

# The Aesthetics of Marble

from Late Antiquity  
to the Present

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**HIRMER**

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# Contents

- 6 **Introduction: Marble, Material, and Image**  
Dario Gamboni and Gerhard Wolf
  
- 14 **Marble Metamorphosis**  
Gerhard Wolf
  
- 62 **Churches and Mosques:  
Aesthetics and Transfer of Marble in Early Islam**  
Mattia Guidetti
  
- 76 **Sacred Marbles and Holy Spots in Rome:  
Interpretations and Re-Interpretations  
in the Middle Ages**  
Daniela Mondini
  
- 90 **“From the Highest Heaven”:  
A Renaissance Pax and a Vision in Marble**  
Jessica N. Richardson
  
- 114 **Style and the Aesthetic of Surface in  
Architecture from Alberti to Michelangelo**  
Alina Payne
  
- 132 **Painting on Marble:  
Reflections on the Meaning of Stone Supports**  
Johanna Beate Lohff
  
- 146 **For God and for the King:  
The Elaboration of a Symbolic Use of Marble  
in the *Ancien Régime***  
Sophie Mouquin
  
- 168 **Attending to Marble in  
Eighteenth-Century Britain**  
Malcolm Baker
  
- 186 **The Amimetic Aesthetic of Marbling**  
Raphael Rosenberg

214	<b>From Wood to Marble: Altarpieces and Devotional Sculpture in Buenos Aires, Lima, and Santiago during the Second Half of the Nineteenth Century</b> Fernando Guzmán, Diego Fernando Guerra, and Paolo Pioresi	366	List of Figures with Photo Credits
226	<b>The Discourse of Marble in the Spanish Caribbean: The Case of the <i>Capitolio Nacional</i> in Havana</b> María Ocón Fernández	378	Bibliography
236	<b>Sober Opulence: Marble in the Architecture of Adolf Loos</b> Marie Theres Stauffer	414	Notes on Contributors
252	<b>Marble After Modernism</b> Adrian Forty	418	Index
266	<b>The Non-Finito in Auguste Rodin's Marble Oeuvre</b> Christiane Wohlrab		
276	<b>Between Material and Text: Marble's Material Culture in the Twentieth and Twenty-First Centuries</b> Alexandra Parigoris		
294	<b>The Quarry and the Tower: Filming Marble's Architectural Anticipations</b> Spyros Papapetros		
312	<b>Articulate Stones in the Digital Age: "Wrinkles, Scars, Blotches, Bruises, Fractures, Mutilations, Amputations, Dislocations, and Restorations"</b> Adam Lowe and Charlotte Skene Catling		
328	<b>Marble for Iconophiles and for Iconophobes</b> Dario Gamboni		

# Articulate Stones in the Digital Age

“Wrinkles, Scars, Blotches, Bruises, Fractures, Mutilations, Amputations, Dislocations, and Restorations”<sup>1</sup>

“Beside each wrinkle one invariably finds a scar,” Victor Hugo wrote when he compared the ravages of time with the—usually destructive—human-made alterations to the Cathedral of Notre-Dame. Every object, as every person, has a biography that becomes legible on its surface.<sup>2</sup> The more precious an object the longer it is likely to last and the more wrinkled and scarred it will become. Yet these marks are the means by which objects become articulate and reveal their histories.

Stone, measured in geological time, has been fashioned into a built history of human time, almost infinitesimal by comparison. Marble is a visual record of natural forces: violent tectonic shifts, turbulence and folding, extremes of heat, compression, and the raising and lowering of sea levels leaving behind traces of organic life. This is its ‘pre-history.’ There is then the purchase, extraction, transport, and working of marble into objects; what they represent or embody, and what takes place around them. Their stories morph and proliferate, shifting emphasis and meaning in translation. Almost imperceptibly, objects become less legible over time, until their original meanings are lost and replaced with newer ones. But objects are their own forensic evidence.

This essay is about looking, and the capacity of marble to embody multiple narratives. It takes the perspective of recording with lasers and photogrammetry, and re-materializing using digital printing and craft skills, focusing on three extraordinary and very different examples of worked stone: the panels from the Treasury Wall of the Basilica of San Marco in Venice (Fig. 1), the Sarcophagus of Seti I (Fig. 2), and the *Table of Teschen* (Fig. 3). In each case, history, use, and meaning are condensed into a material presence that is made more visible through digital technology, prompting new speculation on the past.

## The Basilica of San Marco

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The Venetian concept of time and its own mythology is as liquid as the city itself. The Basilica of San Marco, the magnificent Italo-Byzantine conglomerate of a building in Venice, is an accretion over centuries, through building, tearing down and rebuilding, destruction, theft, repurposing, and reinvention. Here architecture takes on a geo-archaeological depth. The



1 View of the south exterior wall of the Treasury of San Marco, Venice

marble cladding of the trophy wall of San Marco uses all the reverberative power of direct quotation. Cities were invaded and spolia used to create a civic identity for Venice with instant resonant gravitas, physical authority, and beauty. Here history is co-opted through the reconstruction and manipulation of collective memory. So what is ‘original’ or ‘authentic,’ and where does emotional resonance lie? This is, after all, the *third* San Marco. In 1935, Walter Benjamin developed the debate around reproduction and the “aura” of an artwork in *The Work of Art in the Age of Mechanical Reproduction*, but is this still useful in the twenty-first century?<sup>3</sup>

#### Ornament and Theft, Ornament and Crime

Of the capitals, mosaics, marble, and 600 columns used to refashion San Marco, much was made up of booty

brought back from the Fourth Crusade (1202–1204). In *The Stones of Venice* (1853), John Ruskin wrote of the building’s “confessed *incrustation*,” describing in romantic language an almost Modernist honesty of architectural expression.<sup>4</sup> Marble revetments were stripped from the interior of Hagia Sophia and pinned like butterflies to the external brick walls of the Venetian basilica. San Marco is a building where the construction is made explicit, where the visitor

will see that every slab of facial marble is fastened to the next by a confessed *rivet*, and that the joints of the armour are so visibly and openly accommodated to the contours of the substance within, that he has no more right to complain of treachery than a savage would have, who, for the first time in his life seeing a man in armour, had supposed him to be made of solid steel.<sup>5</sup>



2 Factum Foundation's facsimile of the Sarcophagus of Seti I

It is the precursor to Adolf Loos's approach to decoration, crystallized in his thesis of honesty versus degeneracy, "Ornament and Crime" (1910)<sup>6</sup> and "Hands Off!" (1917), where he writes: "consider that noble material and good work do not outweigh the lack of ornamentation, but that they are far superior in their delicacy. More than that, they make ornamentation redundant."<sup>7</sup> The complexity and wonder lie within the marble itself.

### Born of Porphyry

The rivets Ruskin writes of raise questions, as they are not consistently present but appear only in some of the marble panels, while others are fixed invisibly to the brickwork beneath, presumably with cement. This is also true of Hagia Sophia, and the Pantheon, where the Romans bonded marble to its surface with cement, delighting in the beauty of the stone itself with no pretense that it played a supportive, structural role. At San Marco, a clear distinction is made between the thin panels that clad the building and the pillars of solid marble that stand independent of it. Marble is located according to a hierarchy, and columns arranged by their value, color, and size. By far, the most precious stone was imperial porphyry, extracted only briefly during Nero's reign (54–68 CE) from a single site in Egypt's Eastern

Desert. The quarries on Mons Porphyrites had been closed for hundreds of years by the time of Justinian (r. 527-565), whose monuments were constructed from those of Constantine, just as Constantinople itself was built partly from a dismantled Rome. After the seventh century, when the Romans lost control of Egypt and access to the imperial porphyry quarry, it was valued even more highly, as there was simply no more to be had.

Porphyry, the rich, reddish-purple color of placenta, was used to line the birthing rooms of the Byzantine empresses, giving rise to the term *porphyrogenitos* (born of porphyry), indicating a legitimate imperial heir. Princes would be crowned emperor on a disc of porphyry like that in the Pantheon. At San Marco, the porphyry loot is displayed to maximize its implicit imperial authority. The darkly gleaming embracing *Tetrarchs* protectively enfold the corner of the Treasury, and with the massive *Pietra del Bando*, whose truncated form seems only to compress and intensify its powerful presence, they were strategically placed between the Basilica and the Doge's Palace, bridging Church and state. Extraordinary sculptural details—the beards of the older *Augusti* against the smooth faces of the younger Caesars, the draped cloth of the cloaks and decorative sword hilts, their wrinkled foreheads—are preserved by the hardness of the stone that resists the weather with impunity. As well as representing a

sovereign provenance in both subject and material, the *Tetrarchs* were subsumed into local Venetian mythology as petrified Saracens in a cautionary tale: thieves who tried to break into the Treasury were turned to stone. The *Pietra del Bando* was used as a platform for announcing public executions and the Pillars of Acri for displaying severed heads; trophies were both mineral and human, symbols of past and present power, embodied warnings.

### 'Image Birthing'

Deep purple porphyry flanks the main entrance of San Marco, followed by green marbles such as serpentine and Thessalian green, then Aquitaine black and white. Book-matched panels of Iassense, with its expressive folded bands of red hematite, punctuate the walls of the Treasury as focal points. Columns of precious Docimeum or *pavonazzetto* are found in the apse. But perhaps San Marco's looted marbles are best understood through Paul the Silentiary's description that unfolds as a lapidary atlas of the empire, filled with sensuous delight. It was recited in 563 after the rededication of Hagia Sophia, and, although today it is as though a thin, gray veil has been drawn over the remaining stones, one can imagine the brilliance of the space when they were all in place, gleaming with their full power.

There is a wealth of porphyry stone [...] besprinkled with little bright stars that had laden the river-boat on the broad Nile. You may see the bright green stone of Laconia and the glittering marble with wavy veins found in the deep gullies of the Iasian peaks, exhibiting slanting streaks of blood-red and livid white; the pale yellow with swirling red from the Lydian headland; the glittering crocus-like golden stone which the Libyan sun, warming it with its golden light, has produced on the steep flanks of the Moorish hills; that of glittering black upon which the Celtic crags, deep in ice, have poured here and there an abundance of milk; the pale onyx with glint of precious metal; and that which the land of Atrax [Thessaly] yields, not from some upland glen, but from the level plain: in parts vivid green not unlike emerald, in others of a darker green, almost blue. It has spots resembling snow next to flashes of black so that in one stone various beauties mingle.<sup>8</sup>



3 Factum Arte's facsimile of Johann Christian Neuber's *Table of Teschen*, 1779–1781, Château de Breteuil

San Marco turned Hagia Sophia inside out. These precious stones are now external cladding, facing the Lagoon, exposed to the heat, cold, wind, and rain for centuries. For all the beauty of the weathered panels that now 'incrust' San Marco, there is an equal melancholy in looking at their painted replacements in Hagia Sophia. The flat and gaudy imitation marbling on plaster just serves to highlight the mysterious depth and complexity of the original stone.

The perception of San Marco emerges through the use of color and the effects of light. In Paul the Silentiary's ekphrastic eulogy, colors are presented as contrasts in an architecture of surface tension: "blood red and livid white," "pale yellow with swirling red," black with white "milk," vivid "emerald," and "darker green"; in each case, qualified with reference to animation through light, "besprinkled," "bright," "glittering," glinting, flashing, "golden light." Ruskin is adamant that "incrusted architecture" is defined by "chromatic decoration" and condemns the color-blind:





4 Factum Foundation's 3D render from the surface recording of the marble cladding from the west exterior wall of the Treasury of San Marco, Venice



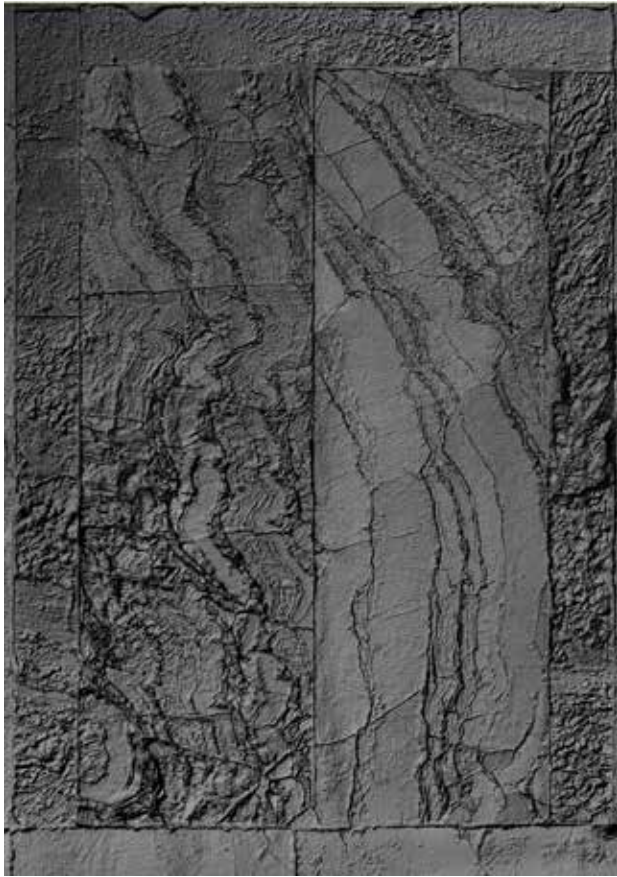
5 Factum Foundation's 3D render of the color and relief information merged of the marble cladding from the west exterior wall of the Treasury of San Marco, Venice

If, therefore, the reader does not care for color, I must protest against his endeavor to form any judgment whatever of this church of St. Mark's. But, if he both cares for and loves it, let him remember that the school of incrustated architecture is *the only one in which perfect and permanent chromatic decoration is possible*; and let him look upon every piece of jasper and alabaster given to the architect as a cake of very hard color, of which a certain portion is to be ground down or cut off, to paint the walls with.<sup>10</sup>

Through *eikonogenesis* or 'image birthing,' markings and shapes in the marble conjure themselves into recognizable forms where the viewer can pass through the surface, like Alice through the looking glass, into an imaginary world beyond. In his book *The Analysis of Sensations, and the Relation of the Physical to the Psychological*, first published in 1886, Ernst Mach examined

"the space sensations that physiologically condition the recognition of a figure [...]," and, by manipulating small, black amoeboid forms in relation to each other, demonstrated the point at which recognition requires intellectual intervention.<sup>11</sup> He concluded that "affinity of form" is instantly recognizable when objects are bi-laterally symmetrical, or rotated through 180 degrees, but recognition needs a secondary, intellectual process when they are orientated differently.

As a psychological tool, Hermann Rorschach chose to use symmetrical images as a shortcut into the subconscious because, in his experience, they were more "suggestive" than asymmetric ones. "Asymmetric figures are rejected by many subjects; symmetry supplied part of the necessary artistic composition [...] symmetry makes possible the interpretation of whole scenes."<sup>12</sup> A great deal of important work has been carried out on the effect of symmetry on perception and the human



6 Factum Foundation's 3D render from the surface recording of the marble cladding from the west exterior wall of the Treasury of San Marco, Venice



7 Factum Foundation's 3D render of the color and relief information merged of the marble cladding from the west exterior wall of the Treasury of San Marco, Venice

imagination, including that by Dario Gamboni, some in this book.<sup>13</sup>

The book-matched marble panels are one of the most striking characteristics of the wall at San Marco (Figs. 4, 5). The *cipollino rosso* (Figs. 6, 7) panels stand out in particular among their watery neighbors. Isolating the marble slabs using frames of contrasting stone, or the same marble double-billet moldings as those found at Hagia Sophia, elevates them to the status of artwork. Cutting and unfolding the marbles not only multiplies a precious material, but also visually declares a human presence. The use of symmetry turns the patterns of the stone from accidental to intentional, from found objects to human-made. One can imagine how the tendency for images to materialize out of the symmetrically patterned panels of the basilica might have been harnessed as a conduit between the mundane and the divine.

#### Recording and Re-Materializing the Treasury Wall of San Marco

After several months of negotiation with the *Procuratoria di San Marco*, the submission of detailed procedures to ensure that the scissor-lift would not damage underground drainage, that the lights and recording system would not threaten the stone, that the data would be useful for conservation, that the tourist-flow would continue uninterrupted, and that the students from the Department of Architectural Preservation at Columbia University could participate, work finally began on 9 October 2017.

Raised above the thousands of visitors in the *piazza* below, the recording process provides the time and proximity to notice subtle details and raises questions. Why is one stone heavily weathered and the next almost smooth? How different are the marbles when wet? Why is one veining captivating while another dull?



8 Factum Foundation's 3D render of the color and relief information merged of the marble cladding from the west exterior wall of the Treasury of San Marco, Venice



9 Factum Foundation's 3D render from the surface recording of the marble cladding from the west exterior wall of the Treasury of San Marco, Venice

Who chose these marbles? Can we still perceive and understand the values that were once projected onto them, that led them to be so highly prized? The surface of San Marco can now be captured using only a DSLR camera, recording an area of about one by two meters in a few hours. Over 10,000 high-resolution photographs of selected marble panels on the Treasury wall were taken, following strict guidelines and despite the weather and ceaseless questions from curious visitors. It was unforeseen that the students would become temporary guardians of the Treasury wall, preventing errant tourists from using it as a urinal.

The time-consuming processing of the photographs took place in Madrid.<sup>14</sup> Once the renders were processed, the depth of the marble surface could be viewed independently of its color, revealing many qualities that may be otherwise overlooked. For example, a *breccia* frame surrounds panels of gray and white marble

(Figs. 8, 9). The *breccia*, in which broken mineral fragments are bound together in a fine-grained matrix, reduces down over time to a variety of chunky surfaces with deep recessions. By contrast, the panel is a finer, slightly sandy material, with hard white veins of denser stone. The sandy areas erode faster than the veins, leaving a beautiful, fluid surface in relief. Each material reveals its formation as it ages, and condition monitoring is one of the valuable roles of photogrammetry.

But visualizations are still only virtual representations viewed on-screen. The data recorded is of sufficient quality to be translated into a triangulated mesh of over 200 million polygons, with an accuracy of 100 microns, and can be re-embodied using a range of 3D output technologies (Figs. 10–13). In other words, the marble skin can be remade at a resolution that is indistinguishable from the original to the naked eye. The digital world returns to the physical.



10 Factum Foundation's color 3D render of the color and relief information merged of the marble cladding from the south exterior wall of the Treasury of San Marco, Venice



11 Factum Foundation's 3D render from the surface recording of the marble cladding from the south exterior wall of the Treasury of San Marco, Venice

The goal of the San Marco exercise was several-fold. First, to record the surface of selected areas of the panels in color and 3D at the highest resolution; second, to prove that this technique could be taught and transferred to students in a matter of hours; finally, and perhaps most importantly, to demonstrate what can be achieved in practice. Recording our heritage is now possible, affordable, and urgent: waiting any longer will mean real and irretrievable cultural loss.

### The Body of the Stone

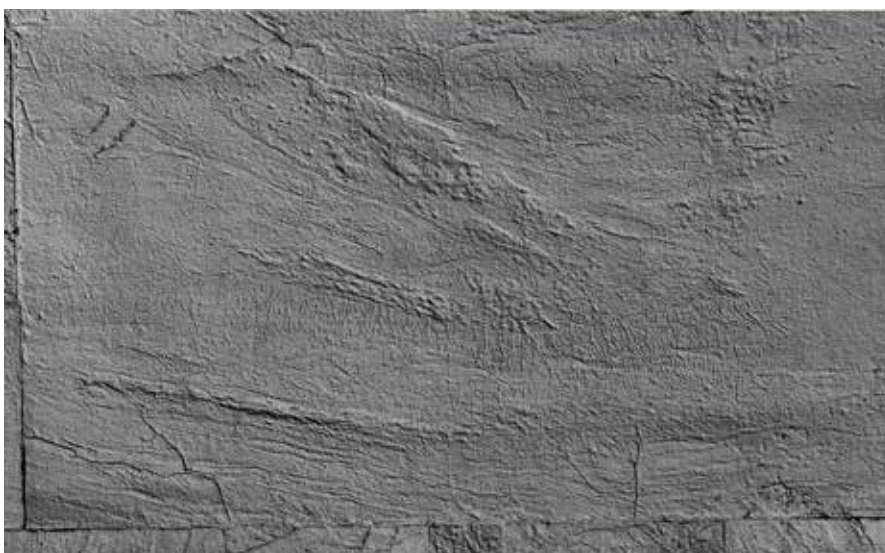
[...] and by that means formed those Representations which appear in the Body of the Stone [...] and may be artificially produc'd by several Bodies and Liquors, which have no affinity, either with Agate, Mochus, or Marble, I can make it plainly apparent by Experiment [...].<sup>15</sup>

Various attempts were made in the seventeenth century to manipulate and manufacture marble by those captivated by its corporeal form and symbolic power. Latent images seen in diverse markings made the material highly prized and were an endless source of inspiration. The idea that these representations were “productions of chance” and might be artificially made, or somehow insinuated into natural stone, began to appeal, as Robert Hooke's above quoted text illustrates.<sup>16</sup> Scagliola re-emerged as the cheapest and most effective way to mimic marble and pietra dura inlays. Formed by kneading a pigmented dough of plaster of Paris with animal glue, it shortcuts millions of years of heat, pressure, and tectonic movements to produce a similarly veined and patterned body.

In his article “Painting in Stone: Early Modern Experiments with a Metamedium,” Fabio Barry looks at a number of early attempts to make and color stone.<sup>17</sup> In the early seventeenth century, Niccolò Tornioli and Michelangelo Vanni pioneered innovative techniques to



12 Factum Foundation's 3D render of the color and relief information merged of the marble cladding from the west exterior wall of the Treasury of San Marco, Venice



13 Factum Foundation's 3D render from the surface recording of the marble cladding from the west exterior wall of the Treasury of San Marco, Venice

make pigments penetrate the surface of marble—some of which Factum is trying to reproduce now—overcoming several hurdles. For instance, many of these texts were written in ciphers; the properties of some of the early ingredients have to be transferred to the present day laboratory, and archaic terminology translated.

By the mid-seventeenth century in Oxford, Hooke's associate William Byrd was also able to stain marble,

benefitting from the shared interests of experimental philosophy and science. By the eighteenth century, there was a revival of interest in controlling the markings of marbles, and both the Comte de Caylus and the Principe di Sansevero were successful to varying degrees. However, it was not until the second half of the century when Leonardo de Vegni developed a method of forming calcareous deposits inside a mold,

that anyone really attempted to ‘grow’ a stone resembling marble. These early experiments are the precursor to the work now carried out by Factum, where some of the techniques, such as Scagliola, are regularly employed.

#### Form from Light

Current technologies seem almost alchemical, with equally magical results. In practice, they are based on

either building up a form in layers, or carving it away from a solid block: ‘additive’ or ‘subtractive’ manufacturing. As discussed below, both were used in parallel to make the facsimiles of the tomb and Sarcophagus of Seti I. However, it was the emerging technology of Océ’s elevated printing system that was chosen to remake part of the San Marco ‘skin.’

Elevated printing is a variation of the photocopy technology that was once Océ’s core skill. In 1937, Chester Carlson invented the xerograph based on the



14 Printing operations for Factum Foundation’s facsimile of the Sarcophagus of Seti I



15 Océ – A Canon Company’s elevated printing for Factum Foundation’s facsimile of the Sarcophagus of Seti I

principle that ultraviolet light neutralizes electrostatic charge. A charged surface is selectively *dis*-charged by exposure to light. The remaining charged area attracts a fine dust of resin-coated pigment that is then fused using heat. In the elevated printing system, this process is repeated many times, gradually building up a relief surface from five micron-thick layers. The marbling process, where oil paint is floated on water, then lifted off onto paper, is comparable. If this were repeated thousands of times with the same sheet of paper while controlling the shape of each layer, the result would be something like elevated printing.

The initial layers of Océ – A Canon Company’s electrostatic system are black toner, followed by white and, finally, color. It cannot print undercuts, nor deposit color on vertical or near vertical surfaces. Every system has its limitations and inherent characteristics, and as applications emerge, the process can be adapted and refined within the constraints of the material.

### The Sarcophagus of Seti I

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The Sarcophagus of oriental alabaster, was found in the center of the hall [...] without a cover, which had been removed and broken, and the body that had once occupied this superb coffin, had been carried away. We were not, therefore, the first who had profanely entered this mysterious mansion of the dead [...].<sup>18</sup>

On 16 October 1817, Giovanni Battista Belzoni, an over two-meter tall engineer and former strongman, discovered the rock-cut tomb of Seti I, the most magnificent and complete in the Valley of the Kings. For 3,100 years, this tomb remained in almost the same condition as the day it was sealed. As few contemporaries could travel to Egypt, Belzoni made a facsimile of his spectacular find and brought it to London. The relief surface was cast from molds made on site, removing much of the original color and fabric in the process. The casts were then hand painted, following the meticulous watercolor records made on site by Belzoni and Alessandro Ricci. The facsimile caused a sensation when it opened at the Egyptian Halls on Piccadilly in 1821, and the

following year it was described in detail in Alfred Thornton’s *Don Juan in London* with a color engraving of the gas-lit interior that fascinated fashionable Londoners.<sup>19</sup>

Belzoni also took Seti’s sarcophagus to London, where John Soane eventually bought it for an enormous sum, more than the British Museum would pay. It remains in his house, under glass, which makes it difficult to examine the delicate carvings (or Belzoni’s name graffitied into the foot of the sarcophagus, a very visible ‘scar’). The stone was white when it arrived and is now honey-colored, stained by the nineteenth and early-twentieth-century London smog. The blue infill that originally delineated the carving fell out or was scrubbed away by over-enthusiastic cleaning. Now only traces of the blue remain, and most are nineteenth century.

### Flesh-Eating Stone

Decay and change are inherent in the idea of a ‘sarcophagus’: literally a ‘flesh-eating stone,’ it protects the body and the soul during their most vulnerable transformation. The Sarcophagus of Seti I contains the protective figure of the goddess Nut on the base and the hieroglyphic text of *The Book of Gates* on both its inside and outside surfaces; it is one of the world’s most compelling objects and important Egyptian finds. *The Book of Gates* focuses on the Sun God’s complex journey after death, through the “dark hours of the sun,” to his rejuvenation each morning. Carved in white alabaster whose surface mimics youthful skin, it has a softness, luminosity, and depth that invites touch.

### Recording and Re-Materializing the Sarcophagus

Archaeologists and geologists use the term alabaster differently. ‘Oriental alabaster’ is a fine-grained, banded calcite (rather than the geologists’ gypsum), with a low index of refraction, allowing light to penetrate several millimeters into the stone before it is scattered back out. This causes the ethereal translucency that makes it so desirable, but also almost impossible to scan with a laser. Factum tried and failed in 2001, as the noise in the data exceeded the information. In 2016, a second attempt was made, this time with a specially designed and lit camera rig. Over 5,000 photographs were taken and processed with the same *Reality*



16 Factum Foundation's facsimile of the fragments from the lid of the Sarcophagus of Seti I, from Sir John Soane's Museum, London. The fragments are displayed in a facsimile of Bonhomie's original case



17 Applying Océ's 3D print to the surface of the milled form of the Sarcophagus of Seti I during the production of the facsimile





18 Detail of Factum Arte's facsimile of Johann Christian Neuber's *Table of Teschen*, 1779–1781, with the facsimile of the accompanying catalogue, Château de Breteuil

*Capture* software that was used for San Marco's marble panels. The outcome was a 3D file of over 12 billion polygons: vast, unwieldy, and impossible to handle in one piece. Factum's 3D studio ingeniously transformed the data and, using both photogrammetry and topographic-mapping software, separated the sarcophagus surface from its undulating form. The form was milled into a polyurethane block while the surface was distorted into a flat plane for elevated printing. The printing was built up in five-micron color layers of UV-cured resin (Figs. 14, 15), and was finally mapped back onto the curvilinear structure.

This process of re-materialization was experimental from the outset and modifications were improvised as new difficulties were discovered. Byrd, Sansevero, and de Vegni must have experienced similar frustrations in their explorations, and felt the same exhilaration with success. The resin appears to be transformed from a synthetic material to an alabaster (Figs. 2, 15–17). The facsimile of the Sarcophagus of Seti I is an object with its own visual qualities, and in the same way that plaster casts were valued as objects with unique qualities and scientific value, so the sarcophagus has become more than an imitation. An object of wonder and excitement, it reveals the evidence of the past through the technologies of the present.

## The Table of Teschen

“I can think of nothing more devastating, more utterly smug than that hideous [Empire] style. [...] But I believe, all the same, that they've got some lovely things; why they must have that famous mosaic table on which the Treaty of [...].”<sup>20</sup>

The *Table of Teschen*, or *Table of Europe*, was famous enough in the nineteenth century for Marcel Proust to give it a cameo in *Swann's Way*, when the General defends the arriviste Princesse d'Iéna from the Princesse des Laumes. It is generally considered to be Johann Christian Neuber's (1736–1808) masterpiece and one of the most important and dazzling pieces of eighteenth-century furniture. Even the Princesse petulantly admits that the table is “interesting enough from the historic point of view.” In 1781, the Elector of Saxony gave the table to the Baron de Breteuil for his role in negotiating the Treaty of Teschen, signed on 13 May 1779. This effectively restored peace in Europe by ending the war between Austria and Prussia. It also established the principle of collective security, the foundation for the Covenant of the League of Nations and Charter of the United Nations.

### Geological Kaleidoscope

To commemorate this historic event, Neuber created a table that was essentially an enlarged version of one of the *Steinkabinettabatieres* (literally, stone cabinet snuffboxes) on which he had built his reputation in Dresden.<sup>21</sup> Using the principle of creating a decorative pattern from an encyclopedic collection of brilliantly colored local minerals, stones, gems, and petrified woods, but much enlarged, the table has the dazzling effect of a geological kaleidoscope (Figs. 3, 18–20). In Enlightenment spirit, and reflecting a growing interest in mineralogy, a number for each of the pieces is carefully engraved in its metal frame. This allows for the type and origin of each sample to be identified in an accompanying catalogue, beautifully handwritten by Carl Gottfried Nestler and housed in a secret drawer under the tabletop (Fig. 18). Read with a *Petrografische* map of Saxony, the geologically curious can locate the specific source of each stone.



19 View from above of Factum Arte's facsimile of Johann Christian Neuber's *Table of Teschen*, 1779–1781, Château de Breteuil



20 Detail of Factum Arte's facsimile of Johann Christian Neuber's *Table of Teschen*, 1779–1781, Château de Breteuil

The table is clad in gilded bronze over a hardwood core (Fig. 3). Its legs are divided into four sections with decorative acanthus leaves at its tiny feet, swags at the top, its ‘thighs’ wrapped in amethyst and divided from its ‘calves’ by jeweled garters of white quartz and pearls. Alternating gem-cut amethysts and quartz encircle its middle. Its golden surface is opulently set with 128 highly polished, petal-shaped, semi-precious inlays, arranged in four bands that radiate from the center, the edges encrusted with floral designs in colored glass. Meissen porcelain medallions are inset among the gleaming stone samples, with variously engaged fleshy putti. As a seductively dressed geological taxonomy, saluting scientific order while commemorating peaceful European collaboration, it is an object that carries many narratives.

### Compressing Time

Neuber’s travels to Saxon quarries in search of his multi-colored stones is part of the table’s mythology. In the 1770s, the modern classification of stones was in its infancy with a new interest in all things underground. Abraham Gottlob Werner set out his systematic organization of minerals in his book *On the External Characters of Fossils, or of Minerals* in 1774.<sup>22</sup> He also circulated his influential theory of Neptunism, the idea that rocks formed from the crystallization of minerals in ancient oceans, and demonstrated chronological succession in rocks. In reality, Neuber had probably just visited Idar-Oberstein, renowned center for gemstones, where traders mixed with craftsmen who cut and worked unpromising raw material to reveal dazzling interior worlds. These objects trigger some fundamental curiosity, as concentrations of the sublime, compressed to a scale that can be held in the hand. Polished stones with their glassy brightness are very alluring, and perhaps, as the Princesse de Laumes observed, even a little vulgar.

In 2015, the current Marquis de Breteuil sold the *Table of Teschen* to the Musée du Louvre. One of the conditions of sale was that a single facsimile could be made to ensure the table’s continued existence at the Château de Breteuil. Factum recorded the table using 3D scanning and composite-photography supported by many detailed measurements and written notes. Digital technologies were then merged with established craft

skills to produce a new version that is virtually identical to the original when compared side by side. The copy is now in place at the Château on permanent display to the public. The emotional impact of the facsimile in its original setting is a good counterpoint to the aesthetic presence of the original table in its new home.

### Recording and Re-Materializing the *Table of Teschen*

When the Marquis de Breteuil approached Factum to remake the *Table of Teschen*, the first question to arise was, should the stones in the replica *be* like the ones in the original or *look* like them? In other words, was Factum being asked to source the same stones as the original, or replicate their exact patterns and colors? It was decided that there would be too much variation in new pieces of the different stone types. Instead, the two tables, when placed side-by-side, should *look* identical.

To that end, macro-photography and 3D scanning were followed by a period of research into how to ‘extract’ the qualities of the stones. The exact shape of each original sample was water-jet cut from a sheet of 3mm-thick aluminum. These were then coated with a ground of animal glue, calcium carbonate, and titanium white pigment (a recipe very similar to Scagliola). The coating was sanded to a smooth surface. It was then printed with pigment on a flatbed inkjet printer, often in layers to build a density of color. Once printed, the surface was covered with a thick layer of epoxy resin. This layer was then polished to the same finish as the original pieces. The results are staggeringly convincing, only just revealing their artifice through touch. But as the original table had been protected with a layer of acrylic resin during a restoration, the feel of the original and the facsimile were far closer than had been expected.

To complete the facsimile of the whole table required many different processes; laser-scanning, photography, photogrammetry, detailed measurements, CNC milling, water-jet cutting, electro-plating, turning on a lathe, coating, printing, engraving, replicating the porcelain Meissen plaques, modeling, molding, and polishing. Historically, in a pre-digital age, crafts were separated by materials and disciplines. Factum now focuses instead on the mediation of materials—both digital and

physical—where disciplines overlap. There is a general view today that technology will kill craftsmanship. In a project like this, the reverse is true. People with the right skills appear, while others rapidly pick them up; craftsmanship is remarkably adaptive, and can be killed only by the absence of patrons commissioning work of the highest quality. A love of material transformation drives innovation and discovery.

## Living Stone

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Recording, processing, and making prompts a rethinking of the way objects are displayed and experienced. Facsimiles can allow them to remain in the spaces for which they were intended as an alternative to the twentieth-century museum that airlifted them out of their original contexts. The characteristics of light and color that define marble and fascinated Paul the Silentiary and Ruskin have been turned into technological tools: marble can be recorded using photogrammetry ('measuring with light'), it can be 'printed' based on Océ's system of exposure to light, and color can be separated from tone in the processed data. In addition to data that can be viewed as separate component parts, or enormously enlarged making it easier to decipher 'wrinkles' from 'scars,' the techniques developed to re-materialize objects give a deeper insight into the way objects were first made and how they have changed over time. This goes beyond academia, into a haptic relationship that allows an intuitive understanding.

Marble narratives proliferate like a Borgesian library. The sarcophagus leads into the Underworld, the youthful perfection of its smooth, white skin promising immortality. Once the mummified body is permanently enfolded in the softness of the alabaster, a stone partly soluble in water, there is a sense that the image and contents might dissolve into each other as part of the transformation into the afterlife and the boat journey to rebirth. San Marco, through pious pillage, turns an architectural façade into a map of the Roman/Byzantine Empire by literally assembling pieces of it into an architectural composition. Layering age, it becomes a catalogue of the known world through religious conquest. The *Table of Teschen* represents the geo-political world, but with the Enlightenment's optimism; its whole being is a physical assurance that the earth can be taxonomically structured. It implicitly suggests that control and order can be reached through knowledge and diplomacy, then refined and technically perfected into an object of beauty.

Perhaps ultimately it is anthropomorphism that underlies our passionate attraction to marble. It seems alive. It is both 'skin' and 'body,' capable of giving birth to images and emperors through *eikonogenesis* and *porphyrogenesis*. The *Table*, coquettish on its tiny feet and gartered thighs, unfurls its message like peacock feathers in an extravagant, self-conscious display. The sarcophagus consumes flesh in order to resurrect it. The watery patterns, mirrored on the walls of San Marco, unfold and repeat like a cardiogram tapping out a pulse of living stone. Time collapses through these articulate objects, and technology is amplifying their voice.

1 Hugo 1836, vol. 3, p. 127.

2 Ibidem, p. 124.

3 Benjamin 1969.

4 Ruskin 1867, vol. 2, p. 74 (emphasis is Ruskin's).

5 Ibidem, p. 75f.

6 Loos gave a lecture by this title at the Akademischer Verband für Literatur und Musik in Vienna on 21 January 1910. It was published (in French) in 1913 in *Cahiers d'Aujourd'hui*, and later in *l'Esprit Nouveau* in 1920. It was published in German in 1929 as "Ornament und Verbrechen" in the *Frankfurter Zeitung*.

7 Loos 1962, p. 347.

8 Paul the Silentiary, *Description*, vv. 617–646.

9 Schibille 2014.

10 Ruskin 1867, vol. 2, p. 79 (emphasis is Ruskin's).

11 Mach 1914.

12 Rorschach 1948, p. 15 (chap. 1: "The Method").

13 Gamboni 2002.

14 Adobe *Lightroom*, *Reality Capture*, and *Global Mapper* software were used to create zoomable visualizations that can be saved, sent, and studied. *Lightroom* processing achieves ideal exposure, clarity, and color, while *Reality Capture* is a software that generates a point cloud using feature mapping and elegant algorithms.

15 Hooke 1705, p. 436.

16 Ibidem.

17 Barry 2017.

18 Giovanni Battista Belzoni quoted in *Antiquarian Researches 1821*, p. 448.

19 Thornton 1821–1822.

20 At this point, the dialogue in the original text cuts off. See Proust 2013, p. 262.

21 Kugel 2012.

22 Werner 1774; Werner 1805.

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## Dust jacket images

Front (upper image): Detail of an exterior vault of the Taj  
Mahal, 1631–1648, Agra (photo: Dario Gamboni)

Front (lower image): Detail of porphyry slab, Portable Altar  
of Countess Gertrude of Braunschweig, Lower Saxony,  
ca. 1045, The Cleveland Museum of Art, Cleveland (photo:  
© The Cleveland Museum of Art)

Back (upper image): Santiago Calatrava, *Oculus*, 2016,  
PATH station at Ground Zero, Manhattan, New York,  
detail, photographed in 2016 by Hufton+Crow (© VG  
Bild-Kunst, Bonn 2021; photo: © Hufton+Crow / VIEW).

Back (lower image): Adolf Loos, Villa Karma, vestibule,  
1904–1906, Clarens, near Montreux (photo: © Roberto  
Schezen / Esto)

Inner flaps: Framed 'stone picture' with book-matched slabs,  
interior of the Pantheon, 118–128 CE, Rome (photo:  
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History, Rome, photographer: Enrico Fontolan)