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The Amimetic Aesthetic of Marbling*

Various types of stone have been called marble throughout the ages, and the reasons for their aesthetic appreciation have varied. First, there is white marble. In Greco-Roman Antiquity and beyond, it usually came from Carrara or Paros and was the preferred material of sculptors. It was valued for its homogenous, fine-grained structure, its bright flawlessness, its translucency, and the soft sheen of its polished surface. Second, there are monochrome colored marbles, which were employed less frequently by ancient sculptors, who sometimes used them for architectural details. In Roman times, the most popular were those with the strongest colors, such as *nero antico*, *rosso antico* or the monochrome variants of *giallo antico*.¹

The initial impulse for the present essay comes from a third kind of stone often encountered throughout the history of art: stones with colorful flecks and or veins. From a geological point of view, some of these stones are recrystallized carbonate minerals, hence marbles. Historically, other stones, such as granite or *breccia*, have also been referred to as marble, although they clearly do not belong to this geological family. What these stones have in common, however, is that their mineral components appear juxtaposed on a macroscopic

level. They form flecks and or veins in various colors and textures. These flecks and veins form irregular patterns. In the context of the present study, I define any surface with such irregular patterns as marbling. Variegated marble types that have been polished to bring out such patterns were and still are very popular (Figs. 1–7, 20). Just as popular, however, are ‘marbled’ objects made from natural materials such as wood veneer (Fig. 8) and artificial materials such as glass (Figs. 10, 11) or ceramics (Figs. 12–15).

The first thesis of the present study is that generating marbled surfaces is a creative process that has been important across time and space. Although several modern languages derive the term marbling from marble, other, especially earlier, languages preferred metaphors associating these kinds of patterns with clouds or moving water.² Hence, my second thesis is that material is not essential for the aesthetic appeal of marbling. What then is the reason for this appeal? The third thesis of this essay is that there are two complementary explanations for this phenomenon: marbling might suggest mimetic associations, and it has an amimetic appeal. On the one hand, marbling possesses a mimetic potential: those who look at marbled

surfaces might discover faces, figures, landscapes, and other things that appear to be pictured in them. These discoveries surprise the viewer and have been described as a source of fascination for millennia. In this respect, marbling is comparable to rocks, clouds, and dappled walls; it is an example of “images made by chance,” to use Horst Janson’s phrase. Dario Gamboni prefers to call them “potential images” to emphasize their ambiguities and the contribution of the observer.³ On the other hand, marbling possesses an amimetic aesthetic appeal: beholders experience pleasure by looking at variegated speckles and serpentine veins whose colors and forms, relationships and rhythms are experienced all the more when not associated with representation.

No systematic study of the amimetic aesthetic of marbling exists, but James Trilling’s reflections on the topic are highly instructive. In *The Language of Ornament* he discusses the ostentatious use of marble by

Adolf Loos, the Viennese architect who famously called for the abolition of ornament in 1908 and, the following year, clad the two lower stories of a building, prominently facing the emperor’s palace, in a colorfully veined *cipollino* marble (Fig. 1).⁴ Trilling notes that the stone serves to embellish the building and it is therefore ornament. Marble and marbling have been referred to as ornament before,⁵ but Trilling is the first to have considered the theoretical implications of their ornamental use, and he shows that the amimetic aesthetic of marbling is part of a broader history of ornament. As an art historian who specializes in Byzantium, he points out that Loos’s use of marble was part of a tradition going back thousands of years. Still, he emphasizes the caesura rather than the continuity. In Trilling’s view, Loos brought about an epochal change not by abolishing ornament, but by inventing a new form of ornament at the Looshaus on Michaelerplatz: Modernist, “material-based” ornament. In this sense, he writes:

1 Adolf Loos, Goldman & Salatsch Building (Looshaus) at Michaelerplatz, 1909–1911, Vienna



there were clear precedents for his [Loos's] adoption of a material-based ornament without recognizable motifs or predictable patterns. He was, however, the first to use it on a monumental scale, in the most public of settings. By excluding traditional ornament from the façade of the Looshaus he asserted for the first time, as explicitly as it is possible to do in purely visual language, that his flamboyant marble was no longer just a building material, an adjunct to ornament: it *was* the ornament.⁶

Trilling's theoretical classification of marbling as ornament is convincing, although his exemplary analysis is not flawless. First, at the building on Michaelerplatz, Loos did not use *cipollino* in its pure form, as Trilling suggests, but in conjunction with an almost classical (that is, Vitruvian) articulation of architectural elements: Tuscan columns with a continuous tripartite

entablature.⁷ *Cipollino* column shafts were hardly rare in Roman Antiquity. What is unusual is that the entablature and (external) walls of the Looshaus are in variegated marble. This produces an overlap between two competing forms of structure or ornament: the columnar order and the colorful marbling. This overlap was both intentional and adept. Loos kept the profiling of the entablature strikingly simple and flat so as not to detract from the figuring of the marble, setting dark accents in front of the light green *cipollino* by having the smaller elements—the column bases and capitals, the lower architrave, the escutcheons, the lamps, and the latticed bay windows—cast in a brownish-green patinated bronze. Second, in my opinion, Trilling is wrong to suppose a modern caesura in the history of marbling. A cursory glance at the images in this essay is sufficient to reveal the significant continuities in the use of marbling as ornament over vast periods of time (my first thesis).

2 Porphyry vase, Egyptian, 3500–2800 BCE,
Treasury of San Marco, Venice





3 Sardonyx cup, Late Roman or Byzantine, 5th–7th century CE, Treasury of San Marco, Venice

This contribution sets out to provide a study that is as comprehensive as possible of the amimetic aesthetic of marbling. In the first section, I sketch a history of the use of patterned stones. This is followed by an overview of the natural (section II) and artificial materials (section III) that have been used to produce marbling over the millennia. Section IV turns to textual sources, to analyze statements about the amimetic aesthetic of marbling over two thousand years, while section V discusses whether and to what extent, in the course of millennia, marbling was subjected to historical changes. Finally, section VI concludes by scrutinizing the possible cognitive bases of the amimetic aesthetic of marbling.

I. Polychrome Stones

There is some evidence that at least occasionally polychrome stones were the material of choice for stone tools as early as the middle Palaeolithic period, more than forty thousand years ago. This implies that the penchant for marbling extends not only to *Homo sapiens* but also to *Homo neanderthalensis*. With the

grinding of stone tools in the Neolithic period, the interest in patterns becomes more evident still.⁸ This can be shown quite clearly in the case of prehistoric Egypt from around the middle of the fourth millennium BCE, with the so-called second Naqada culture. Stonecutters from that period actively sought out polychrome stones for vases and bowls, they did not shy away from using very hard materials,⁹ and the variety of minerals used increased over time.¹⁰ There are examples of elaborately veined limestone,¹¹ but the most common types of rock they used have dappled patterns. One popular stone, for example, was an almost black andesite porphyry with large, light-pink feldspar crystals (Fig. 2).¹² When polished, these crystals appear as long, light rectangles on a dark ground. They are aligned almost parallel to one another and thus convey a sense of movement, as though they were swimming in a dark stream. The plain forms of these vases are suitable to displaying the patterns of the stone, whereas the statues carved from similarly hard rock around the same period are generally monochrome, which gives fuller expression to their sculptural form.¹³

Second-millennium stonecutters in the Aegean achieved some particularly refined patterns in the





5 Detail of the marble incrustation of an aedicula in the Pantheon, 118–128 CE, Rome

fabrication of vessels and signets.¹⁴ Not only in prehistoric Egypt, but also in Hellenistic times, there was an increase in the number of stone vessels made from particularly hard and variegated minerals. This was due to improved transportation routes and growing ostentation among courtly patrons. Commonly used stones in Hellenistic time were agate and chalcedony, particularly finely veined microcrystalline quartzes in variegated and strongly contrasting colors. Of these, the most prominent is sardonyx (Fig. 3), a rare rock that was quarried in India and already known in Mycenae.¹⁵ It was used for the manufacture of vessels in Alexandria and Antioch from the Hellenistic period to the Byzantine era.¹⁶ The example illustrated here, a bowl measuring 28 centimeters wide, is one of the largest pieces ever to have been carved from a single piece of sardonyx.¹⁷ It is one of eight sardonyx objects now at the Tesoro di

San Marco, most of which probably found their way to Venice in 1204 along with other plunder from Byzantium.¹⁸

Since the second millennium BCE, stones with polychrome patterns have also been incorporated into architectural structures. The oldest instances I am aware of are in the so-called palaces of Crete, such as those at Knossos and Phaistos, where gypsum or alabaster cladding was used extensively, although only small fragments are preserved.¹⁹ Still, contemporaneous wall paintings with striking marbling in the podium zone convey some impression of what was perhaps once there (for example, the West House in Akrotiri or the Throne Room of the Minoan Palace of Knossos). Hellenistic cultures in the eastern Mediterranean also faced their palace walls with slabs of colored marble.²⁰ The archaeological evidence is sparse, but what survives is impressive.²¹ Again, the contemporaneous painted marbling is better preserved, and archaeologists have interpreted it as a cheaper alternative to real stone walls.²²

4 Marble incrustation of an aedicula in the Pantheon, 118–128 CE, Rome



6 Apsidal recession with marble incrustation in the Pantheon, 118–128 CE, Rome

The Pantheon in Rome is an important milestone in the history of marbling. The cladding of the building's external wall is only partially preserved. It was a simple pilaster articulation of white marble slabs. By contrast, the interior of the rotunda is broken up by a complex rhythm of recessions and projections. Eight apsidal openings alternate with eight columned aediculae and the whole space is encompassed by a continuous Corinthian order. With the exception of the dome, the interior of the rotunda is adorned throughout with polychrome marbles (Figs. 4–7). The upper level was completely altered in the eighteenth century and the floor has probably been renovated several times, but the furnishings at ground level still seem to be from the period of the building's construction under Emperor Hadrian (r. 118–128 CE), even though there are some recent claims that significant renovation work was carried out in the eighteenth century.²³ Although the incrustations are often mentioned as the most extensive use of colored marble to have survived from Greco-Roman Antiquity, what has been overlooked is that it also happens to be one of the oldest instances ever of book-matched stone slabs.²⁴ The polychromy underlines the architectural structure of the building: the pilasters and columns of the major order are all in yellow marble (*giallo antico*). The large, continuous entablature is accentuated by an alternation of light (architrave and cornice in white marble) and dark (the dark-red frieze, probably porphyry). The remaining wall surfaces (Figs. 4–6) are subdivided into smaller individual fields. There are, for instance, on both sides of the aediculae (Fig. 4) three polychrome fields between the continuous base of *pavonazzetto* and the entablature of the minor order; then two bands of single fields between the entablatures of the minor and major orders (Figs. 4, 5). Each of those fields is a symmetrical, multi-colored stone picture. Most of those stone pictures are framed with rocks of different hues and or three-dimensional profiles. This form of symmetry is referred to as book-matching. In order to obtain such panels, stone blocks were sliced in single slabs; the slabs were then laid out next to each other—mostly horizontally reversed, but sometimes also vertically, so that there are one or even two axes of symmetry (Fig. 7), formed by the edges between two or four slabs.

The marble book-matching in the Pantheon is so sophisticated that it cannot be the first attempt to implement this technique of stone laying. However, I am

not aware of any previous examples, neither in stone nor as painted imitations.²⁵ In later times, book-matching would become very popular. It was used in the design of representative Byzantine churches such as Hagia Sophia in Istanbul (532–537), San Vitale in Ravenna (521–547), Hosios Loukas near Distomo (tenth to

eleventh century), and the Chora Monastery (1316–1321) in Istanbul,²⁶ but also at the Umayyad Dome of the Rock in Jerusalem (687–692) (see Guidetti Figs. 5, 6).²⁷ Compared to Byzantine marbled incrustations, the Dome of the Rock is more restrained in its coloration and variation, whereas its symmetry and regularity are

7 Framed 'stone picture' with book-matched slabs, interior of the Pantheon, 118–128 CE, Rome



consistently augmented by repetitions of double book-matching. This tendency towards a stronger geometrization seems characteristic of Umayyad ornament, but can be observed in this region even earlier, in the apse of Saint Catherine's Monastery at Sinai (548–565).²⁸

If we ignore Venice—a location of particular importance for marbling to which I shall return at the end of my text—the tradition of incrustations with polychrome veined marbles was interrupted after Late Antiquity in the Western Roman Empire. This was not a matter of technical inability, since monochrome marble slabs, sometimes with alternating colors, were often used—for instance in the Florentine Baptistery.²⁹ And although the 'Cosmati' did produce great amounts of intarsia work with colored minerals, they rarely used patterned marbles, at least not in large panels.³⁰



8 Hans Spineider, veneer panel, 1584, Velthurns Castle

The second half of the sixteenth century in Italy marks a new chapter in the history of marble incrustation. Various workshops specializing in the cutting and laying of hard polychrome stone were established almost simultaneously in Florence, Naples, Rome, and Sicily.³¹ The Romans in particular took up the torch of the classical tradition. Slabs with striking patterns were mirrored in multiples and set within complex framing systems. The primacy of Rome in this field was perhaps due to the ready availability of antique marble, but the Pantheon may also have been an important precedent.³² Marble incrustation was regarded as the noblest furnishing for Roman churches and chapels from the late sixteenth to the eighteenth century, and it also adorned some of the more ostentatious rooms of Roman palaces, inspiring countless imitators across broad swathes of Catholic—and partly non-Catholic—Europe. Marble incrustation and book-matching have been very popular ever since, especially to convey the impression of luxury in secular buildings, occasionally on the outside, and more often for entrances and bathrooms (see Stauffer Figs. 2, 4, 10); Adolf Loos (Fig. 1) is just one example.

II. Natural Marbling

Artisans have been creating surfaces from organic materials with marbled patterns of speckles and veins for millennia. Wood is the most common of these materials. It characteristically grows at different rates depending on the rhythm of season, forming annual rings that repeat alternations of colors. These rings vary in size depending on climatic conditions, causing minor irregularities in the repeated color alternation and the emanation of roots and branches introduces undulations into the annual rings. Sawing, sanding, and polishing reveals wavy patterns of the grain, which are comparable to the veins of polychrome marbles. The colors and figure of the grain vary widely between different types of wood.

There is archaeological evidence that polished wooden spears were made more than 300,000 years ago. Finds from Schöningen in Lower Saxony suggest that their makers were actively seeking to bring out the woodgrain.³³ This pushes the beginning of the interest



9 Johann Michael Flor, stucco marble in the Marble Room, 1738, Altenburg Abbey

in marbling back from *Homo sapiens* and *Homo neanderthalensis* to the more ‘primitive’ species of *Homo heidelbergensis*. In historical times, a sophisticated appreciation for woodgrain can be discerned as early as 2600 BCE in the wall paintings at the Tomb of Hesy-Ra in Saqqara.³⁴ The exact reproduction of the woodgrain in those paintings is remarkable, both with regard to their early date and in comparison to later, more idealized forms of pictorial representation in ancient Egypt. However, we cannot explicitly demonstrate the aesthetic appreciation of the painted wood veins. This is more evident with the invention of veneer. We do not know when exactly this happened. It was definitely not later than the reign of Tutankhamun (d. 1323 BCE), since his Tomb contained examples of veneered furniture. The

reason behind the invention of veneer was probably the high demand for wood types regarded as aesthetically attractive, but too rare. Hence, the costlier wood species were sawn into thin veneers and pasted to the surfaces of less costly wood species.

The aesthetic appreciation of woodgrain can be seen in countless cultures over the millennia. Pliny documented the extraordinary aesthetic appreciation for woodgrain in the first century CE with a specific regard to the first century BCE.³⁵ Large wood panels with rich vein patterns were often used in East Asia. In the Shōsōin of Nara, for example, a cabinet from the eighth century has been preserved. The impressive woodgrain is almost its sole decoration, and this woodgrain was preserved and highlighted by a layer of clear lacquer.³⁶



Ennobling wood with a veneer is similar to cladding a building with polychrome slabs of stone. Just like slabs of stone, veneers are often book-matched. Noteworthy examples can be found at Velthurns Castle in South Tyrol, built by the prince-bishop of Brixen, Johann Thomas von Spaur. The sumptuous furnishings of the representational rooms were commissioned in 1584. The walls are partly decorated with frescoes, but predominantly with wainscoting by Hans Spineider.³⁷ Some of this woodwork is adorned with intarsia (figurative and strapwork), but most of it is animated by its own intrinsic structure, with the grain and dense knotting of the veneers forming striking patterns.³⁸ For the most sumptuous room in the building (the prince's room), Spineider used large amounts of Hungarian ash with intricately convoluted patterns (Fig. 8). The panel is made up of five narrow, vertically aligned sheets of veneer. The cabinetmaker partly used book-matching: the three sheets on the left have been stripped from the same piece of wood.

Instances of patterns derived from the natural grain of wood, as at Velthurns, occur only occasionally in sixteenth-century Europe.³⁹ In the following centuries, the interest in woodgrain grew rapidly. Veneers of walnut burr were especially popular. By the eighteenth century, these had become standard fare for the doors and furniture of distinguished churches and palaces, at least in northern Italy, Germany, and Austria. Parisian court *ébénistes*, such as Étienne Levasseur and Bernard Molitor, created sophisticated patterns with large veneered surfaces.

Another type of marbling is tortoiseshell. This is obtained by heating and pressing the shells of certain tortoises and turtles. Since the sixteenth century, artisans from Goa and Gujarat in India used this material to produce vessels, boxes, and combs that were often exported.⁴⁰ European cabinetmakers familiarized themselves with the material in the seventeenth century, decorating countless objects (such as boxes and picture frames) and pieces of furniture with it. The visual charm of this brownish material derives in part from its milky translucency, but chiefly from its slightly irregular distribution of dark, cloudy flecks. The armors of other animals, such as the skin of rays and certain mussels, are comparable to the shell of the tortoise and have also been used to generate marbled patterns.⁴¹

10 Chalcedony glass bottle, Venetian, early 16th century, Victoria and Albert Museum, London

III. Artificial Marbling

Marbling can be created with paint, but also with specific techniques suited for very different materials, such as glass, ceramic, plaster, lacquer, or textiles. Artificial marbling ranges from the deceptive imitation of stone to the individual invention of patterns that depart from natural models. Some areas of the history of the various marbling techniques have already been studied. What follows here is the first coherent, albeit provisional and brief, synopsis of the field. The earliest form of artificial marbling was probably wall painting. Heinrich-Josef Klein published a history of architectural marbling in 1976. It covered the period from the second millennium BCE up to the end of the nineteenth century, and provided a very useful overview with thoughtful insights. His implicit ambition was to provide a stylistic history of marbling, but he did not succeed in this, since his material suggests more continuities than developments. From the above-mentioned Minoan examples of the first half of the second millennium on, there are two distinct groups of patterns that frequently occur alongside one another: veined alabaster-like figurations that were generally painted with brushes, and mottled *breccia*-like patterns that were often produced by dripping.⁴²

In the early and high European Middle Ages, painted marbling was common in book illumination, but rare on a monumental scale, or, as at Saint Savin-sur-Gartempe, very rudimentary. Giotto marked out new paths. The marbled architectural elements integrated into the frescoes at the Arena Chapel in Padua around 1305 are a landmark achievement. The *Expulsion of Joachim from the Temple* is a case in point; even more so is the design of the entire lower level of the chapel with painted, polychrome marble incrustations. Between each of the grisaille figures representing the *Virtues* and *Vices*, Giotto painted two panels of marble within a number of frames. The doubling of the panels gives the impression of book-matched slabs; each pair of adjacent panels has a symmetrical pattern with some minor variations to be expected of real marble panels.⁴³ I am not aware of any monumental, book-matched painted marbling older than Giotto's chapel in western medieval Europe. His inspiration for doing so may have been drawn from the antique buildings of Rome and or the Venetian churches near Padua, and possibly also



11 Miniature glass Kuttrolf, Central Europe, 18th century, private collection

from San Vitale in Ravenna, which lies between his Tuscan homeland and Padua.⁴⁴ Giotto's significant contribution to figurative painting of the fourteenth century is well known. What tends to be overlooked is that his Paduan frescoes were crucial for the dissemination of painted marbling, which was an important aspect of Italian painting well into the fifteenth century.⁴⁵

Painted marbling has a number of advantages over its stone counterparts. It is less labor-intensive and therefore cheaper. It also provides a broader spectrum and greater freedom in the choice of colors and patterns. That noted, it cannot match the texture, the brilliance, and the luminosity of minerals. One remedy for this is artificial stone, and two methods for its manufacture have been widespread in Europe since the Baroque period: terrazzo and stucco marble. Terrazzo is used predominantly for flooring. It was very popular in



12 Marbled earthenware pot, China, 7th–8th century CE,
MAK—Austrian Museum of Applied Arts/Contemporary
Art, Vienna

Venice and its hinterland in the eighteenth century, and in Italian the technique is still referred to as *terrazzo alla veneziana*. Terrazzo is produced by casting chips of stone in a cement matrix. The cement mixture is pressed before it sets, then ground and polished once fully cured. The appearance of terrazzo can be altered by adding pigment to the cement and by changing the color and size of the stone chips. The enduring characteristic of terrazzo is its dense mass of randomly juxtaposed stone chips.

Stucco marble is a technique for marbling surfaces of any size. It can also be used to adorn three-dimensional forms such as cornices. The basic ingredients are plaster, marble dust, lime, colored pigment, and water.⁴⁶ Various batches of dyed plaster are kneaded into this and the mixture is then cut into slices. The resulting slabs are ground and polished several times. For the untrained eye, it is difficult to distinguish between stucco marble and real stone. The colors do not have less luster and intensity than those of natural marble.

However, stucco marble is softer, less robust, and not weatherproof, hence it is only used for interiors, and generally not for floors or pedestal areas. It was apparently invented at the Bavarian court as a marbled variant of monochrome Scagliola. The oldest verifiable examples are the decorations of the narrow faces of the Antiquarium in Munich, which was begun by Blasius Pfeiffer in 1586. He was employed as an “artificial marbler” at the court of Duke Wilhelm V.⁴⁷ The use of stucco marble became widespread in southern Germany and Austria during the eighteenth century; the “marble room” at Altenburg Abbey (Fig. 9) offers one example of the striking effects that were achieved—fantastic color combinations and well-balanced overarching compositions that would not have been possible with real stones.⁴⁸ Stucco marble remained popular into the nineteenth century. Leo von Klenze used it in a variety of colors for the interiors of the New Hermitage in Saint Petersburg and simulated single marble blocks. Stucco marble was used widely in Vienna at the time of the Ringstrasse, for instance in the mirrored buildings of the Naturhistorische Museum and the Kunsthistorische Museum, both erected after 1871 and designed by Gottfried Semper and Carl Hasenauer. The monumental entrance halls, staircases, and rotundas are lavishly decorated with stucco marble. A comparison between the two buildings reveals that the choice of colors and patterns was based on semantics as well as aesthetics. In the Naturhistorische Museum, the stucco marble imitates the natural stones exhibited in its mineralogical collection. By contrast, in the Kunsthistorische Museum it is not naturalistic but rather fantastic. The complex course of the veins and the multiplicity of colors present imagination and virtuosity.⁴⁹

Glass was invented around the middle of the second millennium BCE and used for the manufacture of vessels with marbled patterns from the very outset. Antique glass vases from ancient Egypt to Imperial Rome frequently surpassed their stone precursors in terms of color contrast and the regularity and symmetry of their patterns.⁵⁰ The art of glass marbling, widespread in Antiquity, was rediscovered in Murano shortly after the middle of the fifteenth century and called *calcedonio* or chalcedony glass (Fig. 10).⁵¹ In later centuries, glass-makers used several other marbling techniques. In Central Europe milk glass with speckled or thread-like ornamentation became popular in the late seventeenth



13 Sancai ceramic bottle, China, first half of the 8th century CE, Freer Gallery of Art, Washington DC



14 Faience hexagonal bottle with pewter lid, Austria (Gmunden), ca. 1700, private collection



15 Faience pewter-mounted jug, Germany (Frankfurt), 1716,
private collection

and eighteenth century (Fig. 11).⁵² In 1829, Friedrich Eggermann started producing 'lithyalin' glass in the northern Bohemian town of Polevsko (Blottendorf). He stacked multiple thin layers of colored glass on top of each other. Once the glass had cooled, marbling was achieved by grinding back the facets of the composite to reveal the multiplicity of colors at different depths.⁵³ A new high point in the manufacture of marbled glass took place around 1900. Notable examples are the vases produced by Joh. Loetz Witwe in the southern Bohemian town of Klášterský Mlýn (Klostermühle). This company manufactured a huge number of differently shaped vessels adorned with a far smaller number of standardized, marbled, and iridescent designs.⁵⁴

The oldest marbled ceramics I am aware of date from the Tang dynasty in China (seventh to ninth century CE). The Tang artisans obtained marbled effects by simultaneously using two completely different techniques, sometimes within the same object. The first technique is the mixture of different clays, which turn whitish and reddish-brown when fired. In one earthenware pot from seventh- or eighth-century China and now in Vienna, we can clearly understand the making of such objects (Fig. 12).⁵⁵ Two different clays were kneaded into a roll. The roll was then cut into slices,

each of them revealing a marbled structure. Slices with a similar pattern are assembled next to each other. In the eighteenth and nineteenth century, one millennium after the Tang period, marbled ceramics with multi-colored clays became very popular in Staffordshire. Such objects are generally called agateware and were copied by several manufacturers on the European continent.⁵⁶ Thus, the process of kneading and cutting different clays with different colors is also comparable to the production of stucco marble.

The second and more frequent Chinese technique uses glazes. It is now referred to as *Tang sancai*, that is, three-colored glaze from the Tang period: yellow-brown, green, and sometimes blue glazes that form dripped-fluid patterns (Fig. 13).⁵⁷ The appeal of these patterns is their random forms and color mixtures. It is possible that these Chinese pots were inspired by Roman glass.⁵⁸ Marbled glazes were consistently popular later on in Asia⁵⁹ and, since the late seventeenth century, this was the case also in Europe. For example, in the eighteenth century the Austrian manufacturers in Gmunden often used the technique of the downward-flowing glaze, analogous to *Tang sancai* (Fig. 14).⁶⁰ A similar, though more refined technique for multicolored marbled faience was used since the late seventeenth century, apparently both in Frankfurt and Rouen (Fig. 15): thin flows of yellow, blue, and manganese glaze were applied on a white ground and probably moved by blowing with a straw.⁶¹

To this day, paper remains the cheapest and most common substrate for marbling. There are verified instances of paper marbling from at least the tenth century CE in East Asia. The technique came to Europe via Persia and the Ottoman Empire around 1600.⁶² In order to create marbled paper, fluid colors are dropped onto a neutral liquid surface. Patterns are produced by dripping, blowing, and combing these colors with brushes, straws, and combs. When the figure is finished, a sheet of paper is carefully laid onto the liquid surface. The paper absorbs the colors and, once dry, they remain fixed onto it. There is an infinite number of forms that can be created on the fluid surface. Common designs include 'spot patterns,' with veins and islands of ink, and this is the paper marbling that most closely resembles real stones (Fig. 18); 'combed patterns,' with many riffles; 'peacock designs,' with forms resembling peacock feathers; and 'curl patterns,' with round swirls of

16 Shoe with Bargello stitch, England, 18th century, Metropolitan Museum of Art, New York





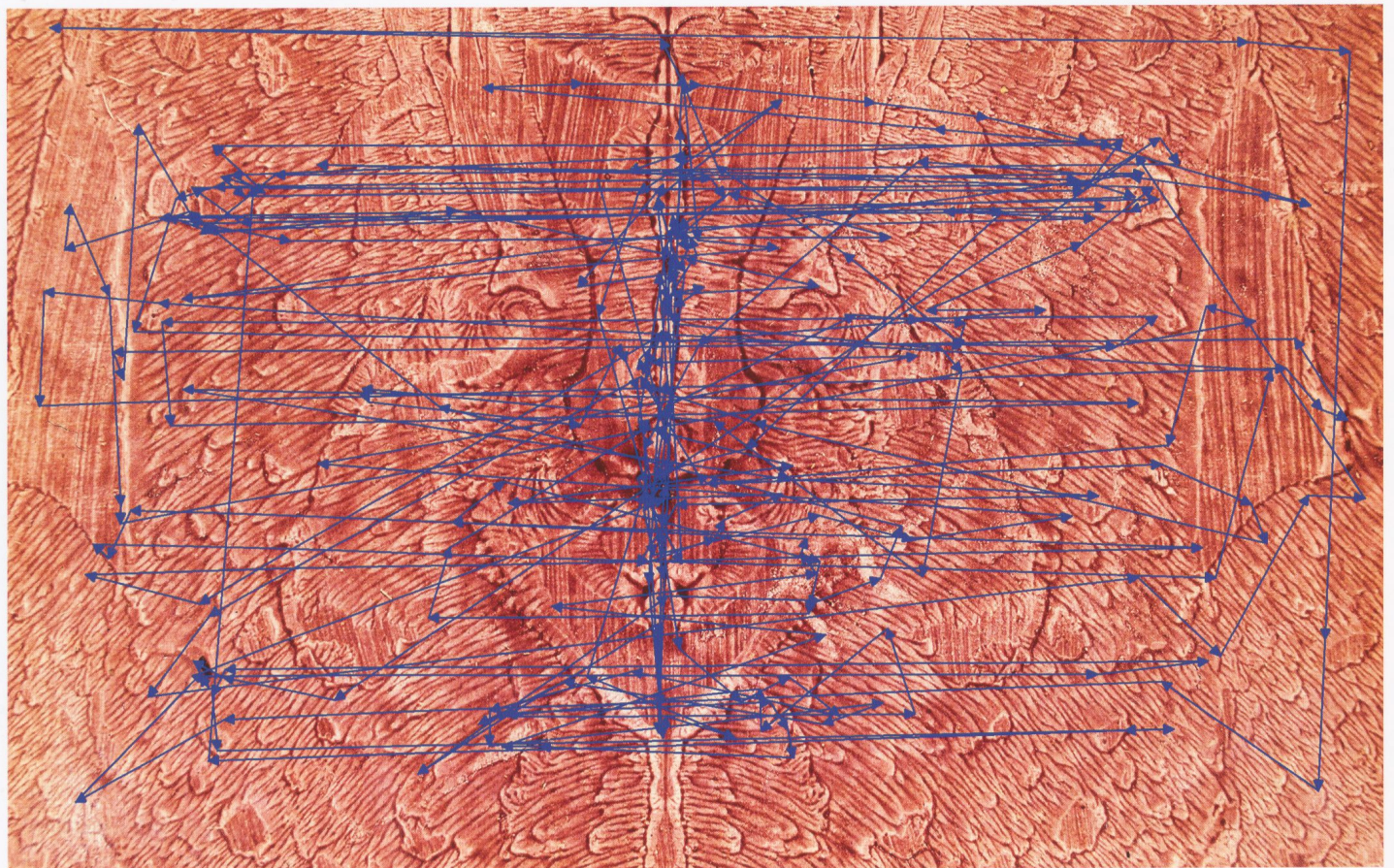
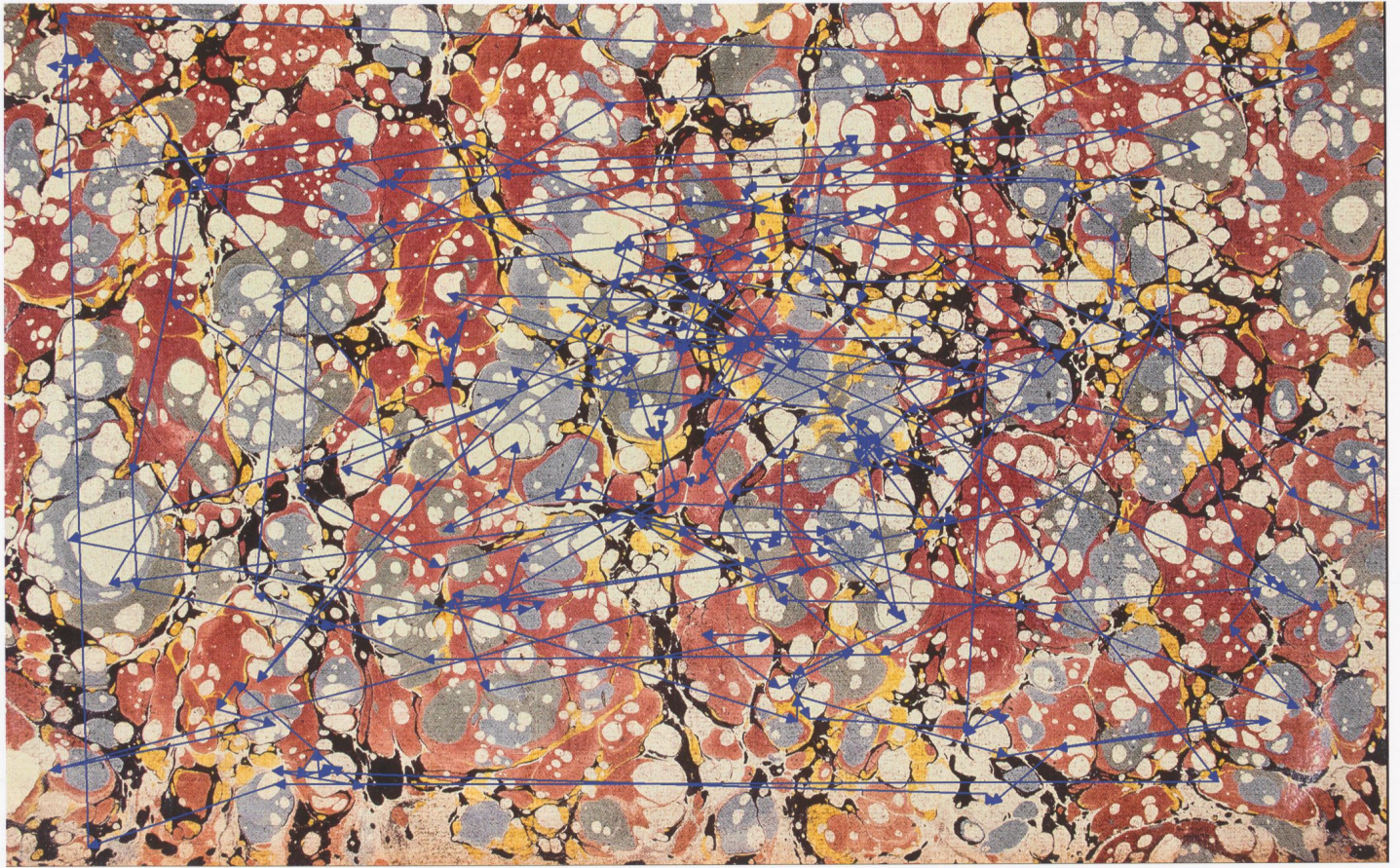
17 Rakuzen Yamada, Laquer box, early 20th century, private collection

color. Besides paper, marbled patterns made on the surface of water have also been transferred to other materials, such as eggshells (i.e., Easter eggs).⁶³ Marbling on a liquid surface is the most common, albeit not the only technique used by bookbinders to produce amimetic decorated papers that were widely used, especially for endpapers.⁶⁴ Another method is called paste paper: it involves applying colored paste with a brush. Patterns are often attained by regular scrapings and or by pulling one paper over another. Effects similar to book-matched marble can be achieved by folding the wet pasted paper sheet in half and then pulling it apart (Fig. 19).

Marbling is also widespread in the production of textiles, where it is obtained through a number of techniques. I shall mention just three of them. Firstly, *moiré*: a process that involves the overlaying of fabrics, particularly silks. It gives them a veined appearance that was prized as early as the Middle Ages.⁶⁵ *Moiré* fabrics are generally monochrome; their patterns derive from the alternating luster of brighter- and darker-appearing waves. Secondly, *ikat*, a technique in which the warp

and or weft of the fabric are dyed lengthways before weaving. The inevitable offsets that occur during weaving give rise to irregularities in the intended patterns, which sometimes look marbled.⁶⁶ Thirdly, a rather simple embroidery pattern with zig-zag curves and varying color shades can lend the fabrics a marbled appearance (Fig. 16). This stitch was popular in various parts of Europe since at least the seventeenth century and goes by various names: Florentine stitch, flame stitch, Bargello stitch, and Hungarian point. Textiles with this adornment were used for curtains and upholstery, as well as for fashion accessories.

The use of lacquer dates back to prehistoric times. Lacquerware are objects coated with a sap derived from certain trees or insects. They were especially popular in East and South Asia. Lacquer can be transparent; it generally has its own color, but it can be colored with added pigments. Lacquer is usually applied in several thin layers; normally the single layers have uniform colors and only one color was used for each layer. However, there have been some attempts to produce marbled effects with lacquer.⁶⁷ An impressive example



is a box (Fig. 17) made by the Japanese lacquer artist Rakuzen Yamada (1874–1939).⁶⁸ He used layers varying from yellow-ocher to red and dark green, obtaining marbling effects by sanding through the layers. In more recent times, a similar process has been implemented for the production of jewelry out of the enameled bodies of junked automobiles, the material obtained is called Fordite, Detroit agate, or motor agate. Just as for the lacquer box by Rakuzen, sections through layers of coating are cut and polished to produce marbled patterns.⁶⁹

IV. Written Sources on the Amimetic Aesthetic of Marbling

Verifiable theoretical reflections on the aesthetic of marbling are not as old as its practice, but we do find revealing statements from the first century CE in Pliny's *Natural History*. He provides explicit testimony for the admiration both of the mimetic potential and the amimetic attractiveness of polychrome stones. There are references to marbling both in Pliny's books on botany and mineralogy and as far as I am aware, these passages have not yet been considered in conjunction with one another. In the books on mineralogy, Pliny discusses at length the aesthetics of stones (mainly Books XXXV–XXXVII). On the one hand, he is full of admiration for the mimetic potential, and describes an agate onto which Apollo and the nine muses had been drawn by nature, each with their proper attributes.⁷⁰ On the other hand, he criticizes the fashion of the early Imperial period for variegated marble and makes it clear that this predilection is based on the amimetic charm of the stones. When discussing the decoration of interior spaces, Pliny writes:

But at the present time [painting] has been entirely ousted by marbles [...] we have begun even to paint on the masonry. [...] in the time of Nero a plan was discovered to give variety to uniformity by inserting markings that were not present in the embossed marble surface, so that Numidian stone might show oval lines and Synnadic marble be picked out with purple, just as fastidious luxury would have liked them to be by nature.⁷¹

Pliny refers to the stone most prized in his own day as myrrhine, which may have been the variant of onyx that we now call sardonyx (Fig. 3). According to Pliny, Emperor Nero is supposed to have paid up to one million sesterces for a single myrrhine bowl, that is, the equivalent of a year's wages for a thousand soldiers. As Pliny explicitly states, the main reason for the extraordinary value attached to this stone, besides its rarity, was its range of colors and veins. He describes this amimetic appeal of myrrhine goods in the following words:

Their value lies in their varied colours: the veins, as they revolve, repeatedly vary from purple to white or a mixture of the two, the purple becoming fiery or the milk-white becoming red as though the new colour were passing through the vein. Some people particularly appreciate the edges of a piece, where colours may be reflected such as we observe in the inner part of a rainbow. Others prefer thick veins (any trace of transparency or fading is always a fault) and also specks and spots.⁷²

In Book XIII, which deals with exotic trees, Pliny describes the veins of the citrus tree root in some detail. His statements on this subject are extraordinarily similar to those on myrrhine from Book XXXVII: apparently, people were willing to pay the equivalent of several country estates in exchange for a single table made from citrus root.⁷³ In elucidating the various types of veins, Pliny provides a nuanced description of the amimetic aesthetic of this kind of marbling:

The outstanding merit of citrus-wood tables is to have wavy marks forming a vein or else little spirals. The former marking produces a longish pattern and is consequently called tiger-wood, while the latter gives a twisted pattern and consequently slabs of

¹⁸ Marbled paper, Germany, 18th century, University Library, Heidelberg, Q 1782 – B fol. Res., Bd. 1. The blue arrows visualize the eye-movements of a subject looking at this paper for 2 minutes.

¹⁹ Folded paste paper, Austria, mid-18th century, in Franz van Stampart, *Prodromus seu praeambulare lumen reserati portentosae magnificentiae theatri [...]*, 1735, private collection. The blue arrows visualize the eye-movements of a subject looking at this paper for 2 minutes.

that sort are called panther-tables. Also some have wavy crinkled markings, which are more esteemed if they resemble the eyes in a peacock's tail. Besides the kinds previously mentioned, great esteem, though coming after these, belongs to those veined with a thick cluster of what look like grains, these slabs being consequently called parsley-wood, from the resemblance.⁷⁴

Pliny had a remarkable interest in historical changes of taste. He was aware that polychrome marble had only become widespread in Rome under Augustus and he recounted the changes of appreciation of citrus-wood roots, stating that Homer knew of the tree and that in the age of Alexander the Great, Theophrastus wrote that there were no better veins than that of the citrus burl.⁷⁵ Yet apparently, it was only in the first century BCE that the value of single tables had become inordinate.⁷⁶ It is hence evident that the Romans of the early Imperial period were willing to pay the highest sums for veined wood and variegated stones. The appreciation depended on the amimetic patterns, on colors and forms produced when cut and polished. Pliny thereby confirms the hypothesis laid out at the beginning of this paper: in this period, marbling was produced specifically for its amimetic aesthetic attractiveness quite independently of materials.

Later texts demonstrate the continuity of such sentiments; in the mid-sixth century, for instance, Procopius of Caesarea and Paul the Silentiary describe the marbles used at Hagia Sophia in some detail, discussing both the mimetic qualities and the amimetic aesthetic of the various stones.⁷⁷ Cesare Cesariano (1521),⁷⁸ Andrea Palladio (1570),⁷⁹ Francesco Bocchi (1591),⁸⁰ and Vincenzo Scamozzi (1615)⁸¹ all use similar terms in referring to the charm and indeterminacy (*vaghezza*) of variegated stones.

Filippo Baldinucci was arguably the first to have defined marbling as a category in its own right, independent of material, and the first to have reflected explicitly on the aesthetic qualities of this sort of ornamental patterns. His *Vocabolario toscano dell'arte del disegno* (1681) includes the terms *marezzo* (sea-like: noun), *marezzare* (verb), and *marezzato* (adjective):⁸²

Marezzo [...] a work designed like waves, resembling the Sea, whether naturally or artificially crafted by

nature, it can be observed on certain types of wood, full of similar waves, although all of the same color; in Art, paper sheets filled with different colored waves are dyed, therefore they are called *marezzati*; and they come from France, or Flanders.⁸³

In the *Vocabolario* Baldinucci also explicitly connects marbling (*marezzo*) with fleck (*macchia*), a term that had already acquired positive aesthetic connotations from Vasari and Scaramuccia:⁸⁴

Fleck [*macchia*], on multi-colored stones, is a term used for the tone that seems to lay on top of the ground color; and for this reason, these same stones are called flecked [*macchiate*], and it is a good quality for stones, which makes them more charming [*più vaghe*]. Because of their similarities to these, the different colors used to artificially fleck [*macchiare*] sheets of paper are called flecks [*macchie*], the sheets are then said to be *marezzati*.⁸⁵

It is worth noting that marbling in early modern Italy was defined in terms of its similarity to ocean waves. The comparison is an apt one, not only on a metaphorical level. Just like marbled papers, 'marbled' stones also owe their existence to a fluid-based process. This may also be why the Japanese called marbled paper *suminagashi*, which means "a pattern formed by floating ink."⁸⁶ Ottoman and Persian bookbinders instead spoke of "cloud paper."⁸⁷

The technique and the aesthetic of marbled paper are described at length by Denis Diderot in the tenth volume of the *Encyclopédie* (1765). He defines the *marbreur de papier* as

a worker who knows how to paint paper, or rather to stain it with different colors, sometimes symmetrically, sometimes irregularly arranged, sometimes imitating marble, and producing an effect pleasant to the eye, as long as the worker is skillful, has some good taste, and uses beautiful paper and fine colors.⁸⁸

Diderot lays emphasis on the endless variety of marbled paper. His classification of figures in terms of regularity and irregularity is instructive and will be discussed below:

Marbled paper can be veined with as many different colors as can be prepared, and there is no limit for the regular or irregular patterns corresponding to the infinite variety of lines that can be traced on the color mat with a stylus, and by the movements of the comb.⁸⁹

V. Is There a History of Marbling Styles?

A central concern of art history is to describe historical changes, often defined as developments of styles, that is, changes of form in the production of art works and the concomitant changes of taste. Contrary to this, in the foregoing paper I described marbling as the continuity of pattern types, across materials and time. This visual continuity over millennia is connected to a continuity in the assessment of the amimetic aesthetic of marbling in written sources, with a high degree of correspondence from Pliny to Diderot. Might we conclude, then, that the pleasure we take in producing and beholding marbling is an anthropological constant and that the form of marbling does not depend on place and time? Are there any differences between marbling in prehistoric Egypt, Imperial Rome, Tang China, Baroque Europe, or the Modern period in the architecture by Adolf Loos? At first glance, the continuities are striking. The same minerals such as *cipollino* were used for thousands of years in similar ways, and similar patterns return in the production of marbled surfaces in analogous and/or different materials in cultures that are distant from each other. So far, I could not detect any long-term regular changes in the history of marbling. There is no linear, overarching history of marbling styles.⁹⁰ However, an in-depth survey reveals that marbling at different places and in the course of time was not uniform. I suggest distinguishing three aspects of historical variances: the invention of new forms, such as book-matching; the accessibility of materials and techniques at certain places and times; and differences in the amount of interest accredited to marbling in various cultures.

First, marbling surfaces are either plain-sided or symmetrically book-matched. Book-matching was the major formal invention in the history of marbling. As discussed above, it must have occurred at around 100 CE (Figs. 4–7). Thereafter book-matched stone

incrustations became very popular and irregular symmetries of veins and stains were also used with other materials—especially woodgrain and color blots on paper. Woodgrain naturally displays axial symmetry when a board is sawn across the trunk from bark to bark. However, book-matched patterns were more often produced by reversing thin veneers cut in the same wood block (Fig. 8). The easiest method for producing marbled axial symmetry is to fold a freshly blotted sheet of paper in two. This technique existed since at least the eighteenth century in the realm of decorated papers (Fig. 19), and was possibly conceived much earlier. Since the nineteenth century, it was used also beyond ornament to produce self-contained pictures. Victor Hugo (1802–1885) made the most imaginative and varied ones. Justinus Kerner (1786–1862) coined a name: *klecksography*. Later, Hermann Rorschach (1884–1922) used this technique for his eponymous psychological test.⁹¹ These short remarks make it clear that it would be possible to write a history of book-matched marbling—with a clear beginning and some elements of a development. Over the last two millennia, marbling was often used in book-matched constellations, nevertheless plain-sided marbling remains largely in use to this day. Therefore, a history of book-matched marbling would only represent a section of the more general history of marbling.

Second, materials and techniques determine the appearance of marbling. Hence, historical changes related to the availability and use of materials and techniques induce changes in the appearance of marbling. For example, marbling in glass only develops after the invention of glass itself and is highly dependent on specific techniques implemented at certain places and times as described above. Another, not yet discussed example are the marbled patterns in the blades of iron and steel weapons, mostly known as Damascus steel. These are achieved by welding layers and or strips of metal that have been variously twisted, coiled, folded, or plaited.⁹² In order to shape and sharpen swords and knives of Damascus steel, the blacksmith removes material from several metal strata. This is in principle a process similar to rubbing down layers of lacquer in Rakuzen's box (Fig. 17), but it is worth mentioning that an analogous procedure was already in use in the prehistoric period, long before the invention of iron. For instance, in Jutland (Denmark) flint axes were produced from

polychrome stones around 3700–3500 BCE. The rounded blades were carved and polished through the layers of the flint-stone in order to achieve ring-shaped patterns.⁹³ Damascene steel knives are nowadays very popular. Such knives are nearly six thousand years younger than the flint axes from Jutland, but they have similar functions (cutting) and follow similar aesthetic principles (amimetic marbling). However, the prehistoric stone tool and the modern knife profoundly differ due to technical developments: their usability and their aesthetic appearance are entirely different. Patterns in Damascus steel are tinier and finer than the ones in stone. Finally, it is noteworthy that we perceive some forms of marbling as characteristic for particular styles. When, for instance, tourists in Florence buy objects wrapped with marbled paper, they associate them with the glory of past times, somehow connected to the monuments visited in the Tuscan capital. By contrast, there are currently wallpapers on the market that photographically reproduce the surface of concrete with many stains and blots that form irregular patterns.⁹⁴ Such wallpapers can be described as modern marbled papers: marbled papers with associations to modern architecture and a modern life style.

Third, some cultures accredited greater interest to marbling than others and, as noted above, Pliny was already aware of such differences. This is the case of the Roman Empire, from Augustus through Byzantium, and this particular interest was renewed in papal Rome after the second half of the sixteenth century.⁹⁵ This is the case of China during the Tang dynasty (618–907 CE), when two new techniques for marbled ceramics were largely implemented (Figs. 12, 13). This was also the case of Venice from the thirteenth to the sixteenth centuries. At this time, marbling is more prominent in the architecture and applied arts of Venice than anywhere else in western Europe. No other medieval church is as richly and variously adorned with colored marbles as San Marco. No church treasury contains as many beautiful colored stone vessels as the Treasury of San Marco (Figs. 2, 3).⁹⁶ And it is certainly not a coincidence that the external walls of the treasury, an annex of the church, are adorned with the finest slabs of colored marble (Fig. 20; see Lowe and Skene Catling, Fig. 1). The lavish use of patterned polychrome marble continues in the Venetian Renaissance: nowhere else during the Italian Renaissance do churches (such as

Santa Maria dei Miracoli) and Palaces (such as the Palazzo Grimani of Santa Maria Formosa) use so much and such fanciful marbling—in the interiors, and partly in the exteriors. At the same time, Venice was manufacturing the most beautiful marbled glasses (Fig. 10). Finally, the interest for marbling is a general characteristic of European decoration in the late seventeenth and eighteenth centuries beyond Rome, and with notable peaks in the southern parts of central Europe (Figs. 9, 11, 14, 15).

VI. Why do we like marbling?

The Delayed Detection of Forms and Habituation

The foregoing journey across continents, through millennia and materials has been something of a whistle-stop tour, but it does suffice to confirm the two theses formulated at the outset of this essay. First, the survey of materials and techniques in sections I–III makes it amply clear that the use of marbling is ubiquitous in the global history of art. Marbling is one of the oldest and most common forms of ornament. It might even be the form of ornament claiming the greatest degree of endurance across cultures, materials, and techniques—from the Stone Age to the present. Second, it is evident that the interest in polychrome marble is not, or not primarily, an interest in a costly material, but is an aesthetic interest linked to a particular visual appearance. Furthermore, this appearance was also achieved using less expensive materials. Wood or paper marbling was not popular simply because it looked like marble; it probably is the other way around: the marbled appearance was the main reason for the predilection for certain polychrome minerals.⁹⁷ The textual sources analyzed in section IV explicitly confirm this second hypothesis. They also confirm my third thesis, according to which the appreciation of marbling is due both to its potential to evoke mimetic associations *and* to its amimetic appeal. Pliny explains the appreciation of both aspects when he discusses grained woods and polychrome stones in similar terms.

20 Detail of the west exterior wall of the Treasury, 14th century, Basilica of San Marco, Venice



Yet why do we enjoy the amimetic aspects of marbling? Does our appreciation of these relate to geometric ornament? A major and possibly essential characteristic of ornament is the repetition of patterns. This applies to simple forms such as zigzags, meanders, and egg-and-dart motifs, as well as to more complex decorative systems such as interlacing, arabesque, or rocaïlle.⁹⁸ The most frequent forms of repetition are serial recurrence and axial symmetry. Serial recurrence involves a potentially endless sequence, as in the case of wallpaper, whereas in the case of axial symmetry, the pattern is reproduced but inverted.

The peculiarity of marbling is that, although forms and colors are repeated, they are replicated—as Diderot noted—with *varying* regularity. Veins and stains of the same or similar colors and of similar, but not identical, size and form reappear at irregular intervals and in unpredictable orientations. Unlike geometrical forms of ornament, repetitions in marbled ornament are never exact repetitions. Marbling consists of imperfect and unpredictable repetitions: repetitions of similar but not identical elements, at similar but non-identical intervals and directions.

It would seem that the irregularities in the repetition of patterns are the clue to understanding the aesthetic appeal of marbling. In order to explain this, I shall introduce the concept of ‘delayed form detection’ derived from Edmund Husserl’s discussion of inhibition.⁹⁹ We normally have the impression of seeing what we see immediately; trees and cows, houses and sky, women and men, circles and triangles. This is the case, regardless of whether the objects that we see are real, painted, or hewn. It happens, however, that the detection of forms can be delayed, that we need more time to determine what or who stands before us. Such a delay may last a fraction of a second. Sometimes it takes much longer and sometimes we experience the sensation that we were wrong at first sight, that ‘it’ is unlike what we first assumed. Such delays and reinterpretations show that the detection of shapes and objects is a process, even though it usually happens so quickly that we do not notice it. The course of this process and the occurrence of delays depend on the clarity of the visual stimulus, but also on the knowledge and attitude of the viewer. In everyday life, delays in the detection of forms disturb our orientation—when we are driving they may cause, for instance, traffic accidents. By contrast, when beholding artworks,

we generally appreciate such delays: they allow us to experience the emergence of forms as part of a process in which we are intimately involved. Instead of being merely passive, interchangeable recipients, we become active creators, we feel almost as if we are artists ourselves, and this is evidently aesthetically pleasant.

Delayed form detection explains why we enjoy marbling, both from an amimetic and a mimetic perspective. Delayed detection of patterns explains why we particularly enjoy book-matched marbling: mirroring marbled patterns increases the amount of dimensions involved in pattern repetition. In addition to recognizing linear patterns (veins) and the repetition of spots with similar shapes and colors, we are also able to recognize symmetry, one of the most powerful principles of order. What is decisive here is that the panels, sawn one behind the other and placed side by side, are never identical. In contrast to geometric ornament, not only is the basic form of marbling less predictable, but also the symmetry is imperfect—its detection delayed. By contrast, industrially printed furniture veneers and identical tiles that imitate stone laid down side by side cause aesthetic boredom, because their seriality and symmetry is flawless.

I derive this theory of delayed form detection from phenomenological observations, but it is also possible to validate it in lab studies. In a study conducted at my Laboratory for Cognitive Research in Art History (CReA, University of Vienna), we showed high-resolution reproductions of eighteenth-century decorated endpapers to twenty subjects. Each subject looked in a randomized order at each reproduction while we recorded his or her eye movements. One of the stimuli was a marbled paper with a small-sized spot pattern (Fig. 18); another one was the folded paste paper discussed above with an irregular mirror symmetry (Fig. 19). The difference in the unconscious viewing behavior of all our participants was remarkable: while looking at the folded paper, each subject’s eyes moved in long, horizontal saccades. They were obviously apprehending the mirrored pattern and, with central vertical eye movements, its axis of symmetry. It is also noteworthy that this behavior continued from the beginning to the end of the viewing time (two minutes). This demonstrates how much and for how long such irregular symmetries puzzle us.¹⁰⁰ Future studies may test the reaction to more or less irregular symmetries

and measure the behavior of eye movement, as well as aesthetic preferences by means of questionnaires, which were not the focus of this first study.

Delayed form detection explains the appreciation of marbling as an anthropological phenomenon. It does not explain why the interest in marbling was more developed in some places and times than in others. Why did the Venetians use so much polychrome marble and collect so many marbled objects between the thirteenth and the sixteenth centuries? Why did they do this so much more than the Florentines of the same period? I suggest explaining such differences and local continuities with the notion of 'habituation,' a key

concept in developmental psychology. The general assumption is that we are influenced by repeated or prolonged exposition to the same or similar stimuli. Prolonged exposure might diminish our attention and response to specific stimuli, but it seems to augment our aesthetic appreciation: empirical studies have shown that we often prefer forms that are familiar to us.¹⁰¹ In 1204, during the plundering of Constantinople, the Venetians brought home many marbled objects. The subsequent covering of San Marco with polychrome spoils is often understood as the exhibition of war trophies. Yet this must have been also the starting point for a centuries-long habituation of the Venetians to marbling.

* This essay has evolved over a number of years. A survey of such a broad topic would not have been possible without countless suggestions and help from numerous colleagues. I would particularly like to thank Nourane Ben-Azzouna, Gerd Blum, Michael Bohr, Cornelius Claussen, Nicholas J. Conard, Marei Döhring, Dario Gamboni, Ulrich Gotter, Erika Forte, Michaela Golubits, Mattia Guidetti, Maximilian Hernandez, Peter Jánosi, Tanja Jenni, Étienne Jollet, Christiana Köhler, Eva-Bettina Krems, Marthe Kretzschmar, Sabine Ladstätter, Lothar Ledderose, Angelika Marinovic, Golo Maurer, Marion Meyer, Anna Miscenà, Susanne Muth, Lukas Nickel, Georg Plattner, Jessica N. Richardson, Markus Ritter, Claudio Rosenberg, Heidrun Rosenberg, Anne-Katrin Rossberg, Günther Schörner, Michael Schwarz, Anton Schweizer, Lioba Theis, Reinhard Wolters and Jonathan Blower (who translated the first draft of this text into English).

1 See Borghini 1989, pp. 65 f., 254f., 288.

2 Regarding paper, for instance, commonly used terms include marbled paper, *papier marbré* (French), *marmoriertes Papier* (German), and *carta marmorizzata* (Italian), but in Persian it is referred to as *kâghz-e abrî* or cloud paper. Liquid metaphors prevail in East Asia, where the technique was invented, as well as in early modern Italy (see section IV of this essay).

3 Recent decades have seen a great deal of research and theoretical discussion on the history of the recognition of mimetic images in 'chance' formations. See Janson 1961; Gamboni 2002; Gamboni 2016. Trilling 2001.

4 As for instance in the foundational work by Klein 1976.

5 Trilling 2001, p. 198. See also Trilling 2003, p. 211. For the types of marble used, see Lenzo 2006.

6 As Loos himself publicly admitted in 1911, the columns were statistically redundant and therefore purely ornamental: Long 2011, p. 154.

7 See Rosenberg 2016, p. 109.

8 El-Khouli 1978; Aston 1994; Kopp 2007.

9 An increase in the number of stone types has been statistically demonstrated for the Naqada period by Kopp 2007. See the survey provided by Aston 1994.

10 Such as the vase at Oxford, Ashmolean Museum, inv. no. 1895.154: see Aston 1994, pl. 8b.

11 Hahnloser/Volbach 1971, cat. no. 2.

12 Smooth surfaces and polychrome stone remain characteristic features of many stone vessels from Egypt well into the late period. Stones that were popular early on included *breccia*, diorite, andesite porphyry, and serpentine.

13 See for instance Panagiotopoulos 2013, esp. pp. 161–163.

14 Bühler 1973 has compiled a catalogue of precious stone vessels from Antiquity. Of 121 entries, 46 are agate and 41 chalcedony (including

onyx and sardonyx). Taken together these account for about 72% of the pieces known to him.

15 Ibidem, pp. 4, 7, n. 20.

16 Hellenkemper 1984, pp. 95–97.

17 Hahnloser/Volbach 1971, cat. nos. 11, 40, 42, 45, 59, 87, 88, 90.

18 Chlouveraki 2006. Comparable rocks evidently were not used in ancient Egyptian wall design, although colored (albeit monochrome) blocks of stone could be part of some buildings. See, e.g., the recently reconstructed two-tone Chapelle Rouge of Pharaoh Hatshepsut from the fifteenth century BCE.

19 Borghini 1989, p. 31.

20 Cf. the so-called Tomb of Alexander at Alexandria (third century BCE), constructed from solid blocks of alabaster with spectacularly dynamic veining in a concentric larger-scale pattern (Gnoli 1988, figs. 280, 281).

21 These occur in Hellenistic graves and on the walls of the Second Pompeian style some time later, e.g., the onyx-like panels with meandering veins and rich polychromy painted at the Roman *Casa dei Grifi*, ca. 100 BCE (Klein 1976, pp. 25–49).

22 See Barry 2011b, p. 224, n. 111; Pasquali (2015, p. 338) refers to "extensive replacement" work under the pontificate of Clement XI (1700–1721) that was identified during a restoration campaign 1992–1995 (Pasquali 1996, pp. 33, 45). Unfortunately, the results of this restoration were not published. To date, not even photographs of the incrustations are available, neither published nor in databases. However, early prints by Andrea Palladio (1570), Antoine Desgodetz (1682), and Pietro Paolo Girelli (1692, after Vergelli da Recanatì) show that the structure of incrustations of the lower floor did not change after 1700 (for illustrations of the prints, see Pasquali 1996, figs. 4, 5, 17). Also, the framing of book-matched slabs in the Pantheon is very different from any Roman Baroque incrustation: book-matched pairs are partly set next to each other without any frame (like the zone between both capitals in figs. 4 and 5), and partly framed with simple rectangular or round forms (figs. 4–7), whereas in the Baroque they generally come together with more elaborated, stepped frames. The laying in the Pantheon is rather comparable with Byzantine examples (as listed below), although more refined than any of them. I hence assume that whatever work might have been carried out in the lower floor in the eighteenth century, it was a restoration with partial replacement of antique slabs, but no reinvention of the decorative system as in the upper floor.

23 Rosenberg 2016, pp. 111–113. Barry (2011, p. 223f.) pointed to pre-Byzantine book-matched stone incrustations and listed several examples.

24 There are two other preserved examples from the second century CE. Both are furnishings of private houses in Roman provinces. Both

- have big(ger) veined, book-matched slabs, but no framed marble pictures, and are hence less sophisticated than the Pantheon. The first is the marble room from Residential Unit 6, Hillside House 2 in Ephesus (Thür/Rathmayr 2014). Inscriptions date the cladding of this grand dining room to 119 and 121 CE. The early second-century Ephesians were using *cipollino*, the very same material that Loos would later select in person from the quarries of Euboea (Rukschcio/Schachel 1982, p. 148). Just as the Ephesians had done, Loos also book-matched the slabs. However, a comparison of the two buildings shows that the Viennese architect eschewed any serial repetition of the book-matched pattern. It is also evident that the quality of the quarry had deteriorated. The *cipollino* on Michaelerplatz is less lively, its contrasts weaker, and its serpentine less dynamic than those at Ephesus. The second is the Villa Silin in Leptis Magna, which is well preserved but not precisely dated (De Nuccio/Ungaro 2002, p. 51, ill.).
- 26 These buildings differ from the Pantheon in that there is no superordinate articulation of the walls by columns or pilasters. This increases the surface of the walls available for marble incrustation—beneath the mosaics. The walls are subdivided into horizontal registers, the centers of which often feature large, rectangular stone images made from book-matched stone slabs and accentuated with fine borders. See Kleinert (1979), who does not go into the history of book-matching. Trilling 1998, p. 119, discusses it, although without considering examples from the age of Hadrian. Pensabene 2013, a monumental compendium on marble in classical Rome, omits this topic entirely. Whereas scholarly discussion of colored marble design from the period of Justinian focuses on its mimetic potential: e.g., Onians 1980; Barry 2007.
 - 27 See Guidetti's contribution in the present volume.
 - 28 For an overview of Umayyad marble incrustations, see Ritter 2017, p. 143f.; for Saint Catherine's Monastery, Forsyth/Weitzmann 1973. The marble paving of this monastery is strictly symmetrical and culminates in a cross in the middle of the apse, designed with four slabs from the same block, laid with a twofold book-matching symmetry. Such a symbolic use of book-matched marble incrustations is rather unusual. Later, Pietro Lombardo and his sons used it systematically for the design of the walls in Santa Maria dei Miracoli in Venice (1481–1489), inside and out.
 - 29 I am only aware of very few examples that stand out: the interior walls of the Sancta Sanctorum in the Lateran Palace in Rome (see Mondini's contribution in the present volume), the central part of the wall behind the tomb of the Cardinal of Portugal in San Miniato al Monte, Florence (Hansmann 1993, p. 297f. and Guidetti 1998, p. 63), and the Chigi Chapel in Santa Maria del Popolo in Rome. The latter was exceptional around the year 1513, when it was begun by Raphael, but not in 1655, when it was finished by Bernini (see Barry 2011b, pp. 485–493).
 - 30 There are just a few isolated instances of polychrome slabs in the Italian Cosmati works. See the two false doors on the façade of San Miniato al Monte in Florence and the single roundel at the center of the floor in Salerno Cathedral. The cloudy central roundel of the Cosmati Pavement at Westminster Abbey, from the late thirteenth century, to which symbolic meaning is explicitly attributed, is quite unique (Binski 1990). The buildings of Charles IV, the Catherine Chapel and the Cross Chapel at Karlštejn Castle, as well as the Wenzel Chapel at the St. Vitus Cathedral in Prague, where the walls are covered with polished semiprecious stones (jasper, chalcedony, carnelian, chrysoprase, agate, amethyst, etc.), are not comparable. These stones differ from antique and Byzantine incrustations in that they are set in punched and gilded plaster rather than covering entire surfaces. See Legner 1978.
 - 31 Klein 1976, p. 121 (describing the renewed use of colored marble as a consequence of the Counter Reformation); Tuena 1989; Barry 1995.
 - 32 Tuena 1989, p. 81.
 - 33 According to Nicholas J. Conard, to whom I am grateful for the information. See Schmidt/Steinmetz 2007.
 - 34 Quibell 1913, pls. V, XIII, XIV.
 - 35 See section IV of this essay.
 - 36 Ragué 1967, p. 10f., fig. 5.
 - 37 Wolfsgruber/Schütz/Stampfer 1993, esp. p. 27f.
 - 38 Examples of the knotty veneer are in the north-west room on the second floor and the southeast room on the first (ibidem, figs. at pp. 40, 50, 182f.).
 - 39 Marbling effects were already commonplace in Salzburgian and Tyrolean furniture of the early sixteenth century. See Windisch-Graetz 1982–1983, vol. 1, pl. VIII, figs. 264, 305, 310; ibidem, vol. 2, figs. 374f. Yet there are also instances of comparable pieces of furniture from Krakow (ibidem, vol. 2, figs. 473f., dated 1500–1550), Bohemia (ibidem, vol. 2, fig. 470, dated 1520–1530), Slovakia (ibidem, vol. 2, fig. 465, dated 1544), Nuremberg (ibidem, vol. 2, figs. 271f., from the 1540s), and eastern Switzerland (ibidem, vol. 2, fig. 281, of ca. 1550). Schönwälder was the first who conducted a detailed technical and art-historical analysis of the wainscoting at Velthurns (Schönwälder 1990, p. 30f.). He emphasizes the “artistic character” of the treatment of the wood as a natural material and regards this as characteristic of Mannerism, a view that may need some revision in light of the *longue durée* of marbling presented here.
 - 40 See, e.g., Bencard et al. 1997, cat. no. 337; Seipel 2000, cat. nos. 66, 83–91, 225; Sauerländer 2008, pp. 611–614.
 - 41 For rays' skin, see Bencard et al. 1997, cat. no. 377; Seipel 2000, cat. no. 117 with fig. p. 22. For mussels, see Seipel 2000, cat. no. 114.
 - 42 Klein 1976.
 - 43 See ibidem, p. 69; Cordez 2013 offers the first extensive analysis and illustration, but without a discussion of their place in the history of painted marbles.
 - 44 Rosenberg/Hollein 2007, p. 57.
 - 45 On marbling in early Renaissance painting, see Didi-Huberman 1990.
 - 46 Braun 2017, p. 3.
 - 47 Klein 1976, p. 225; Maier 2012, p. 30.
 - 48 Gamerith 2008.
 - 49 Klein 1976, pp. 333–336.
 - 50 For Egypt, see Wildung 1984, cat. no. 60. For Rome, one impressive example is the onyx glass cinerary urn at the Kunsthistorische Museum in Vienna (inv. no. Xla 184a, first century CE, see Saldern 2004, p. 168 f., pl. 125, fig. 148).
 - 51 In the seventeenth century, these glasses were enriched by the addition of copper, which produced glass with a metallic sparkle called ‘aventurine’ (Rosenberg/Hollein 2007, pp. 58–61). The bottle illustrated here has the acc. no. 5301-1901 at the Victoria & Albert Museum, London. It is 37.5 cm high.
 - 52 The *Kuttrolf* illustrated here is 13 cm high. Provenance: Vienna, Kinsky, 29 March 2011, lot 901. Cf., e.g., Klesse/Saldern 1978, pp. 96–99.
 - 53 Kuhn/Kräftner 2009.
 - 54 Ricke et al. 1989.
 - 55 The pot illustrated here has the acc. KE 8673, Exner coll. at the MAK—Austrian Museum of Applied Arts. It is 12.6 cm high. See Fux 1978, cat. no. 147, p. 101.
 - 56 Fissore 2009, pp. 117–129.
 - 57 The bottle illustrated here has the acc. F1973.1 at the Freer Gallery of Art, Washington DC. It is 25.7 cm high.
 - 58 Krahel 2007.
 - 59 For example, in the Song period in China (tenth to thirteenth centuries), where apparently random patterns were obtained from labor-intensive glaze reactions (Tregear 1982).
 - 60 The bottle illustrated here is 21.5 cm high. Provenance: Vienna, Kinsky, 29 March 2011, lot 919.
 - 61 Bauer 1988, esp. p. 138; Martin 2016, p. 26 f. The jug illustrated here is 24.2 cm high. Provenance: Danish art market.
 - 62 Wolfe 1990, esp. pp. 5–10.
 - 63 The *Wiener Fremdenblatt* of 6 April 1906 reported on an exhibition at the Wiener Werkstätte featuring dipped Easter eggs (MAK, Vienna, Wiener-Werkstätte-Archiv, Annalen, WWAN 81, p. 14).
 - 64 For an overview on the wide range of decorated papers, see Haemmerle 1961.
 - 65 Dooley 1914, p. 223.
 - 66 On the similarities between *ikat* and marble patterns in regard to Yemenite textiles of the tenth century, see Milwright 2005, p. 216f.
 - 67 For instance, a marbled lacquer box at the Portland Art Museum (acc. no. 2011.86) dated to the fifteenth/sixteenth century (illustra-

- tion available in the Artstor Digital Library). See Heckmann 2002, pp. 133, 141–159.
- 68 The box illustrated here has a diameter of 10 cm. Provenance: Japanese art market.
- 69 I am not yet aware of any academic publications on Fordite. The company Urban Relic Design made a homepage dedicated to this phenomenon with some hints to its history and many figures: <http://www.fordite.com/history.html> (accessed 27 May 2018).
- 70 Pliny, *Natural History*, XXXVII, 3 (Pliny 2014, vol. 10, p. 166f.).
- 71 Pliny, *Natural History*, XXXV, 1 (Pliny 2014, vol. 9, pp. 260–263). See also Pliny, *Natural History*, XXXVI, 1 (Pliny 2014, vol. 10, pp. 2–5). Cf. Trilling 1998, p. 119.
- 72 Pliny, *Natural History*, XXXVII, 9 (Pliny 2014, vol. 10, p. 180f.).
- 73 Pliny, *Natural History*, XIII, 29 (Pliny 2014, vol. 4, p. 154f.). Cf. Wagner-Hasel 2002, p. 326.
- 74 Pliny, *Natural History*, XIII, 30 (Pliny 2014, vol. 4, p. 156f.).
- 75 Pliny, *Natural History*, XIII, 30 (Pliny 2014, vol. 4, p. 158f.).
- 76 Pliny, *Natural History*, XIII, 29 (Pliny 2014, vol. 4, pp. 153–155).
- 77 See Trilling 1998; Barry 2007. Although both only focus on statements about the mimetic aspects of marbling.
- 78 Cesariano 1521, fol. XLVv: “se fano le case de uarii ornamenti & pietre di uarii colori da la natura producte: si in li pauimenti: & si in le incrustatione de muri [...] quale li soi animi & præciosi intellecti si dilectano & si consola la loro placida anima.” Cf. also fol. LXXXIVv on porphyry: “& altre pietre de varii colori confusi.”
- 79 Palladio 1570, vol. 1, p. 53: “I pavimenti di pietre cotte, perché le pietre si possono fare di diverse forme, e di diversi colori per la diversità delle crete; riusciranno molto belli, e vaghi all’occhio per la varietà de’ colori.”
- 80 Bocchi 1591, p. 2: “pietre accomodate per far superbi palazzi [...] & per la varietà de’ colori, per cui sono dette pietre di eccessiva vaghezza colorite.”
- 81 Scamozzi 1615, p. 141: “pietre miste, ovvero di varij colori [...] rendino molta vaghezza con quella vivacità, e differenza di colori;” and ibidem, p. 189: “ne’ monti di Calvene, e là d’intorno si cavano pietre miste di varij colori, e macchiate variamente, e molto vaghe da vedere.” See also ibidem, p. 196.
- 82 These Italian words are derived from *mare* (ocean). The first verifiable instances occur in the fifteenth century (Battaglia/Bàrberi Squarotti 1961–2002, s.v. “mare,” vol. 9, p. 1796f.). Milwright 2005, esp. p. 214, underlines that the water metaphor was common to describe marble patterns not only in ancient Roman and Byzantine, but also in Jewish and Islamic texts. The modern dominance of marble as metaphor for any kind of marbling in western languages may derive from French, where, since 1680, the word *marbreur* has been used to denote a manufacturer of marbled paper (Rey 1992, vol. 2, p. 1188).
- 83 Baldinucci 1681, p. 89f.: “Marezzo m. Lavoro fatto a onde, a similitudine del Mare, o sia naturalmente o artificiosamente fatto dalla natura si vede in alcune sorte di legnami, pieni di simili onde, sebbene tutte d’un medesimo colore; dall’Arte vengono tinti, quei fogli ripieni d’onde di varj colori, che perciò si dicono comunemente marezzati; & a noi vengono di Francia, e di Fiandra.”
- 84 For the aesthetics of the fleck since the sixteenth century, see Sohm 2001, pp. 148–153; Rosenberg 2004.
- 85 Baldinucci 1681, p. 86: “Macchia nelle pietre di varj colori, dicesi quel colore, che pare di sopra più a quello del fondo; e di qui chiamansi le stesse pietre macchiate, ed è una bella qualità di esse pietre, con la quale si rendono più vaghe. A simiglianza di queste chiamansi macchie quelle diverse sorte di colore con le quali artificiosamente son macchiati i fogli, che si dicono marezzati.”
- 86 Wolfe 1990, p. 6.
- 87 Ibidem, p. 8f.
- 88 Diderot/Alembert 1754–1772, vol. 10, p. 72: “ouvrier qui sait peindre le papier, ou plutôt le tacher de différentes couleurs, tantôt symétriquement, tantôt irrégulièrement disposées, quelquefois imitant le marbre, et produisant un effet agréable à l’œil, lorsque l’ouvrier est habile, qu’il a un peu de goût, et qu’il emploie du beau papier et de belles couleurs.”
- 89 Ibidem, p. 76: “On conçoit qu’on veine le papier marbré d’autant de couleurs différentes qu’on en peut préparer, et que les figures régulières ou irrégulières correspondent à la variété infinie des traits qu’on peut former sur le tapis de couleur avec la pointe, et des mouvemens qu’on peut faire avec le peigne, elles n’ont point de limite.” For a survey of the earlier sources on marbled paper see Wolfe 1990, pp. 15–17.
- 90 Klein 1976 is to the best of my knowledge the only explicit attempt to analyze a historical development of marbling on a broad scale, although only related to architecture. He made brilliant contributions to the study of single monuments, but did not manage to reveal any development. Barry 2011b, also a PhD dissertation, considers a significantly larger number of monuments in a more specific timeframe and range of materials (from the Roman Empire to the European eighteenth century and focusing on real stones). In contrast to Klein, he does not pursue a history of style.
- 91 Rosenberg/Hollein 2007, pp. 84–97, 168.
- 92 Maryon 1960.
- 93 Rosenberg 2016, p. 109.
- 94 Produced by the company Murando: <https://www.amazon.co.uk/murando-realistic-wallpapers-Decorative-0050-jdp/B00URQOIH8> (accessed 1 August 2018).
- 95 Barry 2011b, pp. 552–652.
- 96 Besides the above-mentioned sardonix objects, there is an especially large number of vessels in agate, alabaster, chalcedony, jasper, onyx, porphyry, and serpentine: see Hahnloser/Volbach 1971. For the use of variegated marble spolia at San Marco, see Barry 2011b, esp. p. 26; Dorigo 2004. Particularly noteworthy are the remarks of Albertus Magnus (cited in Dorigo 2004, p. 5) in which he admires both the amimetic and the mimetic aesthetic of the marble slabs of San Marco.
- 97 This contradicts common opinions in the archaeological and art-historical literature. See, e.g., Raff 1994 and De Nuccio/Ungaro 2002; for a critique Barry 2004.
- 98 Rosenberg 2017, p. 35; Crucq 2018.
- 99 For a broader development of this concept, see Rosenberg 2016 where, beyond marbling, it is applied to the drawings by Victor Hugo and to historical interpretations of Michelangelo’s non-finito. It should be mentioned that irregularly repeated patterns occur naturally not only in minerals and plants, but also broadly in the animal realm: points, stripes, and labyrinthine windings are characteristic of eggshells, snails, scales, fur, and skin. Evolutionary biologists and mathematicians discussed at length the purpose and the mechanisms producing such marbling (Manukyan et al. 2017; Anderl 2017, both accessed 20 March 2018). However, they only stress camouflage and recognition. None of the models used for non-human animals take aesthetic perspectives into account. But it would be an interesting challenge to test whether for instance zebras also have something comparable to an aesthetic preference for stripe patterns.
- 100 We used an IViewX RED 120, manufactured by SMI, Teltow, and calibrated in a nine-point procedure with 120 binocular recordings per second. The reproductions of decorated papers were presented on an Apple TFT Cinema HD 30” monitor, with 2560 × 1600 pixels, set at a distance of ca. 90 cm from the seated subjects. Half of the subjects were ‘art experts’ (advanced students of art history), half of them ‘non-experts’ (students of other subjects with minimal interest in art). In order to induce an aesthetic attitude, the participants were instructed to rate how much they liked the pictures they saw. Figs. 18 and 19 show the movements of the dominant eye of a single ‘art expert’ (choosing the subject with the overall best data recording quality). I thank Johanna Aufreiter, Solomyia Husak, Chiara Pompermaier, and Luisa Senkowsky for carrying out the experiment. For information on the decorated endpapers, see Rosenberg/Hollein 2007, cat. nos. 24, 41. On the use of eye tracking for art-historical inquiries, see Rosenberg/Klein 2015.
- 101 Lund/Anastasi 1928; Zajonc 1968; Leder/Carbon 2005.