Budapest.
- XENAKIS, I. 2008. *Music and Architecture*. Sharon Kanach, trans. Hillsdale, NY: Pendragon Press.

About the author

Alessandra Capanna is an Italian architect living and working in Rome. She has taken her degree in Architecture at University of Rome "La Sapienza", from which she also received her Ph.D, with a thesis entitled "Strutture Matematiche della Composizione", concerning the logical paradigms in music and in architecture. She is the author of *Le Corbusier. Padiglione Philips, Bruxelles* (Turin, 2000), on the correspondence between the geometry of hyperbolic paraboloids and technical and acoustic needs, and its final and aesthetics consequences. Among her published articles on mathematical principles both in music and in architecture are "Una struttura matematica della composizione", remarking the idea of self-similarity in composition; "Musica e Architettura. Tra ispirazione e metodo", about three architectures by Steven Holl, Peter Cook and Daniel Libeskind; and "Iannis Xenakis. Combinazioni compositive senza limiti", taken from a lecture given at the Dipartimento di Progettazione Architettonica e Urbana at the University of Rome. She is teacher at the First Faculty of Architecture of Rome "La Sapienza". She has taken part to Nexus Conferences III and VI speaking about "Conoids and Hyperbolic Paraboloids in Le Corbusier's Philips Pavilion" (2000) and "BiOrganic Design. A New Method for Architecture and the City" (2006). She is a member of the editorial board of the *Nexus Network Journal*.