

# Concretion, abstraction: the place of materials in architectural design processes.

## Case study: Peter Zumthor

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### ABSTRACT:

Today the design processes are fundamental for the understanding of architectural projects, since universal rules of composition (harmony) and common ideals (beauty) have failed to support them exhaustively. A possible stable common ground to all constructed projects remains in the act of construction.

Peter Zumthor's work is representative of this new framework. In his designs, he explores synergies between the abstract paper work and the concrete constructive realities. When explaining his projects, he highlights the design process which encompasses the abstraction, the materiality and the reality.

This paper bears relevance for both practitioners and theorists at two levels: it explores the theoretical relevance and the practical tools of an outstanding referential architect. It explores, with the specific tools of the architect, the design process of his projects through the question of materials. The analysis is based on both his writings and his realized projects.

**CONFERENCE THEME:** Select one of the ARCC major conference categories

**KEYWORDS:** materials, design processes, construction, Zumthor

## INTRODUCTION

I began this research when I was in charge of the construction lesson at the UCL (Université Catholique de Louvain). I realized that my students did not have access to an important part of the architectural profession. They could not measure the importance of materials and their use in the conception process of the project. Therefore I based my teaching on case studies. Doing this, I noticed that the design practice today operates more by "examples" than by general understanding. When considering examples, designers are confronted with a tension between reproduction and differentiation (they take over interesting features but also need to innovate). Through the understanding of contemporary architect's practices, it might be possible to identify some usable tools or principles that enable an open evolution of practices without constraining them into preestablished moulds.

Observing contemporary architecture, as a practitioner and teacher, one becomes aware of the difficulty to understand the constitutive rules of a project and even when one can identify some, they are often unique and unshared. The qualifiers for the word architecture have multiplied over time: minimalism, hygienism, socio-participationism, formalism, high-tech, low-tech, sustainable and eco are some examples. After one century of avant-gardes, architectural practice has been scattered in uncountable styles and streams. This has led to a free market situation in which architects are confronted by an almost endless catalogue of approaches and styles: between multiple-choice and pragmatist refusal, this context provokes an issue with arbitrariness and relevance. This is probably not an isolated phenomenon. The deconstruction of the architectural design field certainly has its counterparts in other artistic disciplines.

My thinking is fuelled by my cultural position as a European French speaking architect and teacher of architecture.

Jacques Lucan in “On en veut à la composition” (Jacques Lucan, 2002) makes the assumption that the term composition is no longer able to describe the architectural design process. He affirms that architecture does not respond anymore to compositional logics and objectives that make the necessary correspondence of the parts in the unity of the whole the understanding key of architecture. The issue of composition has always played a central role in architectural theory. According to Jacques Lucan, the traditional relationships between the parts ensuring the unity of the whole, which are embodied in the compositional rules and objectives, fail to give an exhaustive account of most contemporary design processes.

To understand the loss of universal rules (composition) and common ideal (beauty), we can refer to the conference of Bernard Huet “Sur un état de la théorie de l’architecture du XXème siècle” (Bernard Huet, 2003).

Vitruvius, Alberti and architecture theorists, who have followed them, do not make the distinction between architecture and the art of construction. The architect is omniscient and proficient in all disciplines. Traditionally, the architectural treatises are articulated in four parts, no matter how many books they consist of. A first part defines and outlines what architecture is. In this part, the author positions himself in the field of the existing treatises. The other 3 parts redefine or actualize the Vitruvian categories: firmitas (solidity: construction and architecture), venustas (beauty: how to compose) and commoditas (utility: what architecture is for architecture). Until the eighteenth century, it was around these common themes that the architectural debate was being built. A first rupture happened with the affirmation of Boullée, stating : “Vitruvius is wrong, there are two parts in the architecture, there is art and science and only art, i.e. Art, not the art of building; only art falls under the area of architecture” (Etienne-Louis Boullée, 1968) . For Boullée, Architecture lied in the project itself and not in the built reality. The unity of the Vitruvian trilogy was broken apart.

One can note that this epistemological shift coincided with the appearance of the first engineering schools in France (Ecole Nationale des Ponts et Chaussées was founded in 1747 by Jean-Rodolphe Peronnet following a royal decree). The outbreak of engineering schools fundamentally changed the construction field. The appearance of tender offers and constructive details caused the disempowerment of craftsmen.

This implied a gradual dislocation of the profession of the architect and of the craftsmen, who lost control over some parts of their field, which were based on tradition, and were now confronted with the integration of a group of specialists into the design process.

The nineteenth century and the industrial revolution confirmed the role of engineers by the apparition of new materials such as steel and reinforced concrete, modifying deeply the construction field. This epistemological shift pushed theorists to reinterpret architecture from the Antiquity and of the Middle-Age. This new knowledge questioned the composition processes. Viollet-le-Duc and Gottfried Semper were the first to actualize the rupture of the Vitruvian trilogy in theory and in practice. Viollet-le-Duc proposed a theory based on the art of construction itself, in which spatiality was the result of a structural or constructive principle. On the other hand, Gottfried Semper proposed a theory in which spatiality was realized through the disposition of skins (“*Prinzip der Bekleidung*”). Structure and construction became spatially irrelevant and hidden necessities.

Since then, the Vitruvian categories can be thought separately. This has widened the field of research in architecture considerably and was echoed by “engineer architecture», represented in France at the end of the 19th century by architects like La Brouste and A. Perret. Since the beginning of the 20th century, the avant-garde experiments of the functionalist, formalist and constructivist architects developed the dislocation of the Vitruvian trilogy further. Their projects were mainly directed to one single Vitruvian category and marginalize the other two. Since the end of the 20th century, the freedom made possible by the Vitruvian dislocation seemed to question fundamentally architectural processes. A shift from a coercitive traditional unity towards a libertarian specialized dislocation had taken place. Are there still recognizable principles inherent to architectural processes? Are there still identifiable endogenous dimensions of architecture?

It is noticeable that nowadays built projects must meet an amount of rules located outside the field of architecture (urban planning, safety, firefighter, budget, image or marketing...) that dislocate

the profession even further. As a practitioner, one can question if there are still common “codes” for architects? Many architects “who build” offer a specific approach to the act of building, as if this was an inalienable aspect of architecture feeding it from the first sketches. I propose that a possible stable ground to all built projects remains in the act of construction. Here I would like to overcome the theoretical “skin-structure” debate induced by Viollet-le-Duc and Gottfried Semper, in order to focus on the making of architecture.

## CASE STUDY: PETER ZUMTHOR

Peter Zumthor’s work is representative of this new (absence of) framework. In his designs, he explores synergies between the abstract paper work and the concrete constructive realities. When he explains his projects, he highlights his design process which encompasses abstraction, materiality and reality. Particular interesting in his work is the relationship between tradition and its surpassing.

The following analysis is based on both his writings and his realized projects. To date, Peter Zumthor has held several conferences. The following reflection is based on “Thinking architecture” and “Atmosphere”, two texts that have followed these conferences.

In the first place, it is important to recall that Zumthor had trained as a cabinetmaker before studying architecture. Before starting his own architecture practice, he worked several years at the department for preservation of monuments in the canton of Graubunden in Switzerland.

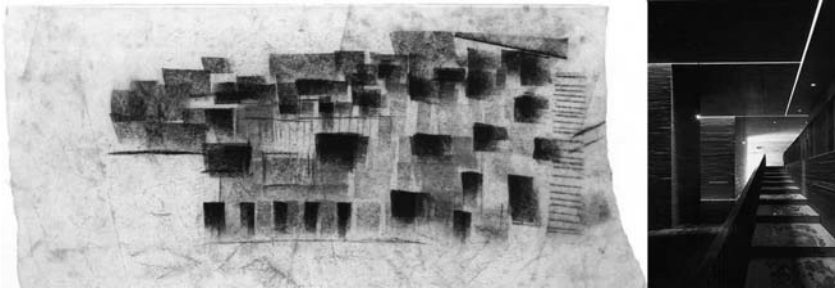


Figure 1: drawing and picture thermal bath, Vals (Peter Zumthor, 2007)

### I. ATMOSPHERE

Zumthor describes his architectural goals as following:

When I work on a design I allow myself to be guided by images and moods that I remember and can relate to the kind of architecture I am looking for. (Peter Zumthor, 1998, 25)

Entering a Zumthor building, one is instantly caught in a particular atmosphere, by an immediate emotion. Peter Zumthor searches in his memory for images and architectural sensations in order to create the atmospheres that are implemented in his projects. Rather than implying an intellectual meaning, he creates an immediate and physical relation to the environment to space as to the material, to heat and light, as well as sounds and smell. What is the particularity of the atmospheres of Zumthor’s buildings?

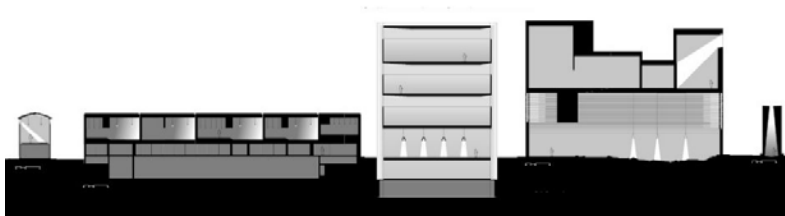


Figure 2: Spatial analysis of Saint Benedict chapel, Vals Therme, Bregenz museum, Kolumba museum, Brother Claus chapel



**Figure 3:** Atmosphere reference: Edward Hopper, rooms by the sea, 1951

## 1.1. SPATIALITY

Monumental scale, indirect or diffuse light and interiority are three spatial features used recurrently by Zumthor to create his peculiar atmospheres. All these features confer a sacred expression to spaces.

Pronounced contrast appears between light and shadowy areas. One can distinguish two light modes. First of all, light can be channeled in order to create light and darker areas. This implies that the light source is always “elsewhere”, inducing complementarily light shades in the space. Good examples for this are the chapel Bruder Klaus and chapel Saint Benedict, Vals thermals baths, Kolumba museum superior rooms. Secondly, shadow and light can be defined diffusely, often by a shadowy ceiling zone as it is the case, in the ruins of Chur, the Bregenz Museum, or the Kolumba museum ground floor level of the ruins. Here, the light is diffused through the facade, acting as a filter. Low pending artificial light emphasizes the contrast, creating a light space within darker architectural spaces. The architecture sets the lighting conditions, which on the other hand define the perception of space (e.g. Fig 2). This can be considered as a transformation of Le Corbusier’s quote “Architecture is the learned game, correct and magnificent, of forms assembled in the light”. Zumthor induces a reciprocity between light and architecture.

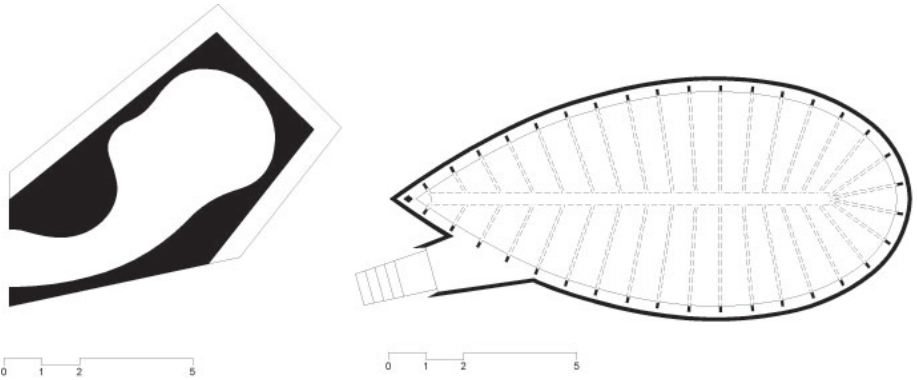
Monumentality is introduced by scale effects and high ceilings. The absolute absence of symbols increases the sensation of eternal structures standing there for their own sake. Monumentality corresponds to a-humanity, as it often seems that Zumthor’s work is quite a-programmatic and not intended for appropriation.

In his projects, a distance to the outside world is established. His buildings seem to be out of space and out of time. The interaction of the outside world is always mediated. For example, an identifiable entrance system pierces the material thickness of the building’s skins. Zumthor limits the views to the exterior. This tool allows him to avoid views to the approximate context and narrows the viewing frames to the distant landscape only, even in dense building environments such as the Kolumba museum. There is also a lack of physical articulation to the context. The buildings are carefully located in the landscape in order to maintain their independence, like neolithic stones or centenary trees, but are not articulated on a material or typological basis.

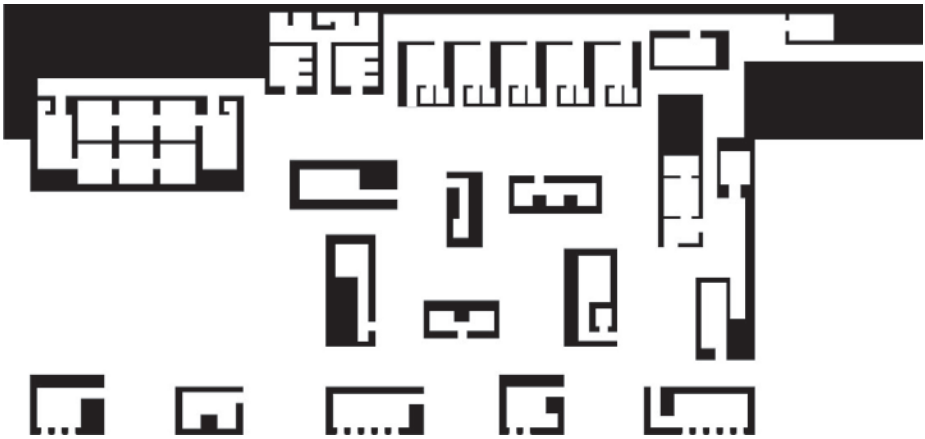
Two categories of buildings appear:

The first one consists of single, isolated cells (for example: Klaus Bruder chapel, Saint Benedict chapel). These unicellular buildings share identical spatial features. Strong “chiaroscuro” affects space through natural indirect lighting, and interiority is created through an umbilical access creating a distance between the interior and the exterior world. In those unique cells, there are no views to the exterior.

The second type is characterized by complex programs that require multiple rooms. These multicellular buildings consist of a combination of cells. These cells are like a set of unicellular projects, sharing the same spatial characteristics, from the umbilical access to the type of lighting and the absence of views to the exterior. This results in a building with two complementary kinds of spaces: on the one hand, unitary static spaces and on the other hand a common space, a dynamic, circulatory space which limits are unreadable. This space establishes the only dialogue with the exterior, through windows framing the distant landscape.



**Figure 4:** Plan of Brother Claus chapel, Wachendorf (Germany) and Saint Benedict chapel, Sumvitg (Swiss)



**Figure 5:** plan of Therme, Vals (Swiss)

## 1.2. KNOW-HOW

I do not work towards architecture from a theoretically defined point of departure, for I am committed to making architecture, to building, to an ideal of perfection, just as in my boyhood I used to make things according to my ideas, things that had to be just right, for reason I do not really understand. (Peter Zumthor, 1998, 35)

Zumthor considers the project as a material body, with the act of construction as underlying condition. For him, the building process is at the heart of the project's work. He was born into a family of "Handwerker" and belongs to the "Baukunst" tradition that can be defined as the architecture of the art of building. His projects always consider the construction since the first sketches and intentions. The first lines of the projects are already loaded with implications and implicitly intended for the craftsmen and the builders. This might be the reason that Zumthor's drawings are so important and specific.

According to the dictionary, know-how is practical knowledge of how to get something done. The know-how is different from other knowledge such as scientific knowledge, because it can be directly applied to a task. This is often a tacit knowledge, which means that it is difficult to transfer to another person by means of writing it down or verbalizing it. There is no universal way of transmitting it.

Zumthor obviously believes that our presence in the concrete world is fundamental and prior to any intellectual construction, similarly to what Martin Heidegger called "being-in-the world", Dasein. The concept of know-how and its application in the project lead Zumthor to stay firmly in the world of concrete and explainable things.

### 1.3. MATERIAL CONSTITUTION LAW

As Zumthor says, in each of his projects, the material has dictated its laws. The projects are born from an idea and in his case this idea is always accompanied by a material. He does not see a way to design in which he decides first on a shape and then on the materials.

Peter Zumthor believes that the inherent potential of materials (structural, technological, tactile, visual, etc) is best exploited by respecting their natural laws. Each project is made to fit the natural behavior of its materiality, which, in turn, is determined by assessing the project's conditions.

Matter becomes a raw potential for new constructive rules, rather than predetermined modular constructive materials assembled into a larger whole. If wood is used, it is not in the common preestablished way, but rather wooden elements are formed into a new, unique, and, at the same time, natural language. Often, various materials (each with their usual rules, are melted into one new "matter" with distinct rules, like the burned trunks and poured concrete for the Brother Claus chapel. He strives not to use the conventional morphology and grammar of architecture. "What you see is what you see" said Franck Stella, one of the artists behind American minimalism. There is no artificial message, image or symbol. He uses materials without any signification, meaning a "culturally accepted" or shared sense (this is probably to be linked with the absence of symbols in his building, cfr 1.1).

He wants to reveal the material in a similar way to American minimalism. He is particularly interested in the primary construction ("*Robbau*"). In his projects, there is no possible distinction between the primary construction (as he says "the anatomy" of the building) and the secondary layers (skins, finishes,...). The "*Robbau*" is considered as structural and technological necessity and at the same time as finishing, as one harmonic (and various ways monolithic) whole, in contrast to most contemporary architecture. It is not to be confused with an absence of finishing or a brutalism approach, because the constructive principles imply a very detailed and intended appearance. But, unlike minimalist artists, he faces other, more complex realities (program, standards, technologies, etc) that create a unique piece of art. Architecture is normally not something continuous or monolithic. It is constituted of multiple parts, often referring to different scales. The challenge is therefore for Zumthor to merge distinct elements into one single monolith. The choice of materials, their assortment and their implementation system are fundamental ingredients in the design process, together with the spatial principles enhancing a great autonomy of the building, in order to create a new, unique "construction material" from different elements, and let it develop according to its own and unique rules in an undisturbed way.

The "*Robbau*" approach of Zumthor produces three different types of monoliths.

Massive monoliths are the most obvious ones, in which the matter itself is monolithic and jointless.

Assembled monoliths appear when the elements are countable elements, like wooden elements. However, we can consider this type of building as a kind of monolith rather than a composed structure, because all elements are made to fit each other in the light of the whole. As such, every part of the structure is necessary. These structures are not strictly repetitive, meaning that parts can share features but are still unique in their shape or position.

Composite monoliths consist of two radically different elements that merge into a new, irreducible constructive method, in which the two elements are complementary and necessary to the other.

Whatever the type of monolith, they define the limit between interior and exterior. Notably, the interior side differs from the exterior side, even in massive monoliths. This bifaciality of the monoliths is interesting, because it reinforces the feeling of a complete loss of contact between the interior and the exterior, like a grotto, or a baroque church, or a treasure chest.

## 2. THE MATERIAL SPACE

The following three projects represent the coherence and diversity of Zumthor's approach towards spatiality and materiality.

## 2.1. CHAPEL SAINT BENEDICT (SUMVITG – SWISS) – THE ASSEMBLED MONOLITH

The wooden construction of the Saint Benedict Chapel is an assembled monolith, in which columns, beams, windows and the floor are clearly identifiable and separable, and solve the entire building, including the structure, cladding and the floor (except the invisible foundation).

A continuous line of natural light in the upper part of the wall separates the roof frame from the rest of the building. This light is filtered by the vertical frame. Through the high position of the opening and the thickness of the wall-structure the light source is far from the inside, reinforcing the interiority. The interior space of the chapel is defined by its ground, a wooden floor, which is also detached from the edge of the facades and structure giving the impression that the columns are coming from the soil. The lighting principle gives a monumental scale to the building.

The constructive principle is derived from “classical” wooden frames. A series of columns distributed with a short interaxial distance bear the floor and the roof. However, the classical frames are transformed into a specific shape that creates a very strong, harmonic unity. This specific shape of the roof is reminiscent of a boat hull in which each beam is based precisely on a column. The wooden windows follow the instituted rhythm, and so does the floor structure. There is a strong continuity between all elements of the building. The structure is detached from the skin, evidencing the distance “between” the place of prayer and the outside. It creates an artificial “thickness”.

The monolithic unity appears from the geometry. Although composed by independent elements, they are so complementary in form and size that their existence depends on their mutual articulation. On the outside, larch shingles contribute to the unitary character of the building. Their assembly allows a continuous deformation. The exterior skin bends to create the entrance to the chapel.

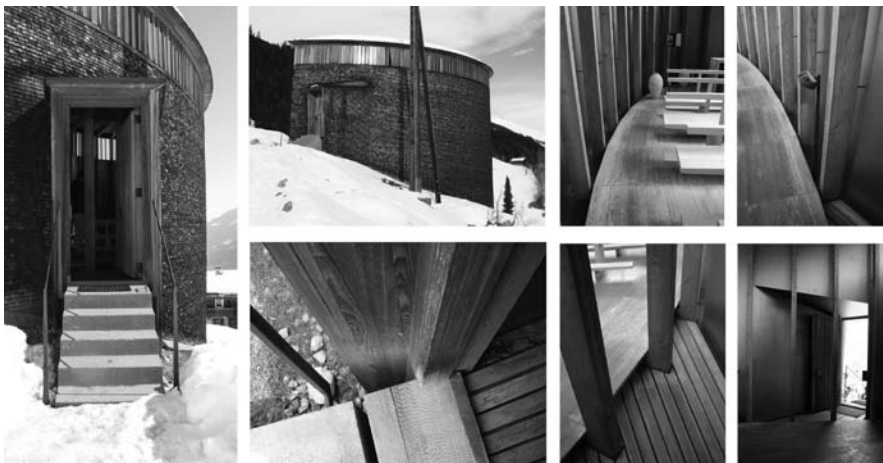


Figure 6: pictures of Saint Benedict Chapel

## 2.2. CHAPEL BRUDER KLAUS (WACHENDORF – GERMANY) – THE Poured MONOLITH

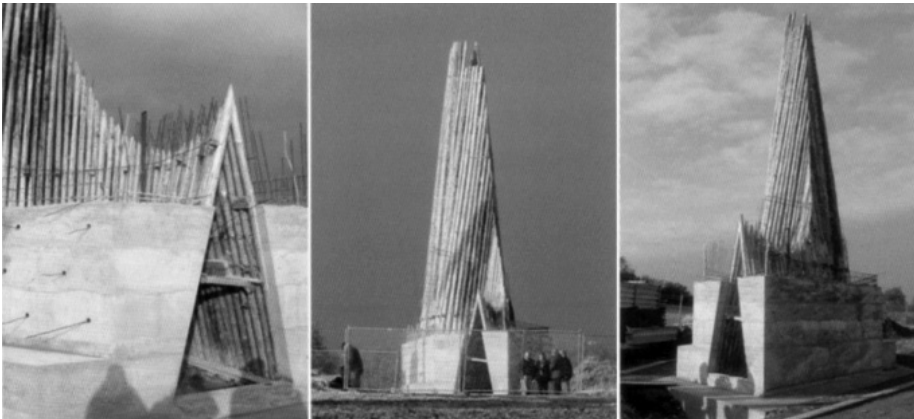
The chapel Bruder Klaus is entirely built in concrete.

Planted at the edge of a field, outside of the village, on a small hill, its position in the landscape can be perceived as a foreign body, or rather as a menhir present since ever. The drop-shaped plan (e.g. Fig 4) creates two spaces: a dark access corridor and a place of prayer connected to the sky. The light penetrates through a hole in the roof and through the little openings created by the wooden lagging. 112 spruce logs were used as internal shuttering. Their arrangement in tipi allows in a simple way to sustain all the effort during the pouring of the concrete. Once installed, the internal shape of the chapel is determined. The outside wooden lagging was reused as and when. Once the concrete poured, the interior wood tipi is burned, leaving the indelible trace and smell of the construction process and referring to the spirituality of the place. The finishes are included in the primary construction. The plastic of the project is intimately linked to the construction process (e.g. Fig 8).

The principle of the project forms part of its edification system. In this case, time plays a central role in the constructive process (the burning of the trunks, the layered pouring, etc.). Concrete is poured in accumulating layers, forming an indivisible mass. Although constructed of concrete only, the interior and exterior aspects of the chapel differ strongly. In the interior, the burning process of the logs has created a very different materiality giving a wooden texture to the concrete, including a wood burning smell, and darkness from the ash.



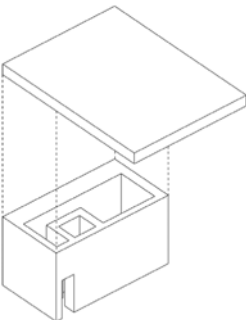
**Figure 7:** pictures brother Claus chapel



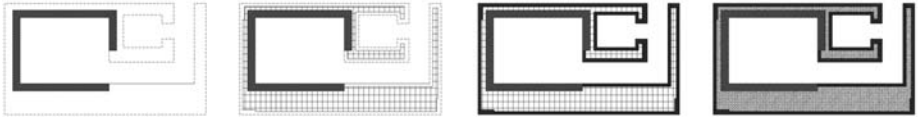
**Figure 8:** construction process of Brother Claus chapel

### 2.3.THERMAL BATH (VALS - SWISS) – THE COMPOSITE MONOLITH

The Thermal baths in Vals are a good example to reveal the subtlety of the system of joining different materials. The plan of the baths (e.g. Fig 5) is composed of different monolithic columns hosting thematic baths (flower, cold, hot, etc). Each column supports a separate roof. Light infiltrates the space through the joints of the different roofs.



**Figure 9:** roof structural principle of vals Thermes



**Figure 10:** Constructive analysis of Zumthor, Vals baths

Peter Zumthor uses quartzite (a local stone) to confer the importance of the theme “Felsentherme”, meaning thermal bath in the rock. However, he did not use it as a simple veneer stone. To avoid this pitfall, he developed a tectonic system of mixed masonry where stone plays different roles in the structure, as a support for the implementation of the wall and finally as an exterior skin. Through this process, the shuttering are no longer simple intermediate construction elements, but they play a definitive role in a structural and visual point of view.

1. Interior walls for the bath, non-bearing, are poured on site
2. Steel bars for the reinforced concrete are placed
3. Stones of various lengths are built around the reinforcement. They form the visible part of the wall and play the role of formwork for reinforced concrete.
4. Concrete is then poured in small steps in order not to exert too much pressure on the masonry. Once charged, the masonry is requested in compression while the reinforced concrete supports the tensile strength generated by the cantilever roof.

This project is a concretion of various heterogeneous materials, forming a monolith with different materialities in the the inside and the outside of the cell.



**Figure 11:** interior pictures, Vals baths (A+U, 1998)

### 3. CONCLUSION

Despite a large material diversity (glass, concrete, wood, masonry...), his oeuvre shows great coherence.

Zumthor’s projects make use of materials arranged according to their own nature, forming harmonic monoliths with a great interiority. Zumthor explores materials, their behaviors, their internal characteristics. Then he assembles them according to their natural laws. Through the complete interiority and independence of the context, he avoids any unnatural or hybrid assembly which would not use its internal law.

He considers the building as an organism (he speaks of the anatomy of the building, with an explicit reference to the organic world) that develops according to its internal law, its behavior, its way of being. In the development of the project, Zumthor establishes the conditions for the possible state by suppressing all disturbing influences from the outside (spatial interiority). He carefully also develops the “primary assemblages” of materials and identifies precisely how they constructively behave

(material interiority). His control over the building is absolute: the constructive details as well as the spatial aspects are “closed” to external influences or contradictions, which transform the buildings into autonomous, eternal structures.

How does it relate to other architectural practices addressing materiality? Is it unique and anachronistic or meaningful for contemporary practices?

Zumthor’s position appears to be isolated. However, there are other contemporary approaches that share the fundamental idea of “the act of building” as endogenous architectural force that enables to get out of the infernal spiral of “everything is possible”

Today, we can observe several large families in the use of the materials:

The Zumthorian way proposes to respect what materials want, following their natural “folds”. He creates conditions in order to allow the materials to develop themselves without external interference through the principle of interiority. His buildings are timeless and outside of the chaotic contemporary stream of information, materials, signs and products.

The Herzog & De Meuron family question what the materials afford instead of what they want. They push materials to the limits of their capacities and twist their usual applications. Their buildings show real openness to the world. They take part in the movement of their time and put it in question, by grasping bits from the stream and torturing them to obtain some kind of truth. They operate a shift from “construction products” to “architecture’s material”, where Zumthor simply addresses the full potential of “raw materials”. Through projects such as Munich stadium (Germany), the winery in Yountville (USA) and the Tavole house (Italy), they explore the material components and reorganize them to push them beyond their internal law confronting them with reality.

The Japanese way attempts to remove materiality from architecture, following Toyo Ito, SAANA or Ishigami. In their projects, the materiality seems to become more or less absent. This absence creates a kind of timeless spatiality which is not necessarily open or closed. However, this approach is not a negation of matter (in the sense of Semper), because to make matter disappear implies a very strong commitment to materiality and very sophisticated technological solutions. Unlike Zumthor’s retraction from the contemporary fluxes by an absolute interiority, and autonomy of the crafted materials, and unlike Herzog & De Meuron, who surf and distort the wave of the industrial production, SAANA or Ishigami intend to absorb the unpredictability of the world by a transparent or absent materiality.

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