

The simple but fascinating ink drawing by the French architect Eugène-Emmanuel Viollet-le-Duc (1814–1879) – Crystalline system of the Mont Blanc (Fig.1) – illustrates the geometrical structure that, according to him, regulates the morphology of the entire Mont Blanc *massif*. Far from an amorphous, chaotic mass, he imagines the mountain as a gigantic crystal that follows the regular structure of a polyhedron – more specifically the rhombohedra, the simplest and most symmetrical crystalline system generated by an oblique axis. Explaining that the surfaces of the principal or secondary planes of the rhombohedral structure are harder than its centre, Viollet-le-Duc claims that, as the Alpine mass progressively shrank (through cooling) and eroded (through the action of glaciers), it left higher and stronger ridges, therefore revealing the rhombohedral prismatic crystalline pattern that structures it.<sup>1</sup> The diagram on the left outlines the basic rhombohedral crystalline system (cut in half), with its principal planes and subdivisions, while the drawing on the right demonstrates through a specific example (the remnant peaks towards Blaitière in the Vallée Blanche as seen from the Tacul) how the erosion, or general ruination, of the Mont Blanc follows this regular system.<sup>2</sup>

Viollet-le-Duc didn't include this spectacular drawing in the set of illustrations he chose for his 280-page geological study on the Mont Blanc, *Le massif du Mont Blanc – Étude sur sa constitution géodésique et géologique sur ses transformations et sur l'état ancien et moderne de ses glaciers* (1876) – though some woodcuts in the book come close to it (Fig.2). As it is undated, it is possible that it was simply drawn after publication. But we can also presume that it was too obviously speculative, if not too imaginative or romantic to be illustrated publicly. It indeed gives us a glimpse

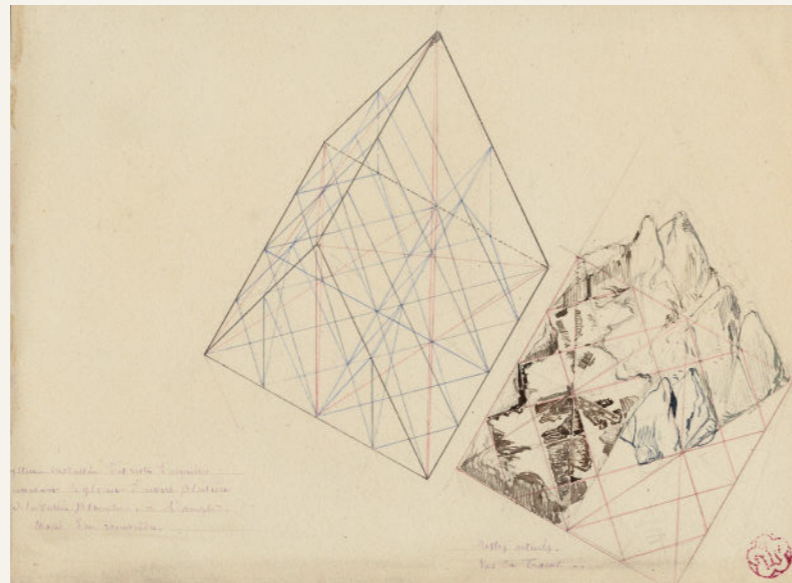
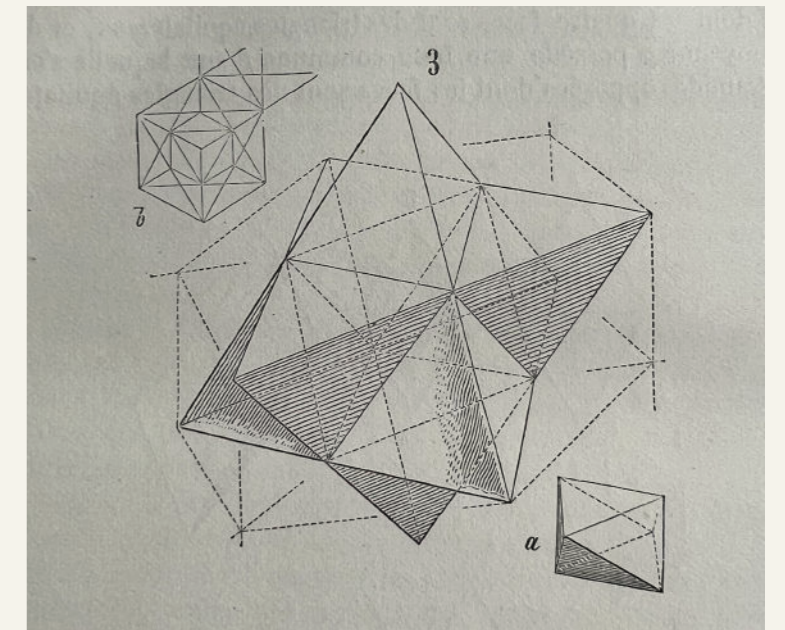
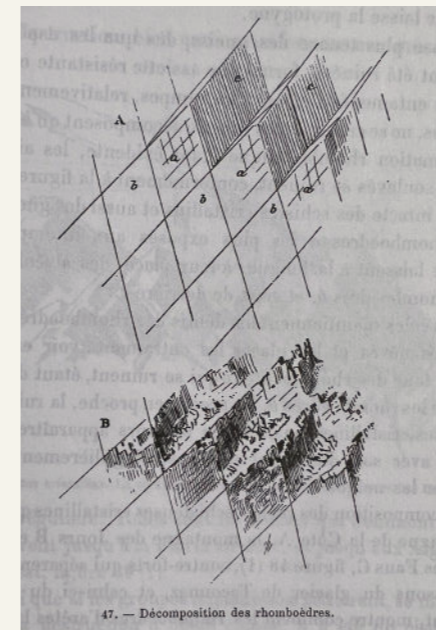


Fig.1 E.-E. Viollet-le-Duc, Crystalline system of the Mont Blanc Undated. Ink on paper, 20.0 x 26.6cm. Photo © Ministère de la Culture – Médiathèque du Patrimoine, Dist. RMN-Grand Palais / image RMN-GP. Annotations – bottom left: 'Crystalline system of the remnant peaks separating the glacier towards Blaitière in the Vallée Blanche. Half of a rhombohedra'; and on bottom right: 'Current remnants seen from the Tacul.'

Fig.2 E.-E. Viollet-le-Duc, Plane of contraction of the primitive granite mass, following a rhombohedral crystalline system. Unsigned wood engraving. Fig.47 from *Le Massif du Mont Blanc* (1876). Private collection.

Fig.3 E.-E. Viollet-le-Duc, Crystal formation. Unsigned wood engraving. Fig.3 of the article 'Style', in *Dictionnaire raisonné de l'architecture*, vol.8 (1868). Private collection.



of Viollet-le-Duc's quasi-sacred conviction that the crystalline principle is the world's most fundamental – the one great truth in the mirror of nature. It is an idea that permeates his entire oeuvre, whether archaeological or architectural. It was the central image used to illustrate his definition of style (Fig.3).<sup>3</sup> And he resorts to it for his most grandiose speculative iron project presented in the twelfth of his *Entretiens sur l'architecture*: the vaulted concert hall for 3,000 people, with a free-span of 46m, 15m longer than Santa Sophia (Fig.4).<sup>4</sup>

Viollet-le-Duc's geological work follows closely from his work as medieval archaeologist and architect. Having spent his entire life studying the play of the structural forces that operate in masonry buildings, whether medieval or modern, he moved, towards the end of his life, to the contemplation of the same primary laws and forces working in nature on the grandest scale. For eight years between 1868 and 1876, he used his summer vacation to study and measure the greatest of European mountains, the Mont Blanc.<sup>5</sup> His first aim was the preparation of a complete and systematic map of the region under survey – a goal he achieved spectacularly with the production of a huge and stunning chromolithographic plan 'view' of the massif 'as if it had been photographed from an altitude of 10,000 metres' (Fig.5).<sup>6</sup> Thanks to a graphical method using subtly graduated light and shade, he could produce a vivid representation of the configuration of the slopes, with its hollows and recesses, and the sharp and abrupt contour of the mountain peaks.

It is indeed from the close observation of the peaks and cols making up the great massif that the highly pictorial form transformed, under Viollet-le-Duc's wilful scrutiny, into a perfectly regulated crystalline system. In looking at these

complex forms, we are taught to recognise a systematic, underlying order (Fig.6). But Viollet-le-Duc did not want to describe simply a static order. His *Massif du Mont Blanc* is primarily an attempt to reconstruct, from the original upheaval, what, according to him, shaped the great *massif* over time. Once the primordial granitic mass crystallised under cooling, or metamorphosed under pressure, it underwent a rapid disintegration, the rhombohedral blocks splitting as water filtered through the interstices of lamination and expanded under frost, and as glaciers eroded the mass. But that very process of ruination is what best reveals the crystalline system. And what can be seen on a grand scale is repeated indefinitely in each of the masses, secondary, tertiary, etc. The Mont Blanc thus acts as one huge crystal formation, every edge, every peak and *aiguille* following a geodesic structure. This sort of unificatory explanation of natural phenomena did not belong only to Viollet-le-Duc. In fact, his geological ideas follow the general system of the famous French geologist Léonce Élie de Beaumont (1798–1874), who devoted his whole life to prove that a unified geometrical network – the *réseau pentagonal* – organises the tectonic of the entire planet.<sup>7</sup> But thanks to Viollet-le-Duc's written and, especially, his visual language, we are made to witness more, as if the gigantic chaotic mass of the Mont Blanc was a deliberate construction, an architecture that can be restored to its rational idea. The two sketches that stand side by side on the drawing reproduced here, one a diagram, the other a rendering of ruined mountain peaks, is indeed nothing less than the illustration of a process of restoration. Viollet-le-Duc was explicit about the analogy between architecture and geology in the introduction to his *Le massif du Mont Blanc*:

To analyse carefully a group of mountains, the manner in which they were formed, and the causes of their ruin; to discover the order in which the phenomena of upheaval occurred, the conditions in virtue of which they have resisted or endured the action of atmospheric agents, to note the chronology of their history, is to devote oneself to a work of methodical analysis which is, on a grander scale, analogous to that to which the practical architect and the archaeologist applies himself when drawing conclusions from the study of buildings.<sup>8</sup>



Fig.4 E.-E. Viollet-le-Duc, 46-metre-span polyhedral vaulted hall. Wood engraving by E. Guillaumot. Fig.18 from 'Douzième entretien [1865]', *Entretiens sur l'architecture*, vol.2 (1872). Private collection.

Fig.5 E.-E. Viollet-le-Duc, *Le Massif du Mont Blanc. Carte dressée à 1:40,000* (1876). Chromolithography by Georges Erhard. 117.5 x 99.5cm. Courtesy Département des cartes et plans, Bibliothèque Nationale, Paris.

Fig.6 E.-E. Viollet-le-Duc, Chain needles at Chamonix. Reconstruction of successive states. Undated. Graphite, 16 x 21.4cm. Médiathèque de l'architecture et du patrimoine, Paris. Dist. RMN-Grand Palais/Art Resource, NY.

Fig.7 E.-E. Viollet-Le-Duc, The artist sketching while trapped in a crevasse, 1870. Watercolour heightened with gouache, 22.9 x 13.3 cm. Katrin Bellinger Collection.



- 1 This explanation is in Chapter 4 of E.-E. Viollet-le-Duc, *Le massif du Mont Blanc – Étude sur sa constitution géodésique et géologique sur ses transformations et sur l'état ancien et moderne de ses glaciers*, ed. J. Baudry (Paris: Librairie polytechnique 1876), 53–97.
- 2 On this famous drawing, see Françoise Véry, 'À propos d'un dessin de Viollet-le-Duc', in *E. Viollet-le-Duc et le massif du Mont-Blanc*, ed. Pierre A. Frey (Lausanne: Payot, 1988), exh. cat., 109–18; Pierre A. Frey, 'Prométhée au Mont-Blanc ou un architecte au chevet du monument de l'Europe', in *Viollet-le-Duc et la montagne*, eds Pierre A. Frey and Lise Grenier (Grenoble: Glénat, 1993), 26–33; Martin Bressani, *Architecture and the Historical Imagination. Eugène-Emmanuel Viollet-le-Duc, 1814–1879* (Farnham, Surrey: Ashgate Publishing Ltd, 2014), 478–91; and Aisling O'Carroll, 'Reconstructing the Dent du Requin', *LA+ Journal 12 Geo* (Fall 2020), 86–93. On Viollet-le-Duc's geological work more generally, see, apart from the catalogues cited above, Aisling O'Carroll, 'Representing Geohistory: Exploring drawing as reconstruction in the archives of Eugène-Emmanuel Viollet-le-Duc', in *The Routledge Companion to Drawings and Models: From Translating to Archiving, Collecting and Displaying*, ed. Federica Goffi (London: Routledge, 2022); Aisling O'Carroll, 'Panorama as critical restoration: Examining the ephemeral space of Viollet-le-Duc's study at La Vedette', in *Homes, Nations and Empires, and Ephemeral Exhibition Spaces 1750–1918*, eds Dominik Bauer and Camilla Murgia (Amsterdam: Amsterdam University Press, 2021), 21–52. See also Robin Middleton, 'Viollet-le-Duc et les Alpes: la dispute du

- Mont-Blanc', in *Viollet-le-Duc. Centenaire de la mort à Lausanne*, exh. cat., ed. Jacques Gubler (Lausanne: Musée historique de l'Ancien-Evêché, 1979), 101–10 and the relevant headings in Laurent Baridon, *L'imaginaire scientifique de Viollet-le-Duc* (Paris: L'Harmattan, 1996).
- 3 E.-E. Viollet-le-Duc, *Dictionnaire raisonné de l'architecture française du XIe au XVIe siècle*, vol.8 (Paris: Morel, 1866), 474–97.
- 4 E.-E. Viollet-le-Duc, *Entretiens sur l'architecture*, vol.2 (Paris: Morel, 1872), 91–98. The 12th *Entretien* instalment first appeared between 1866 and 1868.
- 5 For the most thorough account of Viollet-le-Duc's mountain treks, see Pierre A. Frey, 'E. Viollet-le-Duc, itinéraire d'un dessinateur', in *E. Viollet-le-Duc et le massif du Mont-Blanc*, *op.cit.*, 11–38.
- 6 On this map, see Armand Brulhart-Danna, 'La carte du massif du Mont-Blanc de Viollet-le-Duc, 1876', in *E. Viollet-le-Duc et le massif du Mont-Blanc*, *op.cit.*, 39–60.
- 7 See Léonce Élie de Beaumont, *Notice sur les Systèmes des Montagnes*, 3 vols. (Paris: P. Bertrand, 1852). On Élie de Beaumont's pentagonal network, see Mott T. Greene, 'Élie de Beaumont and the First Global Tectonics', in *Geology in the Nineteenth Century. Changing Views of a Changing World* (Ithaca and London: Cornell University Press, 1982), 69–92; Jacques Touret, 'Élie de Beaumont (1798–1874), des systèmes de montagnes au réseau pentagonal', in *L'essor de la géologie française*, ed. Jean Gaudant (Paris: Presses des Mines, collection histoire et sociétés, 2009), 95–132; and Martin J.S. Rudwick, *Worlds Before Adam. The Reconstruction of Geohistory in the Age of Reform* (Chicago and London: The University of Chicago Press, 2008).

- 8 Quoted from Benjamin Bucknall's English translation: E.-E. Viollet-le-Duc, *Mont Blanc. A Treatise on its Geodesical and Geological Constitution; its Transformations; and the Ancient and Recent State of its Glaciers* (London: Sampson Low, Marston, Searle, & Rivington, 1877), 12–13.

