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Notre Dame du Haut, Ronchamp, the shape of a listening. A whole other generative hypothesis

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Abstract: *The article will examin one of Le Corbusier's more emblematic works: the Ronchamp Chapel. The aim is to discover some of the intentionalities hidden within the design of this work by the swiss architect. It will start with the following considerations of Le Corbusier about the Ronchamp chapel:"it began with the acoustics of the landscape taking the four horizons as a reference...to respond to these horizons, to accomodate them, shapes were created…" And: " Shapes make noise and silence; some speak and others listen..."And again: " Ear can see proportions. It's possibile to hear the music of visual proportion" (Le Corbusier).*

The article sustains that the church is nothing but a giant acoustic machine dedicated to Virgin Mary which main purpose is the listening of the prayers. Infact in the Christian religion Mary is the very vehicle between God and man , she has a human but also divine nature since she is the mother of Jesus. To get in contact with the divine it is necessary to pray Mary, she can listen to man's prayers but she can also pass down God's word to man. In support of this hypothesis there stands an analogy between the chapel's map and the image section of a human ear, highlighting the coincidence between the altar position and that of cochlea, which shape is so dear to le Corbusier that he makes use of it very often in his work.

Keywords: *Ronchamp; acoustic landscape; human ear, architecture as chrystallized music.*

> "*Why do I draw? And why do I teach drawing at the university? Because I express myself by drawing and so the first thing I teach my students is how to draw. "*
>
> *Oscar Niemeyer*

1. Introduction

As the author teaches drawing, there can be little doubt that he has come to view architecture from his own particular standpoint. Thus, he is convinced that architects, through graphic representation, not only express the process whereby their intentions take concrete shape, but also materialize certain assumptions about the meaning of their creative action, including the sources of inspiration and the *guiding ideas*, the doubts, the rethinking and the second thoughts. In this sense, the plan views, elevations, sections, perspective and axonometric projections, as well as the preparatory drawings and earliest sketches of the nascent idea, all help us – in a way that can be seen as essential – to understand the genesis and significance of the spatial solutions that are adopted.

The paper stems from a close observation of Le Corbusier's drawings of the chapel of Notre-Dame-du-Haut in Ronchamp and an analysis of his statements about this work. The result has been a sort of "vivisection" of the drawn object – on the architectural scale but also that of landscape –, looking for clues about what could have influenced the architect in the transition from the "intangible" idea, prefigured in the mind, and the "tangible" result that came into being on the sheet of paper.

In actuality, as was also the case in other circumstances,[1] Le Corbusier left some indications that can help us understand his work and the motives that inspired it. We will thus start from several of his writings linked to the chapel and the name of the site where it was built, before turning our attention to the building as drawn and the key to interpreting it.

2. Inspiration, listening, designing

Two months after Notre-Dame-du-Haut was inaugurated, Le Corbusier wrote: "*My inquiries into plastic form led me to see an* ***acoustic intervention in the domain of forms****. An implacable mathematics and physics can and should reign over the forms presented to the eye, … Their concordance, their repetition, their interdependence, and the spirit of unity or of family which binds them together to form an architectural expression, is a phenomenon which is as supple, subtle, exact and implacable as that of acoustics. I began with the* ***acoustics of the landscape,*** *taking into account the four horizons: the Saône plain facing the Ballons d'Alsace and the two small valleys on either side. I then created forms to respond to these horizons, to embrace them"*.[2] This was in 1955; two years later, he added: "***Forms create noise and silence; some speak, others listen"***.[3] Once again, as earlier for the Villa Savoye, the thinking of Paul Valèry resonates throughout Le Corbusier's reflections.[4] Indeed, Valèry's *Eupalinos* distinguishes buildings that are "muets" from those that are "parlent" and those that are "chantent": mute buildings are devoid of interest, those that speak only tell the story of why they were built, but those that can sing reveal their close relationship with their creator and the latter's capacity to represent himself in them.[5]

Proceeding obliquely, Le Corbusier links this meditation – all centering on an "environmental ear" in harmony with the "acoustic horizons" – with his cherished themes of the metaphysical and the divine. Were it not for the fact that more than thirty years had gone by since the interiors designed by Hermann Finsterlin, the chapel of Notre-Dame-du-Haut would make us think of a transposition in architecture of those organic spaces, which never got beyond the draft stage, that seem almost as if they "*emerged from nature or were exuded by man and developed, like the human body, from the body of being"*.[6] Like Finsterlin, Le Corbusier visualizes "*mental meanders which, like the ramifications of fluidifying ectoplasms, appear to be a paraphrase of the transmission of nervous energy"*,[7] but by contrast with the wild, animal nature of Finsterlin's sketches, Le Corbusier's references to the organic world do not seem to involve any desecrating tension.

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[1] For the Villa Savoye in Poissy, close scrutiny of Le Corbusier drawings of the plan view reveals the outlines of a woman's face, seen full on, the result of a unique repertory of sources of inspiration. In this connection, see: RIBICHINI, Luca. *Il volto e l'architetto*. Roma: Gangemi, 2008.

[2] LE CORBUSIER. "La chiesa di 'Notre-Dame-du-Haut' a Ronchamp". *Casabella-continuità*. 1955, n° 207, p. 7.

[3] Ibid. p. 89.

[4] For the influence exerted by Valéry's philosophy on the architecture of Villa Savoye, see RIBICHINI. *Il volto e l'architetto*, op. cit. and Chapter 2, pp. 41-58 in particular. Le Corbusier, in *Almanach d'une architecture moderne*, published in 1926, wrote that in *Eupalinos ou l'Architecte*, Paul Valéry "*as a poet, he has written things about architecture that a professional – whose lyre is not tuned to this music – could not say: he has felt and admirably interpreted the same profound and rare things that an architect feels when he creates"*.

[5] VALÉRY, Paul. *Oeuvres*. Vol. II. Paris: Gallimard, 1957-1960, p. 93.

[6] FINSTERLIN, Hermann. Nuovi scritti. In: BORSI, Franco. *Hermann Finsterlin. Idea dell'architettura*. Firenze: Libreria Fiorentina, 1969, p. 157.

[7] FAGIOLO, Marcello. *Architettura & Massoneria l'esoterismo della costruzione*. Roma: Gangemi, 2006, p. 372.

If, then, the architectural form is able to collect and transmit both light and sound, the chapel of Notre-Dame-du-Haut – as Ruggero Pierantoni maintained when he investigated the "sisterhood" of auditory and visual sensation[8] – is indeed capable of building "*a bridge cast between two ancient provinces of the spirit* [that of the acoustic forms and that of the forms of light] *kept apart for far too long by Pythagorean misconstruction"*.

In any case, as Frampton suggests, "*Le Corbusier's interest in the sculptural 'resonance' of a building with its site was first formulated in 1923, when he characterized the Acropolis and its Propylaeum by identifying the point 'in which nothing can be taken away, nothing can be left, if not these closely interlinked and intense elements which tragically ring crystal-clear like brass instruments'. This passionate description of the Acropolis, communicating a sense of unity just before being broken, constantly resurfaces all through his life and becomes increasingly imbued with pathos towards the end of his career. This was the concept behind the 'acoustic vision' in Ronchamp; it also inspired the shape of the miniature volcanos and mountains of the community facilities on the roof of the Unité"*.[9] It is perhaps in the name of an acoustic/visual device with which to shape the form of this construction in Ronchamp that the architect refers to an image of strong symbolic value, destroying "*rationalist principles, grammer and syntax. With a generosity unprecedented in history, he contradicts himself and his 1921 theories, the* pilotis *as a roof garden, the grid and the Modulor, he breaks rules and codes without replacing them, leaving his disciples Niemeyer, Candilis, Wogenscky and thousands of followers all over the world speechless and lost"*. [10]

What, then, could have been the design method that Le Corbusier used to develop such a unique idea? According to Danièle Pauly, [11] the sketches for Ronchamp contain the basic design idea *in nuce*. This probably depended on the fact that Le Corbusier's first visit to the site came long after he was assigned the project, and this was a sort of "incubation" period during which the process ripened and matured. Part of the architect's research took place during this incubation period, and was crucial in gaining a mastery of all of the problems involved. Thus, he collected information about the site, the pilgrimages, Marian devotion and Catholic rituals, elaborating them in more complex terms thanks to his grounding in sacred art and his discussions with the clergy. A true process of sedimentation that starts with the things seen and fixed in the mind through drawing: "*Once things enter through the tip of a pencil, they stay inside you for the rest of your life; written and inscribed. To draw something by hand, to follow an outline, to fill a space or understand volumes means, first and foremost, being able to perhaps observe, perhaps discover [...] and only then will the creative event take place"*. [12]

In designing, Le Corbusier uses many different sources of inspiration, from recollections of his travels, his own life or even ideas stemming from techniques that, once impressed in his memory through drawing, were transferred straight to the design, influencing it in unfathomable ways. As he himself wrote, the first step in this *acoustic intervention* was to find a way of transcoding visual form and audible effect. As in music, architecture which aspires to a connection with sound must rely on mathematical relationships, tutelary guardians of perfection and harmony. Indeed, Le Corbusier had long been convinced that: "*To recognize the presence of an acoustic phenomenon in the domain of form, we don't need to be initiated in the use of difficult words, but an*

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[8] PIERANTONI, Ruggero. *La trottola di Prometeo*. Roma-Bari: Laterza, 1996. Pierantoni discusses the *acoustique paysagiste* of the chapel in Ronchamp in his Chapter XLI, pp. 359-368, illuminatingly entitled *"... aussi subtil, aussi exact, aussi implacable que celui de l'acoustique…". Le Corbu, Encore, per cemento solo.*

[9] FRAMPTON, Kenneth. *Storia dell'architettura moderna*. 3ª ed. Bologna: Zanichelli, 1993, pp. 270-271.

[10] ZEVI, Bruno. *Il manifesto di Modena: Paesaggistica e grado zero della scrittura architettonica*. Venezia: Canal & Stamperia, p. 23.

[11] PAULY, Danièle. La cappella di Ronchamp come esempio del processo creativo di Le Corbusier. In: BROOKS, Harold Allen (a cura di). *Le Corbusier 1887-1965*. Milano: Electa, 1993, p. 164.

[12] LE CORBUSIER. *L'atelier de la recherche patiente*. Paris: Vincent Fréal & Cie, p. 37.

*individual who is sensitive to the things of the universe. **The eye can 'see' proportions. We can 'listen' to the music of visual proportions"**.*[13]

As we know, the design was developed starting from the plan view, which according to Le Corbusier is the force that generates all his architecture. As Francesco Tentori realized, in a letter written to Bruno Zevi in 1956, after a visit to the chapel: "here the *'borrowed form' […] has an inherent symbolic value. […] Further confirmation of the symbolism that pervades the chapel's entire architectural form is provided by the plan, which suggests **the image of a bell or, perhaps, that of a human ear"***:[14] an immense white cement ear thrown on the ground and, moreover, showing "*a curious insistence on certain anatomical details"*[15] since the altar is at the very spot where, if a line is drawn across the face at the level of the ear, the cochlea is located. As for the profile adopted for the roof to ensure stable statics, Le Corbusier tells us that he was inspired by the organic form of a crab shell – picked up on a beach Long Island in 1947 and kept along with other *objets trouvés* – whose structural strength he had tested by standing on it with his full weight.

3. El juego del revés…

In ancient times, the Bourlémont hill – exactly where Le Corbusier built the chapel of Notre-Dame-du-Haut in 1955 – was dotted with pagan temples. Later, during the Roman occupation of Gaul, it became the site of an army camp. The existence of this settlement suggests an explanation of the place name "Ronchamp", as deriving from the Latin *Romanorum campus* and its French version "champ des Romains".[16]

Bearing this in mind will help us understand the logical structure of the complicated *"backwards game"* whereby Le Corbusier seeks to give shape to the "aural" space of Notre-Dame-du-Haut, which would otherwise remain undescribed, perhaps to some extent because of a code of architectural representation that is better suited to visual experience than to hearing. Indeed, it was not until much later that ideas about the audible dimension of architecture, as an esthetic component of the built space or even as a "design material" began to circulate,[17] first stemming from John Cage's "visual scores" and then, in the Seventies, culminating in Raymond Murray

[13] LE CORBUSIER. *Modulor 2*. Boulogne-sur-Seine: Éditions de l'Architecture d'Aujourd'hui, 1950, p. 154.

[14] TENTORI, Francesco. "Le Corbusier e Picasso (lettera a B. Zevi)". *L'architettura – cronache e storia*. 1956, n° 6., p. 808. The author would like to thank Prof. Antonella Greco for drawing his attention to this work.

[15] PIERANTONI, *La trottola di Prometeo*, op. cit., p. 368. This was also taken up and analyzed by other authors. In particular, see: PETRILLI, Amedeo. Le traiettorie acustiche di Le Corbusier. In: MAZZOCUT-MIS, Maddalena (a cura di). *Immagine forma e stile*. Milano: Mimesis, 2001, pp. 215-231; PETRILLI, Amedeo. *Acustica e architettura. Spazio, suono, armonia in Le Corbusier*. Venezia: Marsilio, 2001; FIOTTI, Francesco. "Multiversi. Percorsi possibili fra spazio e suono". *Le Carré Bleu*. n° 2. 2007, p. 52-53.

[16] From the 7th century onwards, the site was dedicated to the Marian cult, and in particular to the Birth of the Virgin Mary. The most reliable information, however, dates only to the 13th century, when the site, already a popular place of prayer, finally became a place of pilgrimage. In 1944, German bombs severely damaged the church on the site, which had in turn been built on the ruins of another chapel destroyed by fire in 1913. The Diocesan Commission for Sacred Art in Besançon decided to build a new chapel and commissioned Le Corbusier to draw up the plans. In addition to the 200-seat chapel, the commission also included landscaping the surroundings to accommodate the flow of approximately 12,000 pilgrims normally expected during the two most important Marian feast-days: August 15 (feast of the Assumption) and September 8 (feast of the Nativity).

[17] Though as Roberta Lucente argues: "*The question of the relationship between Music (as formally structured and codified sound) and Architecture (as formally structured and codified space) has arisen periodically since the earliest times, at the critical, methodological and creative levels, and has been marked by occasions and works that can be taken as milestones for measuring the distance between the two spheres at the time in question"* (LUCENTE, Roberta. "Suono e architettura: isomorfismi e nuove aperture disciplinari". *Le arti del suono*. 2013. n° 7, p. 13).

Schafer's theories of the *soundscape* and the acoustic life of a community.[18] And right in the middle of a book that Le Corbusier wrote, and sent to press, to celebrate the inauguration of the chapel, we find the following exhortation, enigmatically combining music and architecture: "*Observe the play of shadows, learn the game … Precise shadows, clear cut or dissolving. Projected shadows, sharp. Projected shadows, precisely delineated, but what enchanting arabesques and frets! Counterpoint and fugue. Music, great music! Try to look at the pictures upside down, or on their side. You will soon discover the Game!"*.[19]

Only if we accept this invitation will we be given the key, the fundamental key, to understanding Le Corbusier's design. At the time of his first visit to the site at Ronchamp, in fact, he wrote: "*June 1950. I spent three hours on the hill to get a feel for the land and the horizons: I let it all soak in. The bullet-blasted chapel is still standing"*.[20] Perhaps inspired by the site's name, which seems to have been guessed in a sort of backwards charade from "Champ des Romains", where the place name *ron-champ* is morphed from the earlier, popular form *rom-champ*, the architect organizes a game that is not all that different from the game mentioned a moment ago – Le Corbusier's attention to the names of his creations is well known –, to invite the viewer to turn the blueprint on its side, or even upside down, so as to be able to read the space's audible characters that otherwise would risk remaining unexpressed.

At this point, Tentori's suggestion that the chapel's floorplan recalls the shape of a bell or perhaps a human ear, takes on new vigor and force. "*It is in the figurative arts – i.e., pure creation – that I find the lifeblood of my architecture"*,[21] as Le Corbusier loved to repeat. And so, when presented with his client's requests, he responded in his usual way by turning the spatial dynamics that were to give character to the church into basic elements. At this point, the question is whether the immense stylized ear lying on the hillside in Bourlémont is or is not the result of an organic approach to the spatial design of the church in which the architect uses forms "shaped" with heterogeneous techniques rather than "planned" with the canonical methods of design. If, as Le Corbusier maintains, architecture develops from the floorplan, we still have to understand why the plan of Notre-Dame-du-Haut seems to coincide perfectly with the cross section – the coronal section – of part of the face at ear level, thus emphasizing the mechanical organs of hearing. The floorplan is oriented according to the cardinal points and, from west to east, shows remarkable analogies first with the form of the external part of the right ear, then its canal, and finally the spiral shape of the cochlea.[22] This is the exact point where the main altar is located: the fulcrum on which contact between human beings and the heavens turns, the channel through which man's words ascend to God and the word of God descends to earth.

And it is the word of God, or rather, His voice, that Western culture and Christianity associate with the sound of the bell.[23] It is no coincidence that the *Poème électronique* – the composition on which Le Corbusier collaborated with Edgar Varèse in 1958 and whose initial sequence is emblematically entitled "Genesis" – opens with a tolling bell, as sound, the "beginning of everything", is the element from which all of creation originates.[24]

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[18] SCHAFER, Raymond Murray. *Il paesaggio sonoro*. Lucca: Ricordi e LIM Editrice, 1985, p. 285.
[19] LE CORBUSIER, *Ronchamp*. Milano: Edizioni di Comunità, 1957, pp. 46-47.
[20] Ibid. p. 155.
[21] JENGER, Jean. *Le Corbusier. L'architettura come armonia*. Torino: Electa Gallimard, 1997, p. 89.
[22] The sense organ that converts sounds from the outside world into nerve impulses which it transmits to the brain.
[23] As Saint Pope John Paul II said, "*The church bells remind us not to forget that Sunday is the Lord's day; they represent the 'voice of God' for those who believe and are a message for those who do not believe. It's so beautiful to hear the sound of the bells that sing the glory of the Lord to all creatures. […] Each of us bears a very sensitive bell. This bell is called the heart. The heart plays a sound and I hope that your heart will always play beautiful memories"*.
[24] Indeed, our universe began with a sound, the colossal explosion that was the "Big Bang".

In the process of creating Ronchamp, the bell also played a fundamental part, with its richly evocative symbology. Thus, there is reason to believe that Notre-Dame-du-Haut sprang from two primal ideas: the *bell*, a shape for housing the sounds and harmony of creation, and the *ear*, an organ for listening to an audible environment, and even to the voice of God. Just as happens in our own psyche,[25] the two shapes have fused as they constructed each other, each with the other's aid, creating an architectural image in which we can still see the tracks[26] of both shapes; to discover them (as the architect suggests) all we need to do is "play" with the floorplan, looking at it upside down, or turning it on its side. It is as if Le Corbusier had set in motion a procedure where he watches a form take shape without intervening, or only taking very limited action, but doing so with the help of an expressive toolkit based entirely on the discipline of architectural representation.

4. Musical facades

One last word – but no less important for all that – should be devoted to the facades of Notre-Dame-du-Haut. While it is true that this church is an immense ear, reclining on the ground to listen to the voice of God, it should also not surprise us that the space also calls to mind a massive pipe organ (a great musical and harmonic machine), where the functional element of listening is preeminent, and the facades, or rather, the openings in the facades, are the expression of a fully-fledged study in musical composition.[27]

Ranged across the facades, these openings recall the perforated roll used in player pianos between the late nineteenth and early twentieth centuries, while the elevation as a whole is reminiscent of a sheet of music, notes writ large on the surface of the walls. Starting from this simple observation, we traced a map of the many openings in the wall, to piece together the musical score they represent.

This musical map of the facades has a parallel in the experiments conducted in the Fifties by the composers Edgard Varèse and Karlheinz Stockhausen; nor must we forget the revolutionary work with the sounds of nature by John Cage and Buckminster Fuller. In this new system of expression, musical notation had abandoned the usual coded marks on the staff in favor of a new mode of representation. Thus, in 1953, Stockhausen's *Kontra-Punkte No. 1 for 10 instruments* identifies the notes with "sound points", apparently isolated, and assigns a different color to each instrument (bars 148-198): green for the flute, sky blue for the clarinet, light blue for the bass clarinet, orange for the bassoon, dark blue for the trombone, red for the violin, purple for the cello. Black is for the piano, which covers all the registers, grey for the harp, and so forth.

Accordingly, after mapping the "openings" on the chapel walls, we arranged them in a grid with time on the abscissa (*x*) and the height of the musical notes on the ordinate (*y*); taking a diagram of the piano keyboard as a

[25] Here, images overlap, often merging and mixing, fusing and confusing, resulting in what Sigmund Freud described in 1930 as: "*a stratification that is the memory, or rather, the story that each of us constructs about a given place*" (FREUD, Sigmund. *Il disagio della civiltà e altri saggi*. Torino: Bollati Boringhieri, 2012, pp. 204).

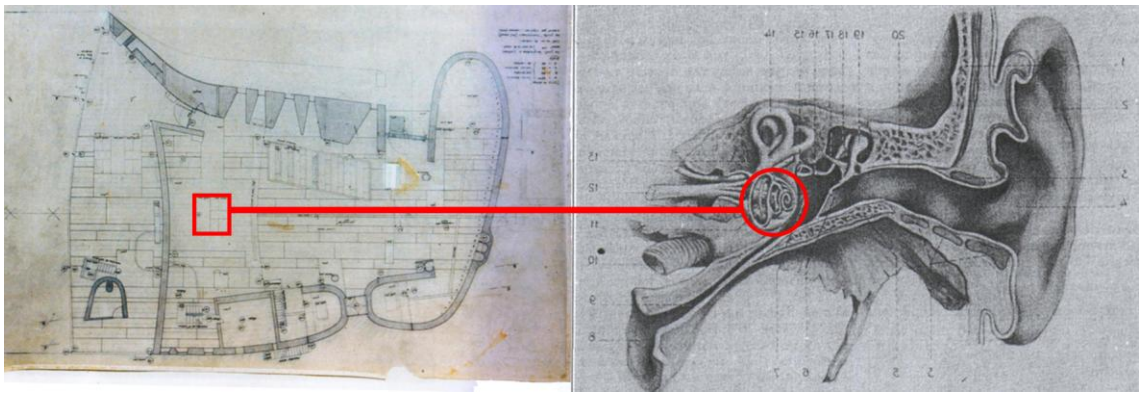
[26] The track, or more specifically the impression, is inherent to the concept of individuality. Through a track, or in other words the marks left on the ground, we can identify an unknown subject. We could thus think of the sound of the bell as the first track – the opening notes, recorded acoustically and then allowed to germinate architecturally – that presented itself to Le Corbusier during his first visit to Ronchamp: "*I remember that June 4 was Sunday, the Lord's day, when the bells ring out in celebration"* (LE CORBUSIER, *Ronchamp*, op. cit., p. 89).

[27] A suggestion in this connection comes to us from Johan Wolfgang Goethe – a major influence for the Bauhaus's experiments in design – who, in a letter dated March 23, 1829, wrote to his friend Johann Peter Eckermann: "*I found a note among my papers: in it I defined architecture as crystallized music. And there is some truth in this; the atmosphere that emanates from architecture comes close to the effect of music"* (TROCON, Renzo. *Johan Wolfgang Goethe. La teoria dei colori*. Introd. di Giulio Carlo Argan. Milano: il Saggiatore, 1987, p. 185).

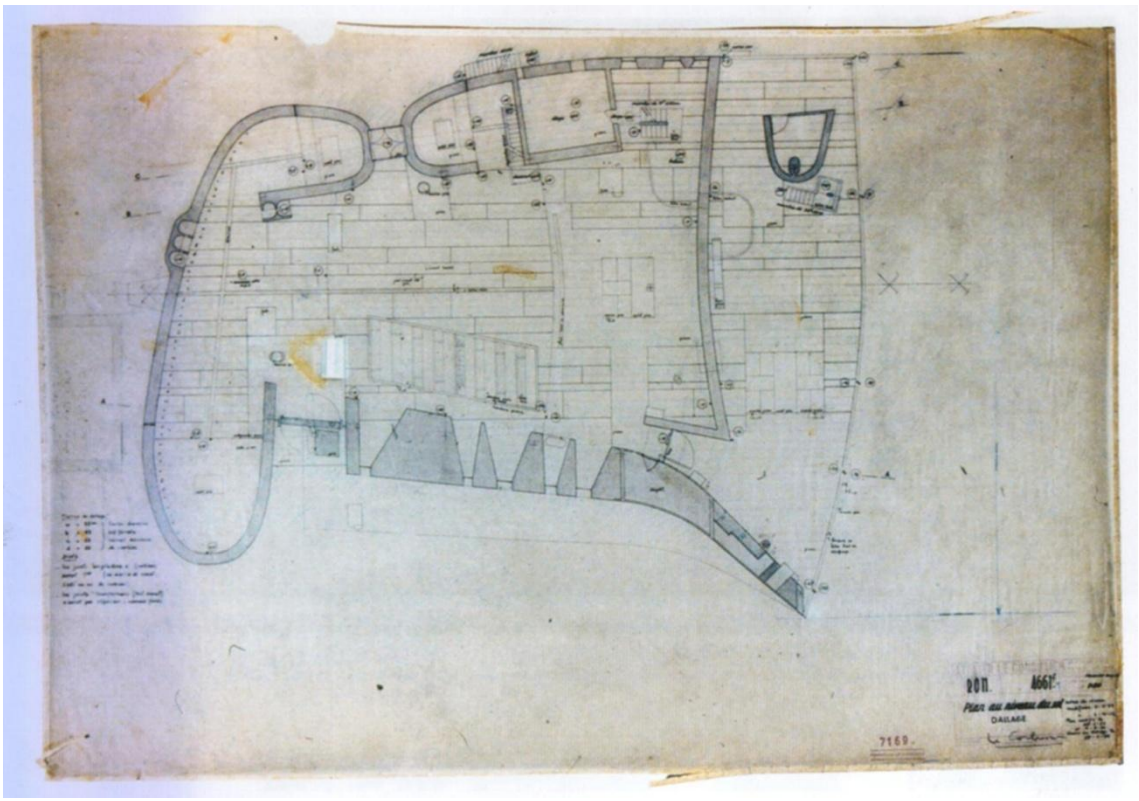
reference, the horizontal grid was divided into half notes with a range of around eight and a half octaves. This information was then entered into modern music software, obtaining a result in line with the musical trends current at the time the chapel was designed in the 1950s.

Though the investigation in this area continues, the findings so far permit us to state that – as was to be the case for the Philips Pavilion at Expo ’58 in Brussels – Notre-Dame-du-Haut not only acts as the sounding box for the tones that arise inside the chapel, but is itself the origin of the sound; almost as if to testify that architecture and music can coincide in harmony.

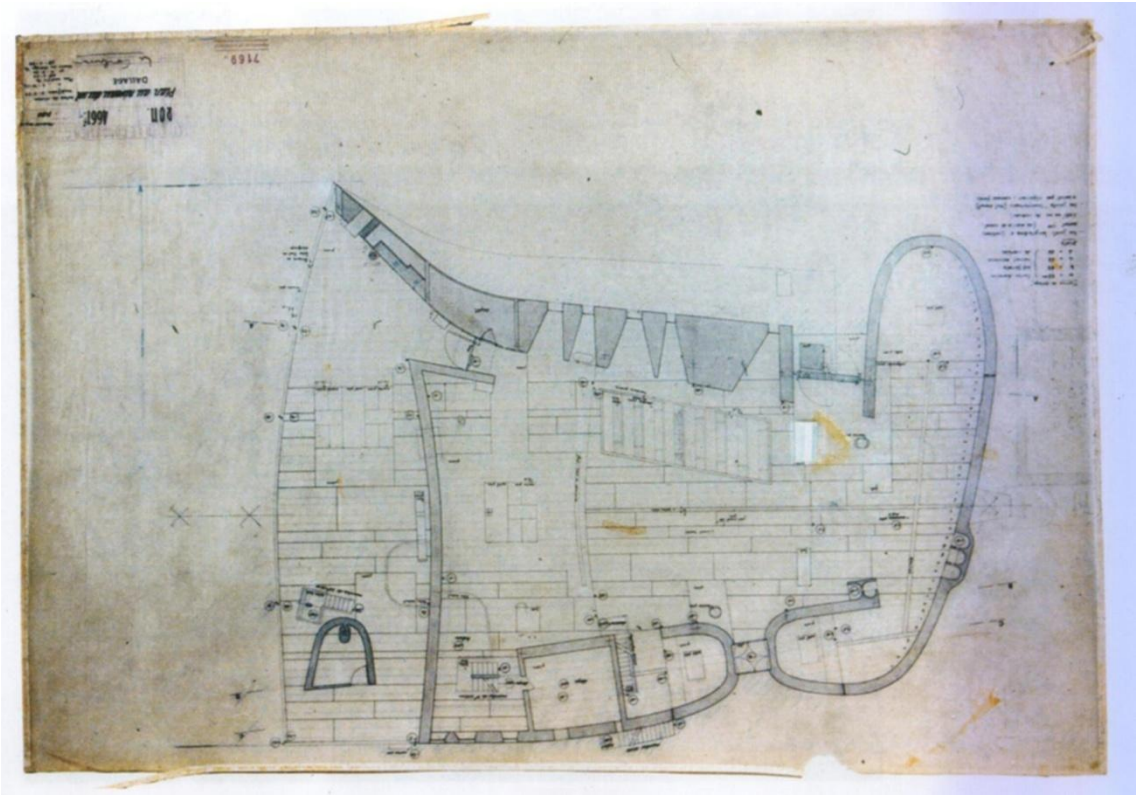
5. Images



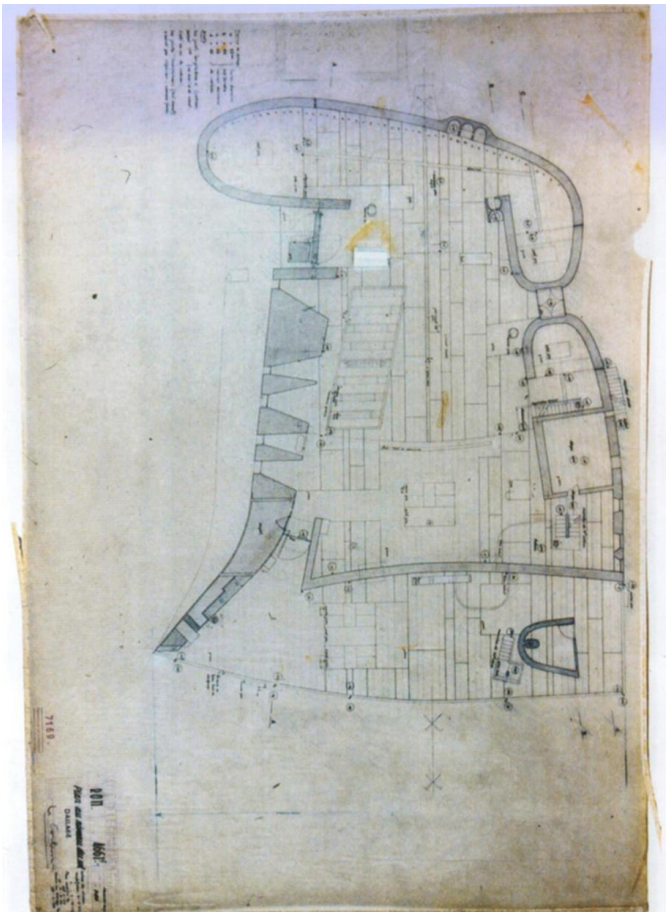
0. FLC7196 - Parallels between the architectural organism (the floorplan of Ronchamp) and the organ of hearing. Note that the position of the altar, where prayers are received, coincides with that of the cochlea, where sound impulses are received.



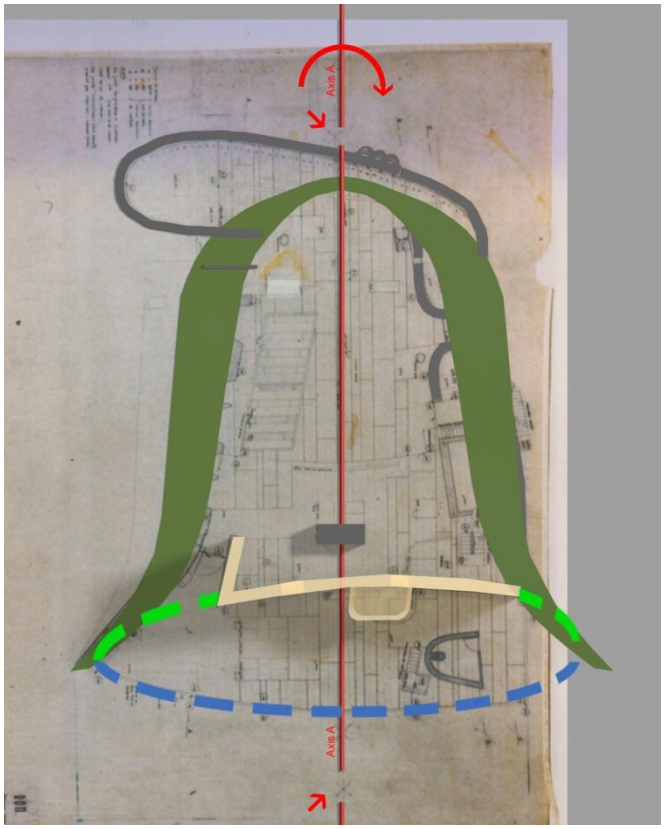
1. FLC7196 - Floorplan of the Ronchamp chapel, in the correct viewing position with the title block on the right.



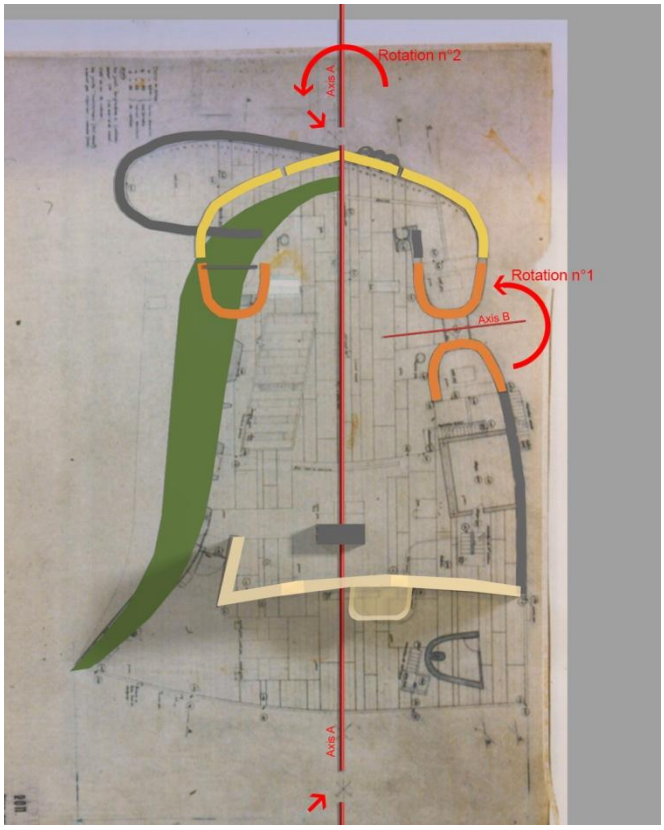
2. FLC7196 - Floorplan turned upside down.



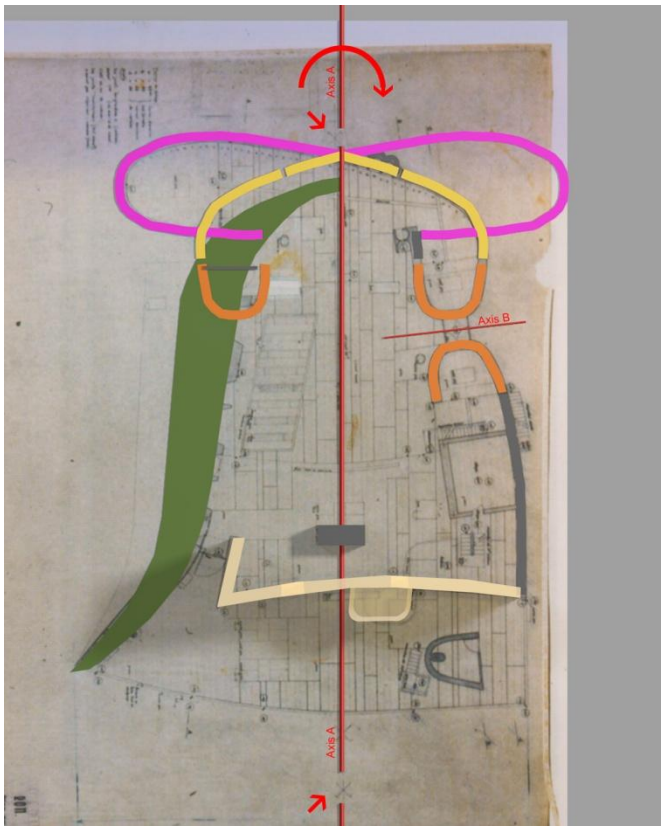
3. FLC7196 - Floorplan turned on its side (bell)



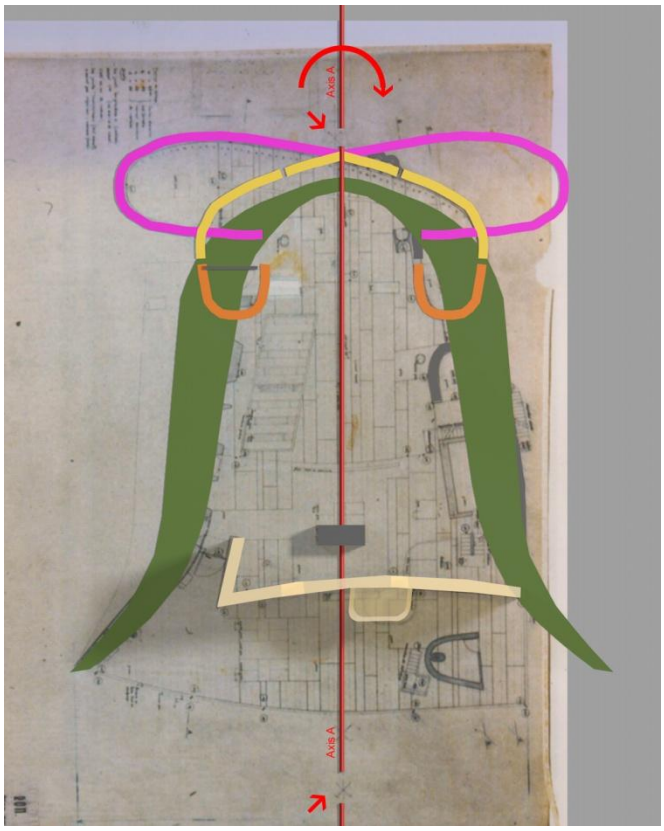
4.1 Rotation around the axis A



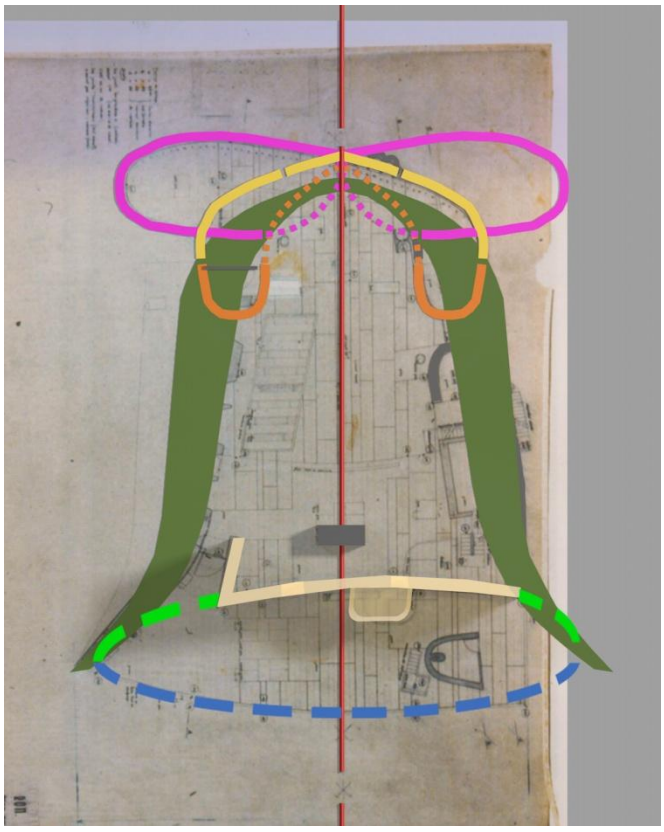
4.2 Rotations around the axis A and axis B



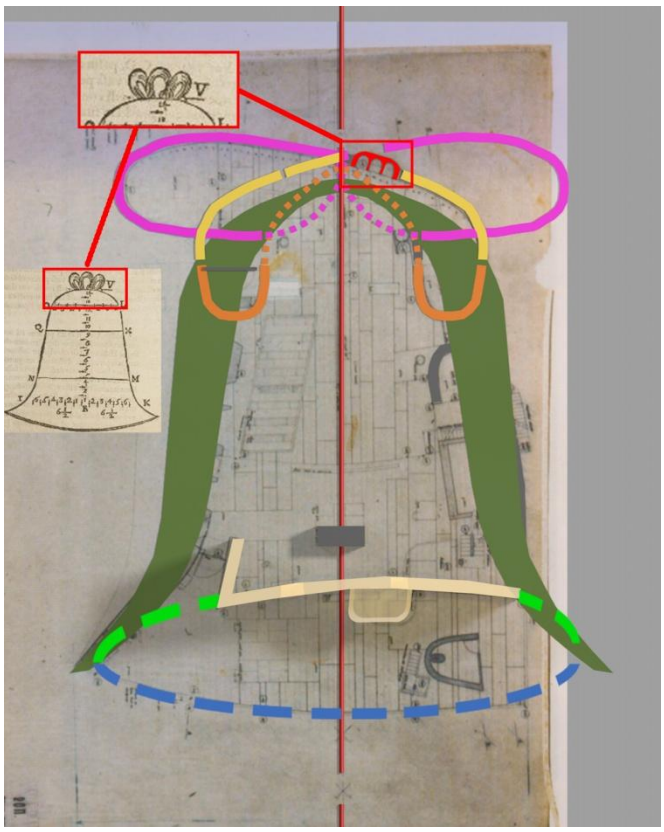
4.3 Rotation around the major axis



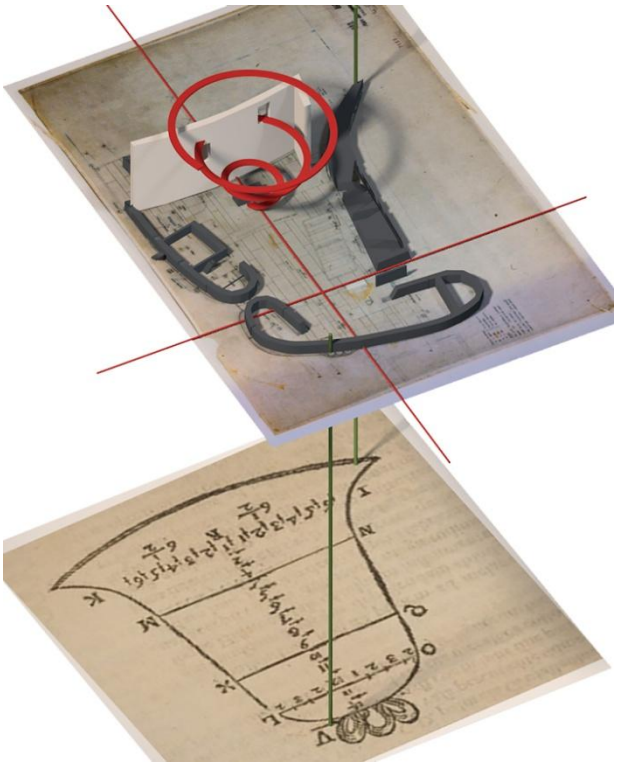
4.4 Rotation around the major axis (suggestion of shape of bell)



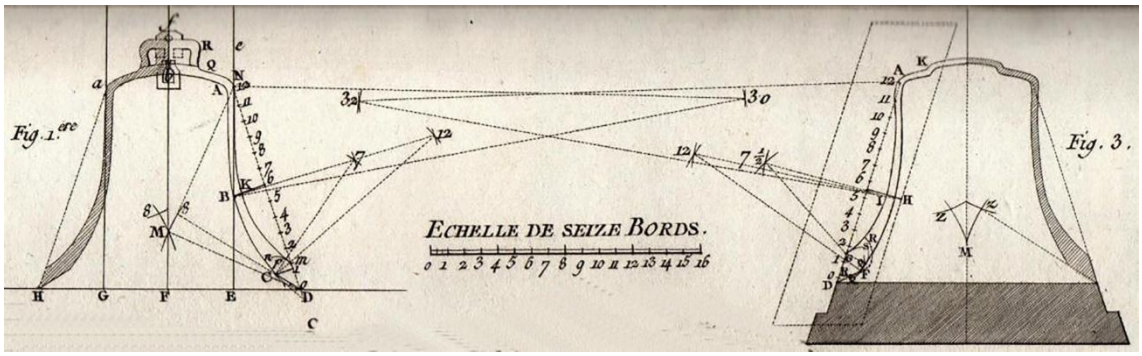
4.5 Closing of bow



4.6

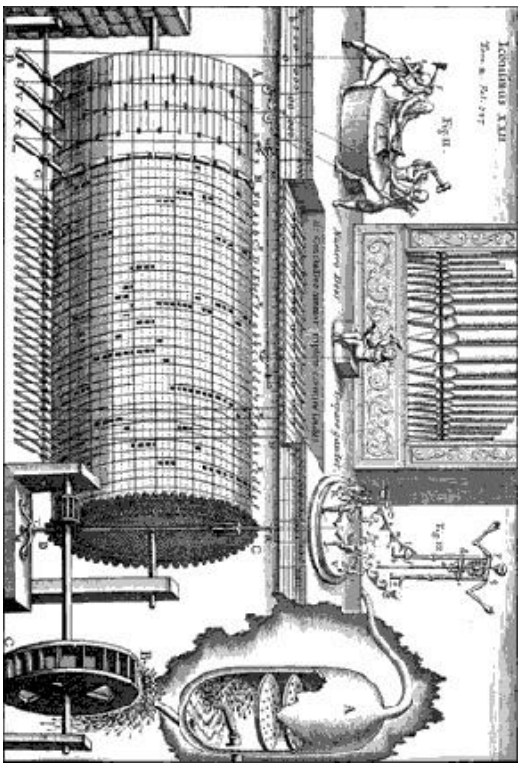


5. Organization and overlapping of figurative references

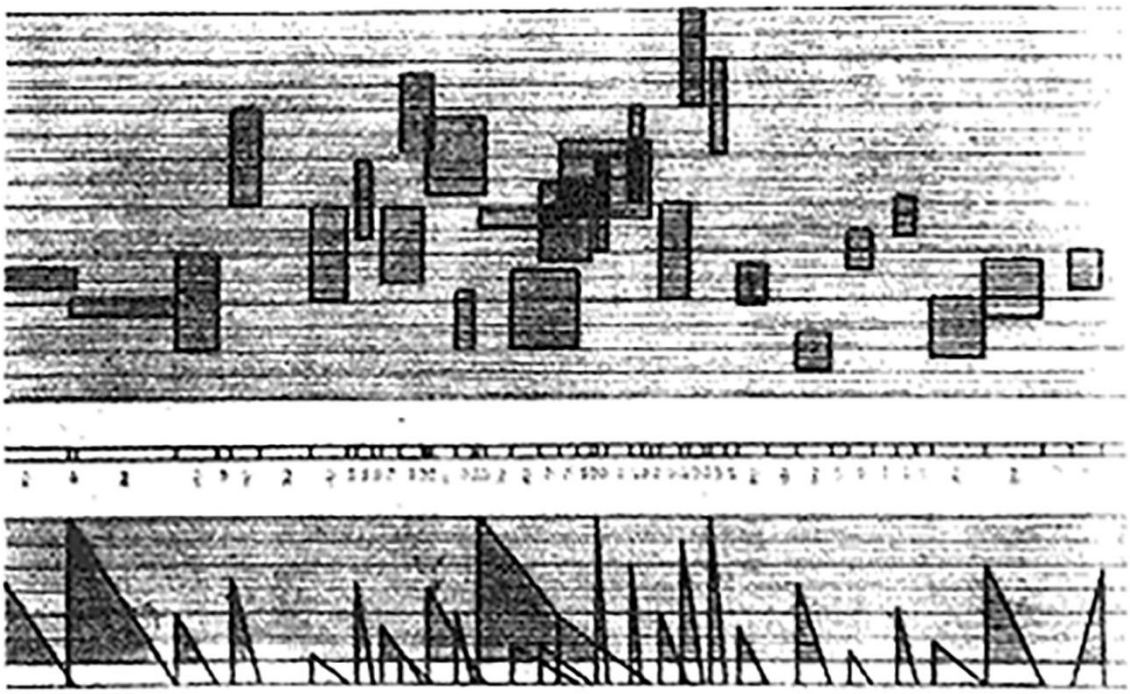


6. Illustration from the *Encyclopédie* by Denis Diderot and Jean-Baptiste Le Rond d'Alembert

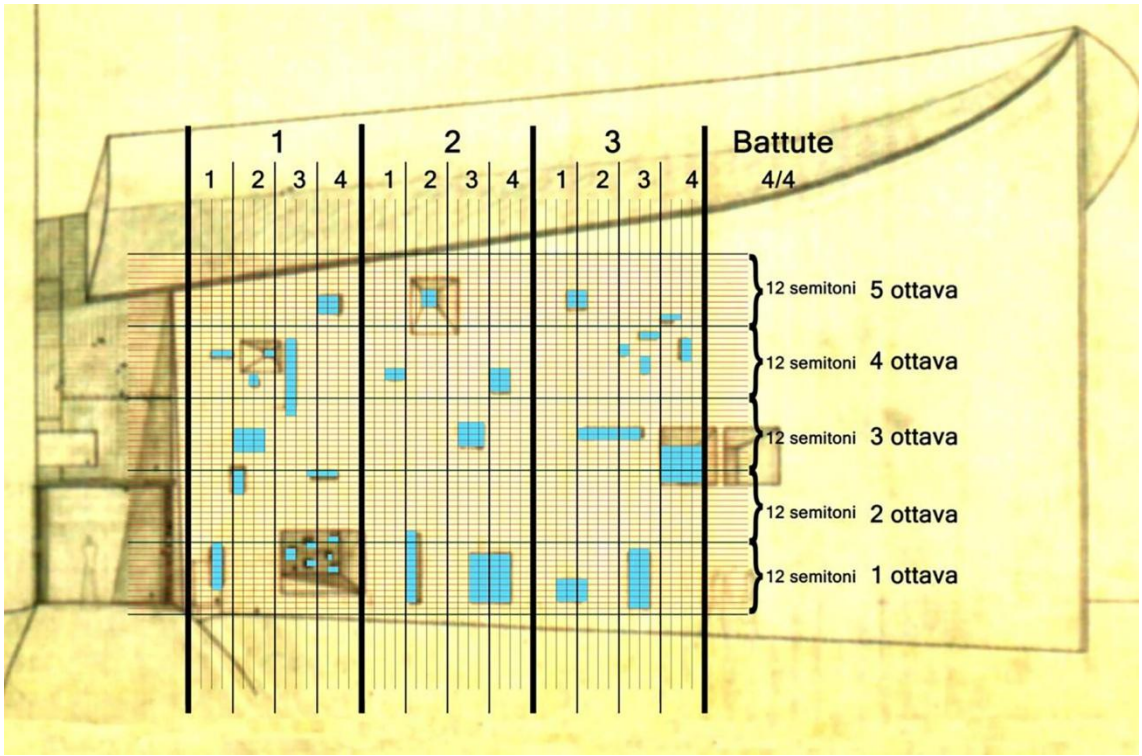
7. Mechanical layout of a barrel organ



8. Father Athanasius Kircher, hydraulic organ with automata (from A. Kircher, *Musurgia universalis*, Rome 1650, II. IC. XXII)



9. Karlheinz Stockhausen, *Studie II*, 1954



10. Score, south façade of Ronchamp

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