What is *material as such* in architecture? The article addresses this question examining sources from the eighteenth century to today, from Carlo Lodoli to Peter Zumthor.

On concrete materiality in architecture

Ute Poerschke

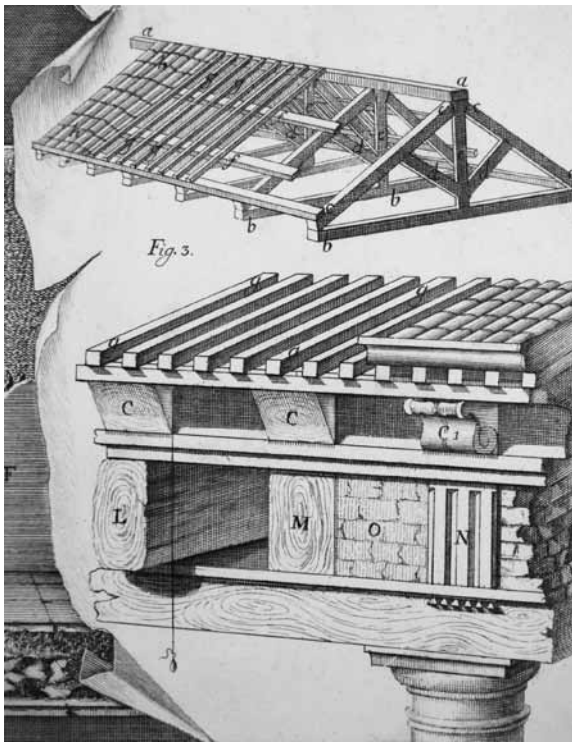
When concreteness of materials is discussed in the following, the point is to examine sources in which architects and theorists speak of the material's *being as such* or *being itself*. What does the call to use wood as wood or stone as stone mean? One might think that this subject, which is so topical today, could be traced back no further than Minimalism and Arte Povera of the 1960s. But in fact this call can be found in writings extending back to the early modern era in the eighteenth century. A provocative *Saggio sopra l'architettura* (Essay on Architecture) from 1756 seems to be the first to address the subject. Its author, Francesco Algarotti, quotes his Venetian teacher Carlo Lodoli:

> *For which reason does stone not represent stone, wood* [not represent] *wood, each material itself and not another?* [...] *as it pertains to its characteristic qualities, to the flexibility or the rigidity of the component parts, to the degrees of resistant force, in a word, to its own essence or nature of the material which is employed. Therefore, because the nature of wood is formally different from the nature of stone, so too the forms which you give wood in the construction of a building have to be different from those of stone. Nothing is more absurd* [...] *than when a material is made not to signify itself, but is supposed to signify another.*[1]

This quotation calling for material to represent itself refers primarily to Vitruvius, and specifically to his fourth book, in which he explains how antiquity transferred the forms of timber construction or the 'carpenter's work' to work in stone.[2] Vitruvius wrote that the forms and ornaments of temple building were developed in timber construction and then carried over to stone. This transfer can be seen very well in an engraving in Berardo Galiani's 1758 edition of Vitruvius that depicts a wooden beam and its ornament *[1]*, which is then adopted in stone construction. The simultaneity of the publication of this edition and Algarotti's essay clearly shows the importance of this discussion in the mid-eighteenth century.

It was precisely this transfer of a canon of forms from one material to another that began to be criticised at this time. Algarotti wrote that Lodoli had characterised such imitation as 'truly the solemnest abuse one could ever have imagined', and said it was necessary to strive to 'eliminate it with the greatest effort of reason'.[3] It was necessary, according to Lodoli, to study the material in question and find the appropriate forms for it. His disciple Andrea Memmo explained how Lodoli had meant this by giving an example: the stone thresholds of their native city of Venice were installed in a way that causes them to tend to crack in the centre *[2]*. The reason they crack is that the door jambs rest on the threshold and thus cause a bending moment in the centre of the threshold that the stone cannot absorb because it lacks flexibility. The connection between structure and material properties is disregarded, which results in 'the cracking, tearing, and collapsing of buildings; almost a manifest punishment for the tort which has been continually committed against the truth'.[4]

This quotation points to a theme that even today is repeatedly overlaid with the issue of the material's concreteness and its being as such: namely, truth



1 Berardo Galiani, *L'architettura di M. Vitruvio Pollione* (Naples: Simoniana, 1758), plate 4

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2 Door in Venice with a threshold broken in the middle

3 Carlo Lodoli's design for a window in his San Francesco della Vigna monastery, 1743

and reality.[5] The material's being as such, its truth, essence, nature, or character (*verità, essenza, natura, indole*) are for Lodoli the 'characteristic consistence', 'flexibility', 'stiffness', and 'cohesion' – that is to say, the constructive properties. This essence is directly related to form. From this quotation it necessarily follows that the *material as such* signified a direct connection between material and form; that material without form was inconceivable. Not only should architecture employ a material according to its nature but furthermore the entire form should derive from the material since one would 'not see all these disorders if one were to derive the form, construction, and ornament from the material's own essence and character'.[6]

Lodoli tried to apply this idea to a window sill in the Venetian monastery of San Francesco della Vigna, which can still be seen today *[3]*. The catenary form of the underside of the sill presents an alternative to the failing form of the existing Venetian thresholds. The window sill exemplifies how Lodoli envisioned the connection of material and form, the complementarity of material and form, and the dependence of form on the material. 'Stone is stone' here really means 'a stone window sill is a catenary-formed beam'. That was a very bold demand in Lodoli's day, and his view was shared by few architects. Even Lodoli's student Algarotti found himself unable to warm up to this new idea, insisting that 'wood is the matrix material in architecture' which 'imprints on all others the peculiarities of its forms'.[7]

Material and its structural properties

Roughly eighty years later, in 1834, Gottfried Semper wrote a sentence similar to the quotation cited at the beginning of this essay: 'Brick should appear as brick, wood as wood, iron as iron, each according to its own statical laws.'[8] In this sentence, Semper extends the list of materials from stone and wood to other building materials, brick and iron, which one might interpret as a modernisation of the original sentence. The odd thing about Semper's sentence, however, is that it occurs in an essay about the painting of Greek temples: 'Vorläufige Bemerkungen über bemalte Architektur und Plastik bei den Alten' (Preliminary Remarks on Polychrome Architecture and Sculpture in Antiquity). Semper had discovered that Greek temples had been painted *[4]*, but that seems to contradict his call for the material to appear as itself. For Semper, apparently, that did not represent a contradiction; just the contrary, he explicated:

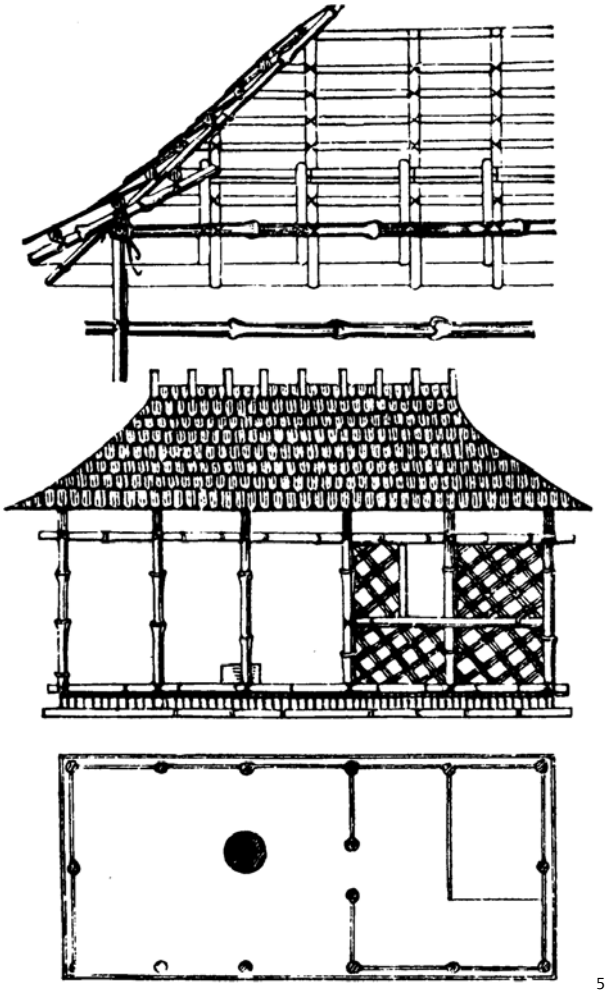
> *Brick, wood, metal, iron and zinc in particular, have replaced ashlar and marble. It would be inappropriate to continue imitating these last two materials – even more so to give the new materials a false appearance.*
>
> *Let the material speak for itself; let it step forth undisguised* [unverhüllt] *in the shape and proportions found more suitable by experience and science. Brick should appear as brick, wood as wood, iron as iron, each according to its own statical laws. This is the true simplicity on which we can let our fondness for the harmless embroidery of decoration run free. Wood, iron, and every metal need a coating* [Ueberzüge] *to protect them against the corroding effects of the air.*[9]

Semper calls for the material to be 'undisguised', only to remark a few sentences later that it needs 'coating'. The solution to this contradiction is that, on the one hand, Semper is concerned with the material as such as a structural form and, on the other hand, the 'coating' or 'dressing' (*Bekleidung*) is

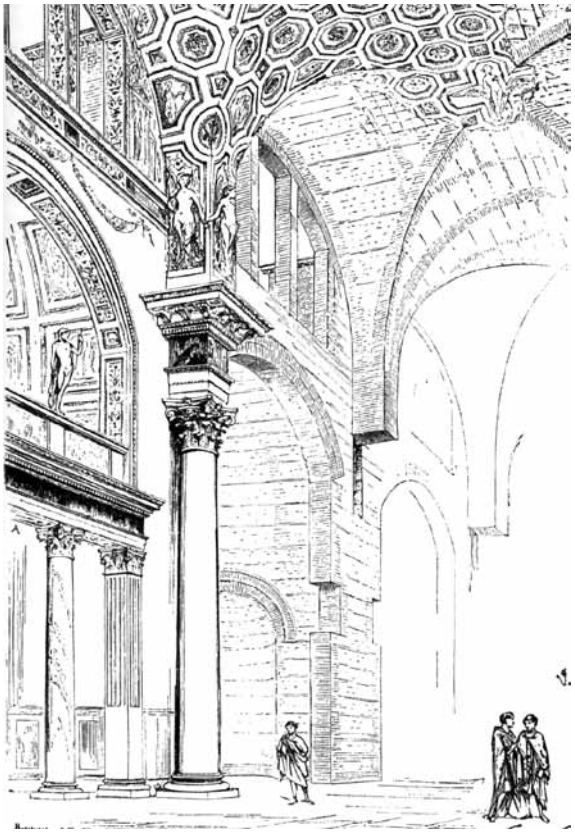
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4 Gottfried Semper, *Anwendung der Farben in der Architectur und Plastik* (Dresden, 1836), detail of plate 5 (drawing of the Parthenon)

5 Gottfried Semper's presentation of a 'caribbean hut', in *Der Stil* (Munich: F. Bruckmann, 1863), ii, p. 276

6 Eugène Emmanuel Viollet-le-Duc, *Entretiens dur l'architecture* (1863–72, repr. Ridgewood, NJ: Gregg Press, 1965), i, p. 131

logically separated from that. The material as such is revealed in its structural form and therein lies the 'true simplicity'. By contrast, the material as such need not be revealed on the covering. But Semper is concerned about more than that. For him, a work cannot simply satisfy a material but has to grow beyond it. For example, he says of the famous 'Caribbean hut' shown at the Great Exhibition in London in 1851 *[5]* that although it corresponds in its totality and in its parts to the purpose for which it is constructed, it has nothing to do with architecture as art and the columns are nothing but tree trunks.[10] He argues that the components of this hut lack the overcoming of the material, lack ornament, and each part fails to be an ideal being for itself and in relation to the whole. Although the materials lead to constructions appropriate to them, this is only the first step to finding a form. But if this first step goes in the wrong direction, there is no hope that the work will ever be art. The next step has to be 'emancipation from structural-material realism'.[11]

Semper's most important text, *Der Stil in den technischen und tektonischen Künsten* (Style in the Technical and Tectonic Arts), demonstrates the role he attributed to material. *Der Stil* is divided into five parts: 'Textile Art', 'Ceramics', 'Tectonics', 'Stereotomy', and 'Metallurgy' – and this is not an organisation according to materials but rather to fabrication techniques. It is about textile art and not textiles, stereotomy (stone cutting) and not stone, tectonics and not wood, and so on. From this it follows that the material as such in architecture is revealed, for Semper, in how it is worked. The skill of deriving a form from certain materials is what interested Semper.

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The sentence 'wood appears as wood' was used by many nineteenth-century architects and theorists, including Eugène-Emmanuel Viollet-le-Duc, in his tenth *Entretien*, which was published in 1863:

> *the materials must be judiciously employed, according to the qualities; there must be no excess on the side of strength or slightness; the materials used must indicate their function by the form we give them; stone must appear as stone, iron as iron, wood as wood; and these substances, while assuming forms suitable to their nature, must be in mutual harmony.*[12]

Just as with Semper, the call for the material to appear as itself is intended in a structural sense and does not preclude it being clad. Viollet-le-Duc's engravings in his *Entretiens* underscore this view by showing structural forms with and without coating next to one another *[6]*. Moreover, the real importance of this quotation lies in the remark that the materials 'indicate their function by the form'. A quarter century before Louis Sullivan's dictum 'form follows function', Viollet-le-Duc formulated here the connection of function and form.[13] Interpreting this connection as unidirectionally – that is, as a one-sided dependence of form on function – as often stated today, cannot be fully verified here. Likewise, Semper's and Viollet-le-Duc's contemporary Karl Bötticher wrote: 'Only the form gives the construction material the property of being able to fulfill its function; conversely, the function can always be recognised from the form.'[14] Viollet-le-Duc, Semper and Bötticher describe a mutual dependence in which the form enlivens the 'lifeless matter' but is also realised only by it.[15] Sullivan's phrase, in contrast, did not address specifically materiality. This can be best shown in a critique by Frank Lloyd Wright. Comparing himself with Sullivan, Wright states that he learned on his own 'to see brick as brick, learned to see wood as wood, and to see concrete or glass or metal each for itself and all as themselves' while his 'old Master had designed for the old materials all alike; brick, stone, wood, iron wrought or iron cast or plaster – all were grist for his rich imagination with his sentient ornamentation'.[16]

Material and its surface

In 1898, thirty-five years after the publication of *Der Stil*, Adolf Loos referred to Semper in his essay *Das Prinzip der Bekleidung* (The Principle of Cladding):

> *Every material possesses its own language of forms, and none may lay claim for itself to the forms of another material. For forms have been constituted out of the applicability and the methods of production of materials. They have come into being with and through materials. No material permits an encroachment into its own circle of forms. Whoever dares to make such an encroachment notwithstanding this is branded by the world a counterfeiter.*[17]

The material as such can once again be understood in relation to structural form, since, as in Semper, there is also cladding – that is, protection for the primary construction. According to Loos, there are many reasons for cladding: 'At times it is a protection against bad weather – oil-base paint, for example, on wood, iron, or stone; at times there are hygienic reasons for it.'[18] For Loos, this results in the problem that the surface material can be confused with the structural material, and to avoid this, he establishes a law:

> *The law goes like this: we must work in such a way that a confusion of the material clad with its cladding is impossible. That means, for example, that wood may be painted any color except one – the color of wood.*[19]

Loos introduced something new, however, and this can be understood as a reference to twentieth-century Modernism. It is a penchant for the surface of a material. This preference can be seen very clearly in Loos's Michaelerhaus in Vienna of 1909-11, with its extensive cladding of Cipollino marble *[7]*. In all the projects where Loos employs natural stone, he demonstrates his mastery in using its colours and grain as design elements.

Beginning with Adolf Loos, two strands of the conception of material as such begin to evolve in parallel. As we have already seen, the older strand concerns material as structural form; the newer one, material as surface. These views could be referred to as the inside and outside material as such. Rethinking Günter Bandmann, they could be labelled 'rationalist suitability of materials' (*rationalistische Materialgerechtigkeit*) on the one hand, and 'sensualist suitability of materials' (*sensualistische Materialgerechtigkeit*) on the other.[20] Bandmann understands rationalist suitability of materials as the justification of a material form in relationship to a purpose. By contrast, in sensualist suitability of materials, the emphasis is on the senses of sight and touch. The extent to which both approaches represent 'suitability' of materials is certainly open to discussion. In the first case, it means that the construction is suitable to the material; in the second case, that the formation and experience of the surface is suitable to the material. It is interesting to note in this context that the concept of 'suitability of materials' first occurs in Loos's day. Loos used it for the first time in 1900.[21]

In Loos, both these views – inner and outer concreteness of materials – are clearly present but they are not yet conceptually separated, since the

7 Adolf Loos, Michaelerhaus, Vienna, 1909–11



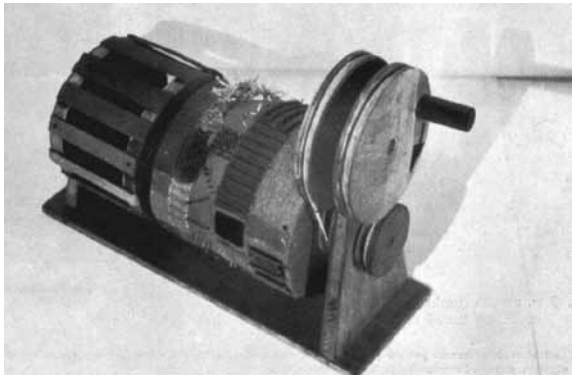
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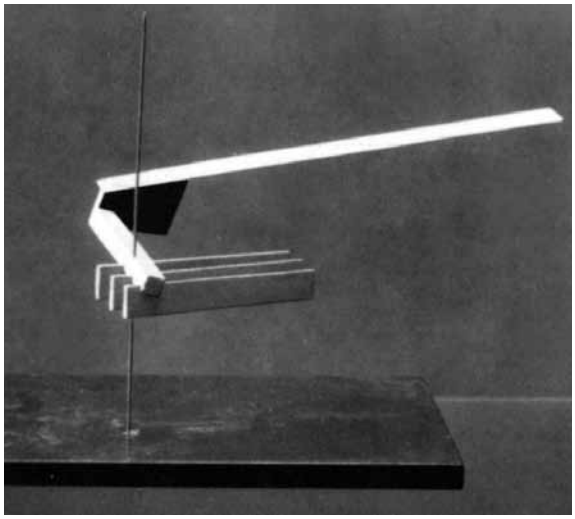
surface still belongs to the realm of coating. One could object that the columns of the Michaelerhaus are monolithic, however, they are not structural and load-bearing.

Both ideas of the material as such were studied in detail at the Bauhaus. In his 1929 book *Von Material zu Architektur* (translated as *The New Vision*), László Moholy-Nagy demonstrated that the Bauhaus was initially intently interested in the surface. He remarked on 'how neglected our tactile education is' and in the second semester conducted numerous 'tactile exercises' *[8]*.[22] He referred to F. T. Marinetti's manifesto on tactilism, in which 'a new kind of art, to be based on tactile sensations' was proposed.[23] Experiencing the material by working with it manually and feeling the material surface was meant to lead to an understanding of the material properties of structure, texture, and surface aspect and 'accede to the desire of the material, instead of subduing it'.[24] That Moholy-Nagy, too, is concerned with honesty and truth becomes clear from his description of Archipenko's sculptures, in which no surfaces, like skin or fabric, are supposed to be imitated but rather 'his wood was to stand for wood, his metal for metal, etc., and have its own value'.[25]

Moreover, Moholy-Nagy was concerned not solely with material surfaces but rather with the 'reaction to push and pull' of various materials and with equilibrium constructions.[26] He presented other exercises from his Bauhaus course that turned such material properties as 'flexibility, limits of elongation, elasticity, etc.' [27] into objects *[9]*. The Bauhaus exercises thus included both interpretations of material as such: the surface, on the one hand, and structural form, on the other. However, the significance these two material themes can eventually have for architecture was not demonstrated by Moholy-Nagy; rather, he dedicated his final chapter on architecture entirely to a new conception of space.



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8 László Moholy-Nagy, *Von Material zu Architektur* (1929), tactile apparatus, p. 25

9 László Moholy-Nagy, *Von Material zu Architektur* (1929), construction of various materials, p. 140

10 Louis Kahn, Indian Institute of Management, Ahmedabad, 1963–75

Material and its reality

During the second half of the twentieth century, we find a number of efforts to overcome the distinction between *material as such as structural form*, on the one hand, and *as surface*, on the other. The effort to fuse inner and outer materiality is characteristic of many modern architects – and certainly not a feature of Post-Modern architects. Louis Kahn's brick buildings in India and Bangladesh in particular do not give one the feeling of cladding but rather of the oneness of structural and surface materiality. In a famous lecture at the Pratt Institute in 1973, Kahn asked the brick what it wants to be:

> *You say to brick. 'What do you want, brick?' And brick says to you, 'I like an arch.' And you say to brick, 'Look, I want one too, but arches are expensive and I can use a concrete lintel over you, over an opening.' And then you say, 'What do you think of that, brick?' Brick says, 'I like an arch.'*
>
> *It's important, you see, that you honor the material that you use.* [...] *You can only do it if you honor the brick and glorify the brick instead of just shortchanging it or giving it an inferior job to do, where it loses its character.*[28]

In Kahn's Indian Institute of Management in Ahmedabad of 1963, the structural logic of the brick is magnificently represented. Of equal importance, however, is the appearance of the raw surface in the light. The fusing of inner and outer material succeeds because the construction does not need any

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'coating' – to use Semper's word. The building has corridors and balconies open to outside air. Neither insulation nor layered external walls are necessary, and the material can look the same inside and out. Hence the surface of the brick does not look like an added shell but rather like the actual boundary of the construction *[10]*.

Kahn calls for this inner conversation with the material not only for brick. Every material has a nature and one has to find out 'what it really is':

> *When you're making something you must consult nature, like the conversation with the brick. And you can make the same conversation with concrete. And you can make the same conversation with paper, or with papier maché, or with plastic, or with marble, or any material that has its nature. And it's the beauty of what you create that you honor* – the material for what it really is.[29]

Over the last two decades, the most vehement advocate of realising the idea of material as such has been Peter Zumthor. He writes often of the 'concrete', the 'concrete world' and the 'concrete qualities of architecture'. Architecture is 'always concrete matter', which can be experienced 'in a concrete way' and in which 'concrete materials are assembled and erected'.[30] In his essay 'Der harte Kern der Schönheit' (The Hard Core of Beauty) of 1991 in particular, he returns again and again to the 'reality of building materials' and the 'reality of the structures [...] whose properties I wish to penetrate with my imagination, bringing meaning and sensuousness to bear'.[31] His designs start out from the place, and this means from material appearances:

> *Occupying oneself with the inherent laws of concrete things such as mountains, rock, and water in connection with a building assignment offers a chance of apprehending and expressing some of the primal and as it were 'culturally innocent' attributes of these elements, and of developing an architecture that sets out from and returns to real things.*[32]

His strategy of trying to grasp the '"culturally innocent" attributes of these elements' calls for interpretation. Zumthor does not speak of materials here but rather of elements. Materials, in contrast to matter or elements, are something people use, hence they are associated with civilisation. Building materials, constructions and buildings can never be 'culturally innocent' and hence his design for the Therme Vals was not a grotto and his design for the Swiss Pavilion for Expo 2000 in Hanover was not a forest. Both are geometric in accordance with their construction materials. Both the Expo Pavilion and the Therme narrate the moment when the things of nature become (construction) materials. Thus the Expo Pavilion can easily be associated with the piles of lumber at a sawmill *[11, 12]*, and likewise the Therme with a quarry *[13, 14]*. A sawmill is the site of a transformation from tree or forest to building timber, and a quarry the site at which rock or cliff transform to stone blocks. The sawmill and quarry thus characterise the moment when human beings take possession of these substances as materials.

Zumthor's strategy of producing a feeling of the primal state of a material is, as these two examples show, a return to the origins of processing. Can material as building material be more *as such* than it is in this most 'primal' state in the sawmill and quarry? Something that was only recently tree or forest and stone or cliff is now *wood as such* and *stone as such*. The presence of the material is heightened by reducing it to this initial state of processing the material. And yet even this material as such in Vals and in Hanover can ultimately be only a citation of quarry and sawmill.

Zumthor succeeds as few other architects do in harmonising *inner* and *outer material as such* – that is, the meaning of construction and the sensuousness of the surface. In the Expo Pavilion in Hanover, in the Wachendorf Chapel, and even in

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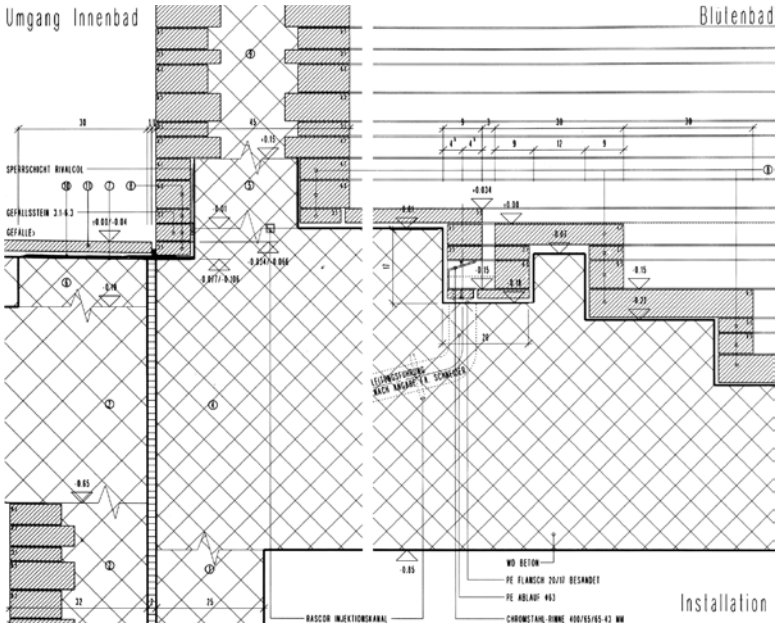
11 Peter Zumthor, Swiss Pavilion, Expo 2000

12 Stack of boards in a sawmill

13 Peter Zumthor, Therme Vals

14 Quarry near Salzburg

15 Peter Zumthor, Therme Vals, detail



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the roofs covering the excavation site in Chur – in short, in all projects not conditioned by special demands such as insulation or sealing – the inner and outer materiality are one. But even Zumthor cannot always escape the difference between material as structure and material as surface. The walls of the Therme Vals, which consist of a constructive bound of gneiss outside and concrete inside, could still be included in this unity, but the floors and stairs with their complex structure to resist moisture cannot [15].

For architecture right up to the present, it has been an intellectual challenge to harmonise the two views of *material as such as structural form* and *material as such as surface*. The multilayeredness of the constructive elements is an important strategy in architecture and contradicts this harmony. There have been repeated attempts to overcome multilayeredness – such as the Swiss experiments with lightweight concrete for single-layer exterior walls – but, despite being more than forty centimetres thick, they do not meet current standards for the insulation of low-energy and zero-energy buildings. Nevertheless, these efforts demonstrate the urgent desire for such unity, which goes hand in hand with desires for concreteness, authenticity, truth and reality.

Concluding, one has to ask: does *material as such* exist? Everywhere and always, material has depended on form – and in architecture also on processing and perception. In architecture, it is tied to contact with the people who form, use and perceive it. It can, however, also be said that wood always remains wood, regardless of its cladding, its structural form, how well or badly it is worked, and how it is perceived. Whether or not a material shows what it is, it is and remains this material. So why do architects call for *material as such*? One reason may be that the call for material as such is one example of how the desire for authenticity and authentic expression of the 'self' is transferred to architecture. With people as with materials, the realisation and presentation of the 'self' is a multilayered act.

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Notes

1. Francesco Algarotti, *Saggio sopra l'architettura* (1756), in idem, *Saggi* (Bari: Laterza, 1963), p. 37: 'Per che ragione la pietra non rappresenta ella pietra, il legno il legno, ogni materia sé medesima e non altra? [...] quale si conviene alle qualità caratteristiche, alle pieghevolezza o rigidità delle parti componenti, a'gradi di forza resistente, alla propria essenza, in una parola, o natura della materia che vien posta in opera. Cosicché, diversa essendo formalmente la natura del legno dalla natura della pietra, diverse eziandio hanno da esser le forme che nella costruzione della fabbrica tu darai al legno, e diverse quelle che alla pietra. Niente vi ha di più assurdo, [...] quanto il far si che una materia non significi se stessa, ma ne debba significare un'altra.'
2. Vitruvius, *The Ten Books on Architecture*, trans. by Morris Hicky Morgan (Cambridge, MA: Harvard University Press, 1914), 4.2.2, p. 107.
3. Algarotti, *Saggi*, p. 37: 'Abuso veramente, dice egli, il più solenne di quanti immaginare si potessero giammai; e che per essere da cosi lungo tempo radicato nelle menti degli uomini, conviene adoperare, per isterparnelo, ogni maggiore sforzo della ragione.'
4. Ibid.: 'Dal che gli screpoli nelle fabbriche, le crepature, le rovine; quasi una manifesta punizione del torto che vien fatto del continuo alle verità.'
5. This topic, too, can be traced back to the above-cited passage in Vitruvius 4.2.5, where it is said the Greeks believed that 'what could not happen in the original would have no valid reason for existence in the copy'. One can interpret 'original' as the timber construction, 'copy' as the stonework. Vitruvius, *Ten Books*, p. 109.
6. Algarotti, *Saggi*, p. 37: 'I quali disordini già non si vedrebbono, se da quanto richiede la propria essenza e la indole della materia se ne ricavassero le forme, le construzione, l'ornato.'
7. Ibid., p. 51: '[...] il legno nell'architettura è la materia matrice [...]; quella che impronta in tutte le altre le particolari sue forme'.
8. Gottfried Semper, 'Vorläufige Bemerkungen über bemalte Architektur und Plastik bei den Alten', trans. as 'Preliminary Remarks on Polychrome Architecture and Sculpture in Antiquity (1834)', in idem, *The Four Elements of Architecture and Other Writings*, trans. by Harry Francis Mallgrave and Wolfgang Herrmann (Cambridge, UK: Cambridge University Press, 1989), p. 48.
9. Ibid., p. 48.
10. Gottfried Semper, *Kleine Schriften* (Berlin, 1884, repr. Mittenwald: Mäander, 1979), p. 294. Semper states this in an English lecture from 1854. The English manuscript can be found in the GTA-archive of ETH Zurich. Only the German translation could be considered here.
11. Gottfried Semper, *Der Stil in den technischen und tektonischen Künsten; oder, Praktische Aesthetik: Ein Handbuch für Techniker, Künstler, und Kunstfreunde*, 2 vols (Frankfurt am Main: Verlag für Kunst & Wissenschaft, 1860; Munich: F. Bruckmann, 1863), trans. by Harry Francis Mallgrave and Michael Robinson as *Style in the Technical and Tectonic Arts; or Practical Aesthetics* (Los Angeles: Getty Research Institute, 2004), p. 760. See also p. 77: 'Although form – the idea made visible – should not be in conflict with the material out of which it is made, it is not absolutely necessary for the material as such to be a factor in artistic appearance.'
12. Eugène-Emmanuel Viollet-le-Duc, *Entretiens sur l'Architecture* (Paris, 1863-72, repr. Ridgewood, NJ: Gregg Press, 1965), trans. by Benjamin Bucknall as *Discourses on Architecture* (New York: Grove, 1959), p. 469.
13. Louis Sullivan, 'The Tall Office Building Artistically Considered' (1896), in idem, *Kindergarten Chats and Other Writings* (New York: Dover, 1979), pp. 202-213.
14. Karl Bötticher, *Die Tektonik der Hellenen*, I (Potsdam: Riegel, 1852), p. 6: 'Die Form erst verleiht dem baulichen Materiale die Eigenschaft seine Funktion erfüllen zu können; umgekehrt kann aus der Form jedes Mal die Funktion erkannt werden.'
15. Semper, *Kleine Schriften*, p. 323: 'den leblosen Stoff'.
16. Frank Lloyd Wright, *An Autobiography* (New York: Longmans, Green and Co., 1933, repr. of 1st edn 1932), p. 148. See also p. 357.
17. Adolf Loos, 'The Principle of Cladding', in idem, *Ins Leere gesprochen: Gesammelte Schriften, 1897–1900* (Vienna: Prachner, 1997), trans. by Jane O. Newman and John H. Smith as *Spoken into the Void: Collected Essays 1897–1900* (Cambridge, MA: MIT Press, 1982), p. 66.
18. Ibid., p. 67.
19. Ibid.
20. Günter Bandmann, 'Der Wandel der Materialbewertung in der Kunsttheorie des 19. Jahrhunderts', in *Beiträge zur Theorie der Künste im 19. Jahrhundert*, I, ed. by Helmut Koopmann and J. Adolf Schmoll, gen. Eisenwerth (Frankfurt am Main: Klostermann, 1971), p. 149. Bandmann employs this distinction in another context, namely, to distinguish between the treatment of material in architecture and that in painting and sculpture; nevertheless, this differentiation can be applied very well to the subject of material as such in architecture.
21. Adolf Loos, 'My Appearance on Stage with Melba', in idem, *Spoken into the Void*, p. 123.
22. László Moholy-Nagy, *Von Material zu Architektur* (1929), trans. by Daphne M. Hoffman as *The New Vision. Fundamentals of Bauhaus Design, Painting, Sculpture, and Architecture* (Mineola, NY: Dover Publications, 2005), p. 27.
23. Ibid.
24. Ibid., p. 74.
25. Ibid., p. 109.
26. Ibid., p. 126.
27. Ibid., p. 127.
28. Louis I. Kahn, *Writings, Lectures, Interviews*, ed. by Alessandra Latour (New York: Rizzoli, 1991), p. 323.
29. Ibid., p. 327.
30. Peter Zumthor, *Architektur denken* (Baden: Lars Müller, 1998), trans. by Maureen Oberli-Turner as *Thinking Architecture* (Baden: Lars Müller, 1999), pp. 11-13, 58-59.
31. Ibid., p. 34.
32. Peter Zumthor, 'The Hard Core of Beauty', in *Thinking Architecture*, ibid., p. 29.

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