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GEOLOGICAL IMAGINATION IN ROMANESQUE SCULPTURE.

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RESUMEN: El artículo parte de la remarcable similitud formal existente entre los patrones observados en las rocas de los Pirineos y un motivo escultórico generalizado. El artículo explora varios factores que posiblemente dieron lugar a que los escultores incorporasen un patrón geológico en el ámbito de la iconografía. Entre estos factores hay que señalar las particularidades del paisaje pirenaico, las especulaciones medievales sobre la formación de la piedra, las doctrinas teológicas, las metáforas religiosas y la experiencia de los escultores sobre su propia práctica.

PALABRAS CLAVE: Esculturas románicas, Pirineos, patrones geológicos, procesos creativos, liquidez

ABSTRACT: The paper's point of departure is a striking formal similarity between patterns found on rock in the Pyrenees and a widespread sculptural motif. The paper explores several factors that possibly led carvers to transpose a geological pattern into the domain of iconography. Among these factors are the particularities of the Pyrenean landscape, medieval geological speculations on stone formation, theological doctrines, religious metaphors, and the carvers' experience of their own practice.

KEY WORDS: Romanesque sculpture; Pyrenees; geological patterns; creative process; liquidity

1. INTRODUCTION

The origin of this article lies in an invitation from a colleague to present a paper on silence. At the time of the invitation, I did not have anything to say on silence proper, and therefore at first I thought to decline. However, I soon realized that I was (and am) interested and invested in the concept of silence as a metaphor. And for me, and probably for many other scholars who work on Romanesque architectural sculpture, silence (as a metaphor), among other things, means the absence of sculptural imagery.

The site where this iconographic silence finds its full expression is the bare church wall, simply because it contrasts with the robed wall, the wall that supports the sculpted tympanum, frieze, panel, corbel, etc. The bare church

wall is something that we look at, but usually only in particular manners. We may derive aesthetic pleasure from it; architectural historians may reify it into an element of architectural syntax; and if such walls are intertwined in one way or another with our own biography, they play a part in our sense of belonging. But we seldom write papers on bare walls.¹ For the art historian, naked walls are the ultimate locus of *horror vacui* (literally speaking). The greatest silence is iconographic silence. From such a perspective, the silence of the bare church wall may not be just a metaphor after all. The Latin word *silentium*, which is derived from the verb *silere*, connotes not only the complete absence of sound but also stillness, inactiveness, and lack of function. And this is exactly what the church wall is for us art historians—inactive and lacking function. While the iconographic silence of the bare church wall has different aspects, in this paper I explore only one.

The bare walls that I would like to look at are those of the hermitage of Nuestra Señora de Trujillo (Figure 1) in the remains of the medieval village Atrosillo near Castilleo de Jaca. The twelfth-century church lies in ruins. Only parts of its roughly dressed ashlar (*sillarejo*) walls are still standing. The simple edifice bears no evidence of

Figure 1. Hermitage of Nuestra Señora de Trujillo.



¹ An enlightening exception is Maria Cristina Pereira's symbolic reading of an aniconic red marble pillar in Moissac (Pereira 2008).



Figure 2. Soft-sedimentary rock, Hermitage of Nuestra Señora de Trujillo (Photo: © Antonio García Omedes).

Figure 3. A capital, Santa María de Iguácel, apse (Photo: © Francisco de Asís García García).

Figure 4. A Thiasos of the Sea capital, Jaca Cathedral (Photo: © Francisco de Asís García García).

any kind of decoration. Approaching the walls and zooming in on single blocks, one can immediately notice a conspicuous pattern (Figure 2). The pattern is the outcome of soft-sediment deformation.² The foliation or repetitive layering of the rock results in a horizontal pattern of parallel, undulating lines. The impression created is that of waves and water.

The undulating pattern would not be of particular interest if it did not bear a striking formal resemblance to a very common sculptural motif. For example, a capital in the apse of Santa María de Iguácel (Figure 3) shows an undulating

motif masking the lower bodies of several nude figures. The rhythmicity, density, orientation, length, and even the number of lines in both cases are very similar. Other instances of the sculptural motif include another capital on Santa María de Iguácel's southern apsidal window; a damaged capital on the right of San Adrián de Sasabe's western portal; a capital inside Jaca Cathedral (Figure 4); the lateral planks flanking the central theme on the frieze above the entrance to Loarre Castle (Figure 5); and a capital on the right side of the central apsidal window at San Pedro church in Loarre Castle.

Two preliminary observations can be made regarding these instances. First, the undulating motif emerges toward the end of the eleventh century in Upper Aragon. At first, its geographical distribution is limited to a very small area (Figure 6). All of these instances are located less than eight miles apart as the crow flies, with the exception of Loarre, which is about seventeen miles south of Jaca. All of these instances are also very close to the stones of Nuestra Señora de Trujillo. Later, during the twelfth century, the sculptural motif appears



²I would like to thank Dr. James F. Tull and Dr. William C. Parker from the Department of Earth, Ocean, and Atmospheric Science at Florida State University for assisting me in identifying the rock type.



Figure 5. Detail of the frieze above the entrance to Loarre Castle.

outside Upper Aragon in places such as Catalonia, Galicia, and Gascony.³ Second, in most cases, the motif is to be found at prominent locations: in Santa María de Iguácel and San Pedro de Loarre it is in the apse; in San Adrián de Sasabe it is on a capital flanking the western portal; and in Loarre Castle, it is on a frieze above the main entrance. Consequently, it appears that the motif was particularly significant.

2. THE ICONOGRAPHY OF THE LOARRE FRIEZE

Reading the iconography of the sculpted scenes that incorporate the undulating motif is a challenging task in large part because it is unclear what the motif stands for. Water seems to be the evident identification. The theme on the Jaca capital is most probably derived from a classical rendering of the Thiasos of the Sea, where the wavy motif represents water (Moralejo 1979:

88). However, the Jaca capital is quite different from the rest of the group. In the two capitals from Santa María de Iguácel, for example, the meaning of the motif is more ambiguous. Francisco Iñiguez Almech suggested that the motif represents the fire that purifies souls in purgatory (Iñiguez Almech 1967: 270). Marcel Durliat argued that the motif represents cloth and refers to the description of the white robes washed in the blood of the Lamb in Revelation 7:14 (Durliat 1977: 21).⁴ Based on the appearance of a similar motif on the Moissac tympanum, Peter Klein read undulating lines in Romanesque sculpture as clouds (Klein 1990:321–2).

To better recover the possible signification of the motif we need to look for a more elaborate sculptural context in which it is included, rather than examining “standalone” capitals. The frieze above the main entrance to Loarre Castle provides us with such

³In Catalonia the motif appears on fragments of the portal sculpture of Sant Pere de Rodes and Sant Joan de les Abadesses (The Metropolitan Museum of Art 1993: 313–4; Castiñeiras & Camps i Sòria 2008: 345–6, 366–7); in Gascony, it appears on a capital in Mazère (reproduced in Cabanot 1978: fig.75) and in Galicia, it appears on a transept capital in Santiago de Compostela (Durliat 1990: 315).

⁴ Durliat later changed his mind and interpreted the same motif as water (Durliat 1990: 88).

a context (Figure 5). The frieze was damaged in the eighteenth century and only its lower part has survived. In its original state, the frieze featured a *Majestas Domini* at the center flanked by apostles, angels, and griffins (Español Bertrán, 2005). At the two extreme sides of the frieze, there are traces of what seem to be processions moving toward the *Majestas Domini* at the center. The lower bodies of the naked participants are masked by the undulating motif in a manner that closely resembles the other instances of the motif.

Francesca Español Bertran raised the possibility that the figures on the extreme sides of the frieze are the Elders of the Apocalypse and the undulating motif is the “sea of glass like a crystal” (“*mare vitreum simile cristallo*”) mentioned in Revelation 4:6. She pointed out the overall similarity between the frieze’s sculptural program and the mosaic

program on the facade of old St. Peter’s in Rome, suggesting that it was most probably Sancho Ramirez’s policy of strengthening ties with the papacy that brought the Aragonese to appropriate a Roman model (Español Bertrán 2005: 16–7; on the relations between the Aragonese monarchs and the papacy and their implications on art see also García García, 2011). The St. Peter mosaic (Picard 1971), as well as other Roman iconographic programs that sought to imitate it, like the frescos of San Giovanni a Porta Latina, show the Elders of the Apocalypse standing on the “sea of glass” represented as waves (Kessler 1989). Despite the formal similarity between the Roman and Aragonese motifs, Francesca Español Bertran concluded that in Loarre the waves represent water and not the “sea of glass.”⁵ Several observations support this identification. The figures in Aragon are usually naked, while the

Figure 6. The distribution of the sculptural motif (purple) and the location of Nuestra Señora de Trujillo (green).



⁵ Serafin Moralejo read the Loarre frieze as a Last Judgment scene. Like Español Bertrán, he identified the wavy motif on the right as the water of the fountain of life in which the blessed are immersed. However, on the left side, the same wavy motif appeared to him as the fire that consumes the damned (Moralejo 1989: 48).

Elders on the “sea of glass” are dressed. The naked figures are shown immersed in waves that mask their entire lower bodies rather than simply standing on them. If correctly transcribed, the inscription around the mandorla in Loarre contained the phrase “FONS EGO SUM VITA[e]” (“I am the fountain of life”). Other contemporary sculptural programs in the area, such as the tympanum of Santa Cruz de la Serós, featured the same phrase as well (Kendall 1998: 233, 276). The inscription’s reoccurrence betrays an interest in religious allegories pertaining to water to which the frieze in Loarre may give an iconographical expression. Later, in the third quarter of the twelfth century, the wavy motif was understood in Catalonia to represent water. The Master of Cabestany’s panel of the apparition of Christ to his disciples from Sant Pere de Rodes (now at the Museu Frederic Marès, Barcelona (Inv. 654)) employed undulating lines to represent the Sea of Galilee (The Metropolitan Museum of Art 1993: 313–4; Castiñeiras & Camps i Sòria

2008: 344–6; Bartolomé Roviras 2010: esp. 280–6).⁶

3. A BREAK FROM THE ICONOGRAPHIC TRADITION

For a modern beholder, the formal similarity between the geological pattern and the sculptural motif may seem coincidental, and likewise the representation of water in such a manner may seem rather unremarkable. However, in northern Spain the water motif marked a considerable break with the iconographic tradition.⁷ A fragment of the tympanum of Sant Joan de les Abadesses shows the Baptism with a flying angel on the left supporting the nude figure of Christ in the middle (Figure 7). The manner in which the Jordan River is rendered calls to mind our water motif. And yet, this representation of the river significantly differs from earlier ones. In the Ripoll Bible tradition (e.g. Vat. Lat. 5729, fol. 366v) the river assumes a mountain-

Figure 7. The Baptism of Christ, Sant Joan de les Abadesses, tympanum fragment (Photo: © Museu del monestir de Sant Joan de les Abadesses).



⁶ Interestingly, the panel’s obverse side shows a damaged Early Christian rendering of Rebecca and Eliezer at the well—another Biblical scene in which water plays an important part.

⁷ Serfain Moralejo noted the “foreignness” of the water motif in (Moralejo 1979: 88).

like form, and in the *Beatus* tradition it assumes the form of the letter Y (e.g. Gerona, Museo de la Catedral, Ms. 7, fol. 189r) (Castiñeiras & Camps i Sòria 2008: 366–7). The novelty of the water motif and the fact that it first emerges in the medium of stone sculpture raises the suspicion that the formal homology between the motif and the geological pattern is not accidental.

In other words, stone carvers in the Pyrenees were so affected by the undulating pattern they frequently encountered on rocks as to reproduce it in their own carvings as a new iconographic element representing water. The question is why they were so affected by the undulating pattern. And the answer I would like to propose is that for stone carvers, the wave-like geological patterns bore the imprint of primordial transformative liquid forces that held special meaning for the carvers due to particular cultural, professional, religious, and environmental contexts and circumstances. In the rest of the paper, I explore some of these contexts.

4. THINKING WITH LANDSCAPE (WATER AND STONE IN THE PYRENEES)

Hydrological and geomorphological events of considerable magnitude occur regularly in the Pyrenees. Autumn is the most dangerous season, when small Mediterranean cyclones occasionally pass over the mountains' central-eastern part. In extreme cases, rainfall may exceed 200 mm in one hour, or 500 mm in twenty-four hours. Even lower and more frequent amounts of rain trigger a variety of geomorphic processes such as landslides, slumps,

lateral and vertical erosion in ravines, deep mass movement, and sediment transport. Debris flow, another common result of rainstorms, may involve substantial mobilization of mass. In October 1987, a rainstorm event in the Izas catchment (0.33 km²) yielded a total sediment output of almost twenty tons, of which about seventeen were bedload (García Ruiz et al. 2002:311–2). During the 1996 Biescas campsite disaster, in which eighty-seven people were killed, about 130,000 tons of sediment was carried to the alluvial fan (García Ruiz et al. 1996:315).

There is a good reason to suspect that geomorphic events pertaining to rainfall were even more frequent in the eleventh and twelfth centuries, if one accepts the Medieval Warm Period hypothesis then the Pyrenees had more precipitation during the High Middle Ages than today (Le Roy Ladurie 1988; Hughes and Diaz 1994; McCormick et al., 2007: esp. 871). From circa 1000 AD, deforestation was carried out in the region on a massive scale in order to develop summer pastures in the high mountains (García Ruiz & Valero Garcés 1996; Carbonell & Ortiz 2013:n. 70). Increased cultivation, especially of difficult terrain, became possible thanks to the contemporary introduction of the Roman plough (Martí Bono et al. 1997:382–3). Both deforestation and intensive cultivation destabilized basins by exposing more potential sediment to be transported during rainfall. As a result, some of the most exceptional debris flows ever recorded, such as the one that severely damaged the monastery of San Adrián de Sasabe, took place in the High Middle Ages (Martí Bono et al. 1997:382–3).



Figure 8. Aguas Tuestas in the Aragonese Pyrenees.

Considering these geomorphological processes, the Pyrenees emerge as a land in flux. A destabilized, fissured, steep landscape of ever-changing contours, collapsing slopes, altering channels, and stones rolling in gushing waters. The contact, many times violent and frictive, between stone and water is a constitutive parameter of topographical change in Pyrenees. Standing in front of rock such as that of Nuestra Señora de Trujillo, the carver's sensibility was shaped by the phenomenological experience of the landscape. For him, stone was not necessarily a rigid, fixed, inanimate object. It metonymically connoted water and turbulence since it was once an integral part of a particular landscape. As a result, the carver may have perceived the undulation motif as either a reference to or the imprint of stream currents—the geomorphic forces that subject and mobilize stone. Looking at the rock, the carver saw water. The visual characteristics of the

Pyrenean landscape offer themselves to such a perception. The geometry of meandering rivers and bent geological strata is often isomorphic (Figure 8). A person immersed in this landscape may be led to perceive stone and water as closely related since both appear to be malleable elements manipulated by similar distorting forces.

5. SAN ADRIÁN DE SASABE

The church of San Adrián de Sasabe exemplifies the symbolic importance assigned to the interaction between water and stone in Upper Aragon (on the church see Valenzuela-Muñoz 1964; Simon 1987). The church is located at the confluence of two streams at the head of the Borau valley. As noted by Antonio García Omedes, the choice of this place for constructing a church is rather unconventional, if not strange

(García Omedes 2014). Medieval builders sought to erect churches in the vicinity of water sources, not in areas prone to frequent floods, such as the one on which San Adrián was built. The river Lubierre passes hardly ten meters to the west of the church at a higher elevation (Figure 9), and the present-day steps leading to the main entrance descend below ground level (Figure 10).

Ironically, the reoccurring floods contributed to the preservation of the church. Stones carried by the streams encased and protected the building. From the time it was partially excavated and restored in the early '60s, the church became exposed to flooding again, and consequently the church's floor is submerged in water, at times more than three meters deep (Figure 11). From an architectural point of view, the location is illogical. Some very powerful cause, then, must have convinced the builders to face the difficulties in erecting a church at such a location (García Omedes 2014; Canellas López & San Vicente 1971: 39-40).

For a modern beholder, the modest size of San Adrián and its rather

ordinary sculptural decoration do not testify to its original prominence. The church itself is one of the few Romanesque buildings in the region that can be securely dated. Bishop Esteban consecrated the edifice between 1100–1104 (Durán Gudiol 1965:114–6; Simon 1987:182–3, esp. n. 23). Yet the current Romanesque church replaced an older building that formed a part of a relatively large monastic complex. The monastery was the most important episcopal see in the burgeoning kingdom of Aragón—a see that was later transferred to the capital Jaca and then, after its conquest in 1096, to the original Visigothic diocesan capital, Huesca. Two types of evidence support the identification of San Adrián de Sasabe as a bishop's seat. The first is textual. For example, an entry in an obituary of the bishops of Pamplona found in the *Roda Codex* (Madrid, Real Academia de la Historia, cód. 78) refers to a certain tenth-century “episcopus sisabensis” (i.e. “from Sasabe”) (Lacarra 1945: 262–5; see also Valenzuela-Muñoz 1964: 77–80). The second type of evidence is archeological. An inscription found in the vicinity of the entrance during the



Figure 9. San Adrián de Sasabe, view from the Lubierre river (note the river's higher elevation).



Figure 10. San Adrián de Sasabe, descending entrance stairs (Photo: © Antonio García Omedes).

excavation of the church reads “HIC REQUIESCUNT TRES EPISCOPI” (lit. “here, three bishops rest”), attesting to the fact that the bishops of Aragon were once buried in the monastery (Valenzuela-Muñoz 1964: 84).

San Adrián’s prominent religious function was perhaps the reason for its unusual location exposed to gushing water and fragmented rock rushing down from the mountains. The exact manner in which the particular characteristics of the landscape were interpreted as having a religious meaning remains unclear (García Omedes 2014). Yet, San Adrián’s location testifies to the fact that they were meaningful.⁸ Against this background, the choice to carve the wavy motif on a centrally located capital on the right side of the church’s main entrance makes perfect sense.

6. MEDIEVAL GEOLOGY

Aside from landscape, scientific knowledge may also have informed the carver’s engagement with wave-like geological patterns. Pre-modern geological theories embraced the idea that water is present in stone in various ways—as a substance, a cause, or some kind of admixture.⁹ Specific types of stones were thought to be formed directly from water. In discussing Psalm 147, Augustine described crystal rock as “snow hardened with ice for many years, so that it cannot easily be dissolved by the sun or even by fire,”¹⁰ (Augustine 1956: 2139; Translated in Kornbluth 1995: 73) and Isidore of Seville explained that the stone *Enhydros* “is named from water for it exudes so much water that you might think there is a gushing fountain closed up in it” (*Etymologiae*, XVI.xii.8. Translated in Isidore of Seville 2010: 326).

Water was not understood only as a substance of stones, but also as a physical force necessary for their formation. Isidore of Seville, for example, writes that when *Puteolan dust* “is submerged in water, it immediately turns into stone and, made stronger by the daily waves, is turned into rock, just as white clay is turned to stone by fire” (*Etymologiae*, XVI.i.8. Translated in Isidore of Seville 2010: 317).

In pre-modern science, the connection between water and stone went beyond the scope of particular cases. In the

⁸ Contrary to the relation between art and geology, the one between myth and geology has been explored recently in (Piccardi & Masse 2007).

⁹ However, medieval writings on the topic were far from reaching a consensus and some thinkers, like Theophrastus, played down the role of water in stone formation (Theophrastus 1965).

¹⁰ “Quid est ergo crystallum? Nix est glacie durata per multos annos, ita ut a sole uel igne facile dissolui non possit.”

Meteorologica, Aristotle postulated that the earth gives off two kinds of exhalations. One is a moist vapor, “potentially like water,” which is derived from the moisture within the earth and its rocks (Eichholz 1949; Halleux 1974: 97–128). Aristotle did not explicitly ascribe the formation of stones to moist vapor. However, at least some of his readers did. Thus, Seneca stated that “in the earth also there are several kinds of moisture . . . which change from liquid to stone,”¹¹ (*Naturales Quaestiones*, 3.15.2-3; translated in Seneca 1971: 234–5) and in Pliny’s *Natural History* we are told that *lapis specularis* (selenite) is formed from a “liquid which like rock-crystal has been frozen and petrified by an exhalation of the earth”¹² (XXXVI.161; translated in Pliny the Elder 1962: 128–9, see also x-xv).

The fourth of book of the Medieval Latin versions of the *Meteorologica* includes an additional chapter titled *De Mineralibus* (Holmyard & Mandeville 1927:1–14). The chapter is partly a direct translation from the original Greek and partly a translation from Arabic of a work by Avicenna (not by Aristotle). The Arabic source for the twelfth-century Latin translation was most probably a manuscript from Spain. Avicenna assigned an unprecedented role to water in the formation of stones: “In general, stone is formed in two ways only (a) through the hardening of clay, and (b) by the congelation [of waters]” (Holmyard & Mandeville 1927:18). Furthermore, he described three modalities of the stone-water relation relevant to the Pyrenean landscape and geology. First, he connected the formation of stones with flowing streams: “Stone has also been formed from flowing water” (Holmyard & Mandeville 1927:19). Second, he correctly speculated on the formation of sediment rocks: “This habitable world was in former days uninhabitable and, indeed, submerged beneath the ocean,” and the prime evidence for that is “that in many stones, when they are broken are found parts of aquatic animals, such as shells, etc.” (Holmyard & Mandeville 1927:28). The Pyrenees were formed by an uplift of sedimentary rock. Therefore, the many fossilized marine organisms in Pyrenean stones point to water as a possible origin of stone. Third, Avicenna attributes the stratification of rocks (like that of the rock from Trujillo) to the action of water: “It is possible that each time

Figure 11. San Adrián de Sasabe, water in the nave (Photo: © Antonio García Omedes).



¹¹ “In terra quoque sunt umoris genera complura . . . quae in lapidem ex liquore vertuntur.”

¹² “Umorem hunc terrae quadam anima crystalli modo glaciari et in lapidem concreescere manifesto apparet.”

the land was exposed by the ebbing of the sea a layer was left, since we see that some mountains appear to have been piled up layer by layer, and it is therefore likely that the clay from which they were formed was itself at one time arranged in layers” (Holmyard & Mandeville 1927:31).

7. METAPHORS OF WATER AND STONE

From prehistoric times, imagined petrifications of water and liquefactions of stone were imbued with political and religious meanings. In the Nordic Bronze Age, petroglyphs, many of which represent ships, were carved on Cambrian sandstone patterned with fossil waves in the vicinity of the sea. The “frozen waves” of the rock provided an opportunity for a seafaring culture to interweave sea and land into a symbolic continuum (Tilley 2004:147–215). A similar, yet later, metaphorical use of “frozen waves” gained popularity in the Byzantine Empire. Medieval writers likened the Proconnesian marble floors of Hagia Sophia, thought to be made of water and carried over water to the capital, to a sea. The marble “sea” transformed the imperial church into a microcosm rich with cosmological associations (Barry 2007; see Michael of Thessaloniki’s ekphrasis of the floor and the mosaics at Hagia Sophia in Mango & Parker 1960; see also Pentcheva 2011).

Engraved gems further demonstrate the manner in which transformations of stone to water and water to stone captured the imagination of Christian thinkers. The Baptism of Christ was carved on two Carolingian rock crystals, one from Rouen and the other from Freiburg. The crystal’s transparency signified purity. Moreover, since crystal was believed to be water transformed into stone, the change from infirm to firm when water becomes crystal parallels human transformation in the baptismal rite (Kornbluth 1995: 49–54, 56–8, 70–3).

A central biblical passage on water and stone that has frequently been read typologically is the one describing how Moses miraculously brought water out of the rock by striking it with his staff (Numbers 20:1–13).¹³ For Ambrose, the passage foreshadowed the Eucharist: “For them [The Israelites] water flowed from the rock, for thee blood from Christ”¹⁴ (*De mysteriis* VIII.48, in Fallar 1955:109; translated in Srawley 1919: 66). For Hildegard von Bingen, its meaning was somewhat more general: “Now you, O father, who serve as vicar for this priest, let your soul flow like the water He made to flow from the rock struck by the rod of Moses, so that your words may give the drink of salvation to unbelieving hearts”¹⁵ (*Epistularium Hildegardis Bingensis*, 86, in Acker 1991: 210; translated in Baird & Ehrman 1998: 197). Both passages suggest a solution to the same implicit problem—

¹³ Interestingly, in medieval depictions of the scene produced in Spain, such as the one in the Visigothic-Mozarabic Bible of St. Isidore (Archivo Capitular de la Real Colegiata de San Isidoro de León, ms. 2, fol. 40v), the texture (yet not the color) of the rock and the water is quite similar.

¹⁴ “Illis aqua de petra fluxit, tibi sanguis ex Christo.”

¹⁵ “Nunc tu, o pater, qui es in uice sacerdotis huius, anima tua fluat sicut aqua fecit que de petra in uirga Moysi effluxit, ita quod uerba tua incredulis cordibus potum saluationis dent.”

how an immutable, distanced, invisible, “solid” God, a God as a “Rock,” can exert agency in the terrestrial realm. The solution consists of postulating a non-solid force or entity that emanates from God. This force, at times equated with the Holy Spirit, assumes the form of wind, fire, and liquids (e.g. water in the Baptism, blood in the Eucharist) and therefore it can move, transform, change, and affect—capacities that the omnipotent God as a “Rock” paradoxically lacks.

8. LIQUIDITY, MAKER, MATTER

Stone carvers in the Pyrenees frequently encountered undulating patterns on rocks. They also chiseled such rocks and therefore experienced the patterns not only from a distance, but also in the particular manner in which makers engage with matter. Makers develop a heightened sensibility to the particularities of the raw materials they process. Michael Baxandall called this sensibility “chiromancy”, arguing that the limewood carvers in fifteenth-century Germany sensed “the impulses moving about in the wood” (Baxandall 1980:38).

In an Early Christian sarcophagus from Brescia depicting the Crossing of the Red Sea, the sculptor “picked out an intensely red onyx block with particularly gushing veining to represent the miraculous hanging wall of water” (Barry 2007:632). This one example out of many shows that makers do not simply impose forms on matter, but

work with matter to “extract” forms that correspond to its properties. In other words, “the properties of the material are directly implicated in the form generating process” (Ingold 2013: 45).

In fact, artists consciously express such a view in technical manuals. A popular contemporary manual, Oliver Andrews’ “Living Materials: A Sculptor’s Handbook,” opens with the following words (Andrews 1983: 1):

The concept of “living materials” acknowledges that every material has an active presence, a capacity for change, that entitles it to be considered “alive.” Any piece of wood, though no longer part of a growing tree, has a grain pattern and a resiliency that causes it to respond characteristically when struck, bent, or cut. Every stone has its structure, granular or crystalline, flawed or sound, which will make it chip or split in certain ways, but not in others. Steel has its rusty willingness, silver its penetrating molten fluidity. To understand and work with these living qualities, and occasionally to counter and transcend them, is the task of every artist and craftsman.¹⁶

However, there is something in the specificity of our undulating motif that

¹⁶ Note the close similarity between the title of Andrews’ manual—Living Materials—and that of Jane Bennett’s highly influential and much more recent book *Vibrant Matter* (Bennett 2010).



Figure 12. Jeff Wall, *Milk*, 1984, transparency in lightbox, 187 x 229 cm (Photo: courtesy of the artist).

goes beyond the general sensibility of artists to raw materials. Makers perceive the creative act essentially as a process of transforming liquids to solids. What we imagine to be the obdurate nature of matter melts in the hand of the artist-transformer. In an influential essay commenting on his work *Milk* (Figure 12), Jeff Wall admits that “water plays an essential part in the making of photographs, but it has to be controlled exactly ... or the picture is ruined” (emphasis mine). “There is a logical relation, a relation of necessity, between the phenomenon of the movement of a liquid, and the means of representation.” This relation consists of the opposition, dialectics, and transformation between “the liquid intelligence of nature,” as Wall calls it—the “unpredictable contours,” “turbulence patterns,”

“compound curvatures,” and continuous change found in nature—and the dry, technological, optical intelligence of the “institution” of photography in particular and of art in general (Wall 2007).

Wall’s commentary on photography makes perfect sense in the case of the pictorial arts, where pigments are mixed with various liquid mediums, applied to the support (sometimes wet as well, as in the case of a *buon fresco*) and then left to dry and harden. Stucco, ceramics, and metalwork involve congealing and solidification too. In relation to stonework, Tim Ingold recently argued that “in the hands of the [pre-historic] skilled knapper, brittle flint becomes liquid, and is revealed as a maelstrom of currents in which every potential bulb of percussion is a vortex

from which fracture surfaces ripple out like waves. The knapper follows these currents in the rhythmically percussive movements of detaching flakes” (Ingold 2013:45).¹⁷ Even digital art may be seen as an attempt to manipulate and fix electrical currents, which we imagine to be liquid-like, traveling in “waves.” From a more philosophical perspective, all art is concerned with the physical fixation of mental fluxes—ideas, memories, thoughts, etc.

Joseph Beuys offers a hint regarding the nature of the connection between liquidity and the artistic process. In his 1979 documentary significantly titled *Transformer*, he commented: “If you look towards the rocky mountains, there things are extremely dense but it started not in this form; it started in a fluid form” (Halpern 1979: 2). Beuys alludes here to the mythico-scientific belief in primordial flux that has characterized Western thought from the Ionian Presocratics,¹⁸ through the Bible, to the present day.¹⁹ “And the earth was without form, and void; and darkness was upon the face of the deep. And the Spirit of God moved upon the face of the waters” (Genesis 1:2). As Ambrose put it succinctly: “The universe itself began with a dark coagulation of elements in the blank horror of space”²⁰ (*Epistulae*

73.23, in Zelzer 1982: 45; translated in Wills 2012: 65).

The artistic process parallels the mythico-scientific event of creation since both aim at ordering and controlling liquidity.²¹ As Wall suggests, art is nothing but hydraulics. Therefore, the eleventh-century carver looking at wave-like geological patterns saw in the petrified liquidity a reflection of his own creative practice. This is exactly what Jeff Wall means when he writes that that “the symbolic meaning of natural forms, made visible in things like turbulence patterns or compound curvatures is, to me, one of the primary means by which the dry intelligence of optics and mechanics [i.e. art] achieves a historical self-reflection” (Wall 2007:110). Once stabilized, naturally occurring liquid-like patterns invite the artist to self-reflect on the nature of his “dry” craft.

Artistic self-reflexivity may not be triggered only by coagulations and petrifications as such. The petrification of the petrified results in rhythmical patterns and textures (e.g. “frozen waves”). At the same time, muscular rhythmicity underlies the pretheoretical artistic action (or practice). It is the rhythmic movement of the arm,

¹⁷ Ingold relies here heavily on Deleuze and Guattari, see (Deleuze & Guattari 1987: 408–9)

¹⁸ The Ionian Presocratics chose alternatively water, air, or fire as the primary element and not earth since, for them, liquid-like forces and formations underlay the physical world. See, for example, (Mourelatos 2008). For the central role of liquidity in the Atomists’ physics, see (Serres 2000).

¹⁹ As in many other medieval works of art, the primordial matter is depicted in the Girona Creation Tapestry, for example, by means of undulating patterns.

²⁰ “Mundus ipse qui vel primum coactis elementorum per inane seminibus, tenero orbe, concreverat, vel confuso adhuc indigesti operis caligabat horrore.”

²¹ It is not just the artist who aims at controlling liquidity but also the prophet (e.g. Moses at the Crossing of the Red Sea, Jesus Walking on Water), the shaman, and the physician (e.g. humorism). Joseph Beuys sensed this communality and strove to unite all these roles poetically to create an idiosyncratic persona of a “Transformer.”

the repetition of gestures at regular intervals—hammering, sawing, brush stroking (Koerner 1993; Herbert 2014)—that captures and immobilizes untamed natural fluxes and brings them under human control. Therefore, a relation exists between the rhythmicity of the artist's body and that of the end product. This relation may lead makers to perceive rhythmicity as a precondition for the symbolic, since the meaningful can come forth only out of bodily cadences (Kristeva 1984; Olin 1993: 730). As André Leroi-Gourhan stated, “rhythms are the creators of forms” (Leroi-Gourhan 1993: 309–11).

However, in the case of the rock, the relation is suddenly reversed. It is a coagulated raw material rather than a coagulated end product that presents highly regularized rhythmicity. For the carver, the rock meets the two requirements of an end product—it is the result of coagulation and it presents rhythmical patterns (the traces of making). In other words, the rock is a naturally occurring work of art.²² And as such, it stands at the border between the natural and the symbolic. Due to its liminal position, the rock does not offer itself primarily as matter to be worked. Instead, it offers an opportunity for the transposition of the symbolically potent natural motif into the iconographic realm so that the rhythmicity of the artistic practice (i.e. motoric repetition), of nature (i.e. the rock), and of the symbolic (i.e. the iconographic motif) rhyme reflexively.

Perhaps it is possible to see this reflexivity in the iconography of the

scenes with the undulating motif. Many instances of the motif feature a figure that while being immersed in the water also touches or more precisely grasps it distinctly (Figure 3). The gesture seems awkward and interferes with the scene's “realism”—it is impossible to grasp water like that, laying four fingers on its exterior surface. The gesture does make sense, though, if we perceive it as a self-reflective comment on the creative practice of carving. The ambivalence of the figure—being at the same time submerged in the liquid and handling it from an impossible outside position—corresponds to the intermeshing of gesture and matter in the creative process, which results in the grasping, stabilization, and petrification of liquid forces. The nude figure is also the carver working the stone.

9. UNDULATION, CHANGE, AND THE EUCHARIST

Outside the medium of stone sculpture, other contemporary works of art feature undulating patterns. The interest in these patterns could well be related to artistic self-reflexivity, but it also has to do with the period's attentiveness (bordering anxiety) to change. Caroline Walker Bynum argues that in the twelfth-century, “intellectuals, religious leaders, and (insofar as we can glimpse them) ordinary people were fascinated by change as an ontological problem – not merely the birth and decay inherent in the life cycle, the economic and political opportunities attendant upon growth, the threat and promise posed by shifting gender relations and family

²² A contemporary aesthetic practice that endorses naturally occurring rocks as works of art is Chinese scholar rocks (Hay 1985; Rosenblum & Doran 2001).

structures, the efforts to position self engendered by cross-cultural contact and emerging national identities – but also and preeminently change itself: the fundamental fact that something can become something else” (Bynum 2001: 18).

Bynum continues to characterize the dominant conception of change at the turn of the twelfth century as evolution-change, defined as an alteration of an unfolding kernel or essence, rather than replacement-change, which assumes a complete substitution of the old by the new. Evolution-change expresses itself mainly through the image of the hybrid since the hybrid encapsulates the impossibility of replacement-change (or true change). The hybrid combines two or more essences that lack the capacity to merge completely into each other, and consequently have to paradoxically coexist.

The concept of evolution-change fueled the tensions underlying the eleventh-century Eucharistic controversy. The controversy started as a response to Berengar of Tours’ views on the nature of the transformation that takes place during the sacrament. Berengar’s stance cannot be fully reconstructed.²³ Yet, he most probably denied the possibility that the bread and wine change physically into the flesh and blood of Christ. By doing so, Berengar was simply following the prevailing concept of evolution-change, which excluded the possibility of true change. Berengar’s opponents found it difficult to argue against him without endorsing the alternative concept of replacement-change. Eventually,

“toward the end of the twelfth-century [...] a new understanding – a new model – of change emerged,” that of “radical change, where an entity is replaced by something completely different” (Bynum 2001: 25). This new understanding of change went hand in hand with the formulation of the doctrine of Transubstantiation, officially sanctioned by the Fourth Lateran Council.

Interestingly, with the exception of stone sculpture, undulating motifs are to be found mostly on liturgical paraphernalia associated with the Eucharistic rite (Kessler 2004: 29). Both the luxurious chalice of Doña Urraca and that of Abbot Suger were made of sardonix. The confluence of the stone’s red and white veins visualized the transformation of the bread and wine during the Eucharist. The top surface of an early twelfth-century portable altar from Paderborn Cathedral consists of blotched marble that alludes to the transformation of the Eucharistic species realized on it (Hamburger 2000: esp. 53). The streaking of the dark agate cup and the alabaster base of the Valencia Chalice, thought to be the original vessel Christ used at the Last Supper, makes a similar argument. The Holy Chalice from Valencia is of particular interest not only because it has served as an (imaginary) prototype of all chalices, but also because before it was handed over to the King of Aragon in 1399, it was kept in various churches in Upper Aragon (including San Adrián de Sasabel) in the vicinity of the rocks and the Romanesque sculpture examined here.

²³ For an introduction to the eleventh-century Eucharistic controversy and a review of the literature, see (Radding & Newton 2003: 1–31).

In all these works of art, petrified undulations are a mark of hybridity, a hybridity that “forces contradictory and incompatible categories to coexist and serve as commentary each on the other” (Bynum 2001: 31)—liquid-like undulations frozen in solid stones; an intermeshing of colors that suggests change in an unchanging rock; and going back to artistic self-reflexivity, raw materials (e.g. marble, sardonyx, agate, alabaster) that function as artistic motifs. Such hybridity, partially due to its paradoxical nature, produces an effect of sacral presence (Didi-Huberman 1995: 28–34).

Consequently, stone carvers could have considered the rock from Trujillo as a hybrid. Not a figural hybrid, of which so many instances are represented in Romanesque sculpture, but one that encompasses the incompatible categories present in contemporary Eucharistic vessels. The period’s sensitivity to the manner in which visual undulations, the problem of change, and acute theological debates were closely

interrelated made rocks with wave-like patterns into a material pregnant with exciting potentialities.

10. ORIGINS

The formal homology between the rocks from the hermitage of Nuestra Señora de Trujillo and the widespread sculptural motif showing undulations points to several possible sources for Aragonese Romanesque sculpture that by and large have not been accounted for—the particular geomorphic and geological characteristics of the Pyrenean landscape; medieval geological theories; the capacity of interactions between water and stone to lend themselves to metaphorical understanding; the maker’s actual experience of the production process; and the heightened sensibility of eleventh- and twelfth-century medieval culture to change. All these sources combined to produce the possibility of, or to use James Gibson’s terminology, to *afford* the transposition of a naturally occurring motif to the realm of sculpture (Gibson 1979: esp. 127–43). What marks these sources as different is that they portray iconography, at least to some degree, as an emergent phenomenon. Contrary to the dominating production model in medieval art history, according to which makers simply translate preconceived ideas of learned patrons or their own fancies (for example Schapiro 1939, 1970) into works of art, the wavy sculptural motif materialized out of an encounter between maker and matter immersed in the particularities of a specific landscape, culture, knowledge, and artistic practice. Meaning and form emerged at the border of discourse



Figura 13. A capital, Jaca Cathedral, western porch (Photo: © Francisco de Asís García García).

once all these circumstantial contexts intersected and as a result reciprocated. Therefore, with all the difficulties involved in reconstructing them, there can be no complete understanding of iconography without taking into account the intricacies of the creative process itself.²⁴

The emergence of the image is not limited just to the one sculptural motif explored so far. Serafin Moralejo pointed to Roman art in general, and to the second-century Hussilos sarcophagus in particular, as a key source for Romanesque sculpture in northern Spain (Moralejo 1976, 1979). Consequently the *jaqués* style has been dubbed as the most Roman out of all Romanesque sculptural styles (Moralejo 1979:85–93). Moralejo's observations are accurate. Many classical motifs found their way into the lexicon of Romanesque sculpture in Aragon. However, the manner in which these motifs are rendered is conspicuously not classical. The aforementioned capital from Jaca representing the classical theme of the Thiasos of the Sea (Figure 4), for example, includes the undulating

motif. However, on the capital, the motif does not only represent water. It also invades the floating drapery of the two central figures. In another capital, flanking the cathedral's western portal (Figure 13), the toga's curve around the right leg of the left figure, as well as the toga's fold on the right figure's chest, are rendered by heavy, parallel sinusoid lines that are clearly reminiscent of the geological pattern. Such a rendering of drapery stands in sharp contrast to classical conventions that dictate the use of v-section grooves of varying depth to model cloth (e.g. compare with the Hussilos sarcophagus). In fact, the formal features of the wave-like geological pattern are the defining characteristics of *jaqués* sculptural drapery and perhaps, if one considers the heavy sinusoid rendering of all *jaqués* sculptural imagery (figures and ornament included), even of the style as a whole. Thus, by bracketing away the "noise" of iconography, the observation of a silent church wall brings us to a fuller understanding of the variety of sources and meanings of Romanesque sculptural iconography.

BIBLIOGRAPHY

Acker, L. van. (ed.) (1991) *Hildegardis Bingensis Epistolarium*. Corpus Christianorum 91. Turnholti: Brepols.

Andrews, O. (1983) *Living materials: a sculptor's handbook*. Berkeley: University of California Press.

Augustine (1956) *Enarrationes in Psalmos*. Corpus Christianorum, 40. Turnholti: Brepols.

²⁴ Tim Ingold argues that, in general, scholars do not explore the production process itself but instead limit themselves to the study of final products. As a result, under the title of production, scholars in fact discuss reception (Ingold 2011: 4–6).

- Baird, J.L. & Ehrman, R.K. (eds.) (1998) *The Letters of Hildegard of Bingen*. Oxford: Oxford University Press.
- Bartolomé Roviras, L. (2010) *Presència i context del Mestre del timpà de Cabestany: la formació de la tradició clàssica d'un taller d'escultura meridional: ca. 1160-1200*. Universitat de Barcelona.
- Barry, F. (2007) "Walking on Water: Cosmic Floors in Antiquity and the Middle Ages" *The Art Bulletin*, 89(4), pp. 627–56.
- Baxandall, M. (1980) *The limewood sculptors of Renaissance Germany*. New Haven: Yale University Press.
- Bynum, C. W. (2001) "Introduction: Change in the Middle Ages". In *Metamorphosis and Identity*. New York: Zone Books, pp. 15–36.
- Cabanot, J. (1978) *Gascogne romane*. La nuit des temps 50. La Pierre-qui-Vire: Zodiaque.
- Canellas López, A. & San Vicente, A. (1971) *Aragon roman*. La nuit des temps 35. La Pierre-qui-Vire: Zodiaque.
- Carbonell, J. S. & Ortiz, N. S. (2013) "The pre-Pyrenees of Lleida in Late Antiquity: Christianisation Processes of a Landscape in the "Tarraconensis"" *Revista d'arqueologia de Ponent*, 23, pp. 27–44.
- Castiñeiras, M. & Camps i Sòria, J. (eds.) (2008) *El románico y el Mediterráneo: Cataluña, Toulouse y Pisa, 1120-1180 : Museo Nacional d'Art de Catalunya, 29 febrero-18 mayo 2008*. Barcelona: Museu Nacional d'Art de Catalunya.
- Deleuze, G. & Guattari, F. (1987) *A Thousand Plateaus: Capitalism and Schizophrenia*. Minneapolis: University of Minnesota Press.
- Didi-Huberman, G. (1995) *Fra Angelico: Dissemblance & Figuration*. Chicago: University of Chicago Press.
- Durán Gudiol, A. (1965) *Colección diplomática de la Catedral de Huesca*. Zaragoza: Instituto de Estudios Pirenaicos.
- Durliat, M. (1977) "L'apparition du grand portail roman historié dans le Midi de la France et le Nord de l'Espagne" *Cahiers de Saint-Michel de Cuxa*, 8, pp. 7–24.
- Durliat, M. (1990) *La sculpture romane de la route de Saint-Jacques: de Conques à Compostelle*. Mont-de-Marsan: Comité d'études sur l'histoire et l'art de la Gascogne.
- Eichholz, D. E. (1949) "Aristotle's Theory of the Formation of Metals and Minerals" *The Classical Quarterly*, 43 (3-4), pp. 141–6.

Español Bertrán, F. (2005) “El castillo de Loarre y su portada románica” *Locus amoenus*, 8, pp. 7–18.

Faller, O. (ed.) (1955) *Sancti Ambrosii opera. Pars 7, Explanatio symboli ; De sacramentis ; De mysteriis ; De paenitentia ; De excessu fratris ; De obitu Valentiniani ; De obitu Theodosii*. Corpus scriptorum ecclesiasticorum latinorum 73. Vindobonae: Hoelder-Pichler-Tempsky.

García García, F. de A. (2011) “HII TRES IVRE QVIDEM DOMINVS SVNT VNVS ET IDEM. El Tímpano de Jaca Y La Escenificación de La Ortodoxia” *Anales de Historia Del Arte*, Volumen Extraordinario (2), pp. 123–46.

García Omedes, A. (2014) “Borau: Ermita de San Adrian de Sasabe”. <http://www.romanicoaragones.com/0-Jacetania/50-Sasave1.htm> (Accessed 16 March 2014).

García Ruiz, J. M.; Martí Bono, C. E.; Lorente, A. & Beguería, S. (2002) “Geomorphological consequences of frequent and infrequent rainfall and hydrological events in Pyrenees Mountains of Spain” *Mitigation and Adaptation Strategies for Global Change*, 7(3), pp. 303–20.

García Ruiz, J. M; White, S.; Martí Bono, C. E.; Valero Garcés, B. L.; Errea, M. P. & Gómez Villa, A. (1996) *La catástrofe del barranco de Arás (Biescas, Pirineo Aragonés) y su contexto espacio-temporal*. Zaragoza: Instituto Pirenaico de Ecología.

García Ruiz, J. M. & Valero Garcés, B. L. (1996) “Procesos geomórficos históricos y su relación con la actividad humana en el Pirineo central español” *Cuadernos de investigación geográfica*, 22-23, pp. 33–56.

Gibson, J. J. (1979) *The Ecological Approach to Visual Perception*. Boston: Houghton Mifflin.

Halleux, R. (1974) *Le problème des métaux dans la science antique*. Paris: Les belles lettres.

Halpern, J. (1979) *Joseph Benys: Transformer*.

Hamburger, J. F. (2000) “Seeing and Believing: The Suspicion of Sight and the Authentication of Vision in Late Medieval Art and Devotion”. In Kalus Krüger & Alessandro Nova (eds.) *Imagination und Wirklichkeit: zum Verhältnis von mentalen und realen Bildern in der Kunst der frühen Neuzeit*. Mainz: Philipp von Zabern, pp. 47–69.

Hay, J. (1985) *Kernels of Energy, Bones of Earth: The Rock in Chinese Art*. New York: China House Gallery, China Institute in America.

Herbert, J. D. (2014) Courbet, Incommensurate and Emergent. *Critical Inquiry*, 40 (2), pp. 339–81.

Holmyard, E. J. & Mandeville, D. C. (eds.) (1927) *Avicennae de Congelatione et Conglutinatione Lapidum, Being Sections of the Kitab Al-Shifa*. Paris: Paul Geuthner.

Hughes, M. K. & Diaz, H. F. (eds.) (1994) *The Medieval Warm Period*. Dordrecht: Kluwer Academic Publishers.

Ingold, T. (2011) *Being Alive: Essays on Movement, Knowledge and Description*. New York: Routledge.

Ingold, T. (2013) "On Making a Handaxe". In *Making: Anthropology, Archaeology, Art and Architecture*. Abingdon: Routledge, pp. 34–45.

Iñiguez Almech, F. (1967) "La escatología musulmana en los capiteles románicos" *Príncipe de Viana*, 28 (108), pp. 265–76.

Isidore of Seville (2010) *The Etymologies of Isidore of Seville*. New York: Cambridge University Press.

Kendall, C. B. (1998) *The Allegory of the Church: Romanesque Portals and Their Verse Inscriptions*. Toronto: University of Toronto Press.

Kessler, H. L. (1989) "L'antica basilica di San Pietro come fonte e ispirazione per la decorazione delle chiese medievali". In Alessandra Ghidoli (ed.) *Fragmenta picta: affreschi e mosaici staccati del Medioevo romano: Roma, Castel Sant'Angelo, 15 dicembre 1989-18 febbraio 1990*. Roma: Argos, pp. 45–64.

Kessler, H. L. (2004) *Seeing Medieval Art*. Peterborough, Ont.: Broadview Press.

Klein, P. K. (1990) "Programmes eschatologiques, fonction et réception historique des portails du XIIe s. : Moissac - Beaulieu - Saint-Denis" *Cahiers de civilisation médiévale*, 33(132), pp. 317–49.

Koerner, J. L. (1993) "Editorial: The Extensionless Point of Practice" *RES: Anthropology and Aesthetics*, 24, pp. 5–6.

Kornbluth, G. A. (1995) *Engraved gems of the Carolingian empire*. University Park, Pa: Pennsylvania State University Press.

Kristeva, J. (1984) *Revolution in poetic language*. New York: Columbia University Press.

Lacarra, J. M. (1945) "Textos navarros del Códice de Roda". In *Estudios de la Edad Media de la Corona de Aragón I*. Zaragoza: Consejo Superior de Investigaciones Científicas, pp. 193–284.

Leroi-Gourhan, A. (1993) *Gesture and speech*. Cambridge, Mass: MIT Press.

Mango, C. & Parker, J. (1960) "A Twelfth-Century Description of St. Sophia" *Dumbarton Oaks Papers*, 14, pp. 233–45.

- Martí Bono, C. E. et al. (1997) "Large Historical Debris Flows in the Central Spanish Pyrenees" *Physics and Chemistry of the Earth*, 22 (3–4), pp. 381–5.
- McCormick, M. et al. (2007) "Volcanoes and the Climate Forcing of Carolingian Europe, A.D. 750–950" *Speculum*, 82 (4), pp. 865–95.
- Moralejo, S. (1976) "Sobre la formación del estilo escultórico de Frómista y Jaca". In *Actas del XXIII Congreso Internacional de Historia del Arte*. Granada, pp. 427–34.
- Moralejo, S. (1979) "La sculpture romane de la Cathédrale de Jaca: état des questions" *Cahiers de Saint-Michel de Cuxa*, 10, pp. 79–106.
- Moralejo, S. (1989) "Origini del programma iconografico dei portali nel romanico spagnolo". In *Wiligelmo e Lanfranco nell'Europa romanica*. Modena: Panini, pp. 35–51.
- Mourelatos, A. P. D. (2008) "The Cloud-Astrophysics of Xenophanes and Ionian Material Monism". In Patricia Curd & Daniel W. Graham (eds.) *The Oxford Handbook of Presocratic Philosophy*. Oxford University Press, pp. 134–68.
- Olin, M. (1993) "Review of Oleg Grabar's *The Mediation of Ornament*" *The Art Bulletin*, 75(4), pp. 728–31.
- Pentcheva, B. (2011) "Hagia Sophia and Multi-Sensory Aesthetics" *Gesta*, 50, pp. 93–111.
- Pereira, M. C. (2008) "Les images-piliers du cloître de Moissac" *Bulletin du centre d'études médiévales d'Auxerre*, Hors-série n. 2, pp. 2-12.
- Picard, J.-C. (1971) "Les origines du mot *Paradisus*-Parvis" *Mélanges de l'Ecole française de Rome*, 83(2), pp. 159–86.
- Piccardi, L. & Masse, W. B. (eds.) (2007) *Myth and Geology*. London: The Geological Society.
- Pliny the Elder (1962) *Natural History, Books 36-37*. The Loeb classical library. Cambridge, Mass: Harvard University Press.
- Radding, C. & Newton, F. (2003) *Theology, Rhetoric, and Politics in the Eucharistic Controversy, 1078-1079: Alberic of Monte Cassino Against Berengar of Tours*. New York: Columbia University Press.
- Rosenblum, R. & Doran, V. C. (2001) *Art of The Natural World: Resonances of Wild Nature in Chinese Sculptural Art*. Boston: MFA Publications.
- Le Roy Ladurie, E. (1988) *Times Of Feast, Times of Famine: A History of Climate since the Year 1000*. New York: Farrar, Struas and Giroux.
- Schapiro, M. (1939) "From Mozarabic to Romanesque in Silos" *The Art Bulletin*, 21(4),

pp. 313–74.

Schapiro, M. (1970) “Review of Lillian M. C. Randall’s *Images in the Margins of Gothic Manuscripts*” *Speculum*, 45(4), 684–6.

Seneca, L. A. (1971). *Naturales Quaestiones*. Loeb classical library. Cambridge, Mass: Harvard University Press.

Serres, M. (2000) *The Birth of Physics*. Manchester: Clinamen Press.

Simon, D. L. (1987) “San Adrián de Sasave and Sculpture in Altoaragón” In Neil Stratford (ed.) *Romanesque and Gothic: Essays for George Zarnecki*. Woodbridge, Suffolk: Boydell Press, pp. 179–84.

Srawley, J. H. (ed.) (1919) *St. Ambrose. ‘On the Mysteries’ and the Treatise ‘On the Sacraments’ by an Unknown Author*. New York: Macmillan.

The Metropolitan Museum of Art (1993) *The Art of Medieval Spain: A.D. 500-1200*. New York: The Metropolitan Museum of Art.

Theophrastus (1965) *De Lapidibus*. Clarendon Press.

Tilley, C. (2004) *The Materiality of Stone: Explorations in Landscape Phenomenology: 1*. Oxford: Berg.

Valenzuela-Muñoz, J. M. (1964) “San Adrián de Sasabe” *Argensola: Revista de Ciencias Sociales del Instituto de Estudios Altoaragoneses*, 57, pp. 71–90.

Wall, J. (2007) “Photography and Liquid Intelligence”. In *Jeff Wall: Selected Essays and Interviews*. New York: Museum of Modern Art, pp. 109–10.

Wills, G. (2012) *Font of life: Ambrose, Augustine and the Mystery of Baptism*. New York: Oxford University Press.

Zelzer, M. (ed.) (1982) *Sancti Ambrosii Opera. Pars X. Epistulae et Acta*. Corpus scriptorum ecclesiasticorum latinorum 82. Wien: Hoelder-Pichler-Tempsky.