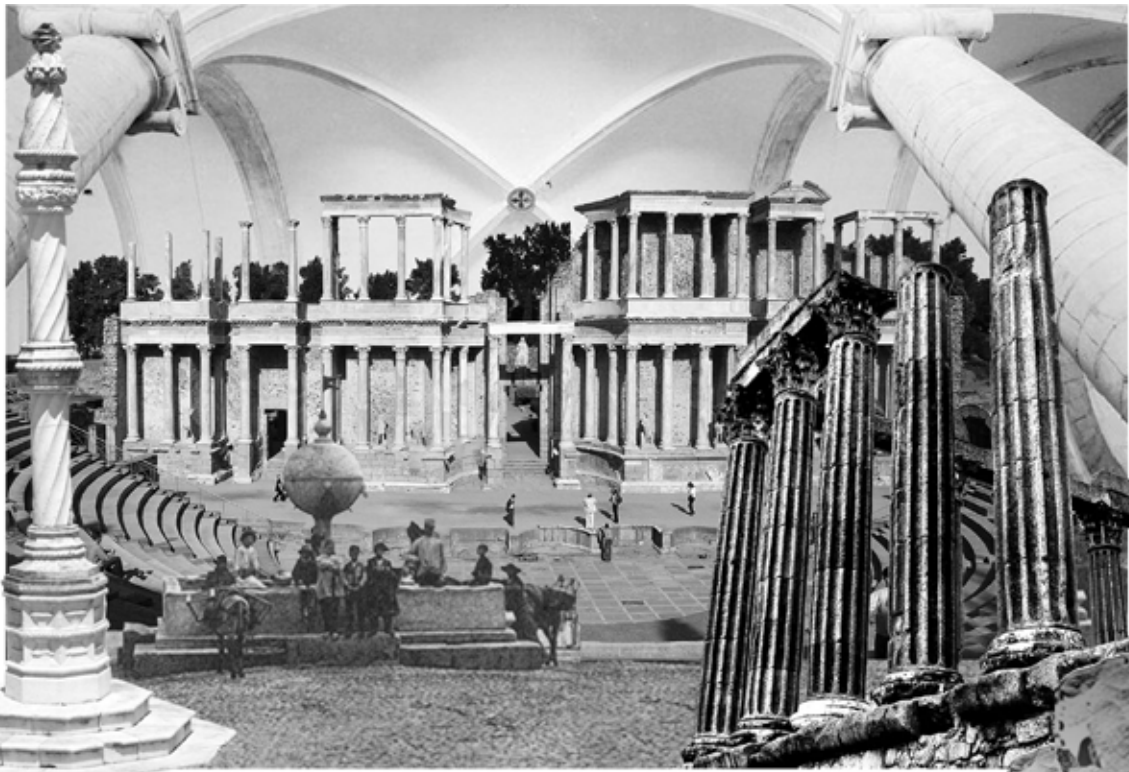


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## The Topology of Marble: The Matter of Estremoz's Built Heritage



### **Introduction: A Crumpled Handkerchief of Marble**

Imagine yourself in Estremoz 700 millions of years ago. You would be immersed in 'metamorphism', the geologic process in which Estremoz marble was conceived. From the Greek: *meta* (transformation) and *morphos* (form), the crystals of calcite present in the composition of limestone are recrystallizing and slowly joining. This process introduces variations in the initial texture of rocks, though its original mineral structure (calcite) remains identical.

By the 1980s, we can testify the major industrialization progress achieved in the Alentejo's landscape. As the exploitative procedures improved, the speed of excavation and capacity to export the marble increased. This process generated a decisive transformation phase in the Estremoz Anticline: digging depths beyond 100 meters were achieved, and a "second nature" (Beigel & Christou, 1996, p. 26) outlined by cavities (caused by the extraction) and mounds (the heaps of marble refused by the industry, which constitutes 80 to 90% of all extracted matter (Silva & Esteves, 2015, p. 305), was formed.

These two extremes in time – 700 millions ago and the 80's – are truly interconnected. Making visible the closeness of processes beyond the metric distance in time, Estremoz marble discloses the first topological evidence of this place. As real evidence of what Michel Serres encourages us to learn, that "time doesn't always develop according to a line and thus things that are very close can exist in culture, but the line makes them appear very distant from one another" (Serres & Latour, 1995, p. 57). The primeval metamorphism of marble and its recent exploitation "are considered as two places separated by an immense distance, whereas I see them as in the same neighborhood" (Serres & Latour, 1995, p. 57).

This paper is structured by the simultaneity of *in-here* and *out-here* interconnections: (a) *Here and In-here*, maps the motion of marble from the quarries with the built urban heritage of Estremoz; (b) *Here and Out-here*, renders visible the intimate connection with distant places, such as Europe, Africa, and South America. Michel Serres defines topology as "the science of nearness and rifts" (Serres and Latour, 1995: 60), picturing it by the action of crumpling a handkerchief:

***If you take a handkerchief and spread it out in order to iron it, you can see in it certain fixed distances and proximities. If you sketch a circle in one area, you can mark out the nearby points and measure far-off distances. Then take the same handkerchief and crumple it by putting it in your pocket. Two distant points suddenly are close, even superimposed. If, further, you tear it in certain places, two points that are close become very distant.***

(Serres & Latour, 1995, p. 60)

This article aims to *unfold the handkerchief of marble* by mapping the interconnections between time and space. Overcoming the

separateness of distance, the argument determines the authenticity of Estremoz marble as a global built heritage.

### **Here and In-Here**

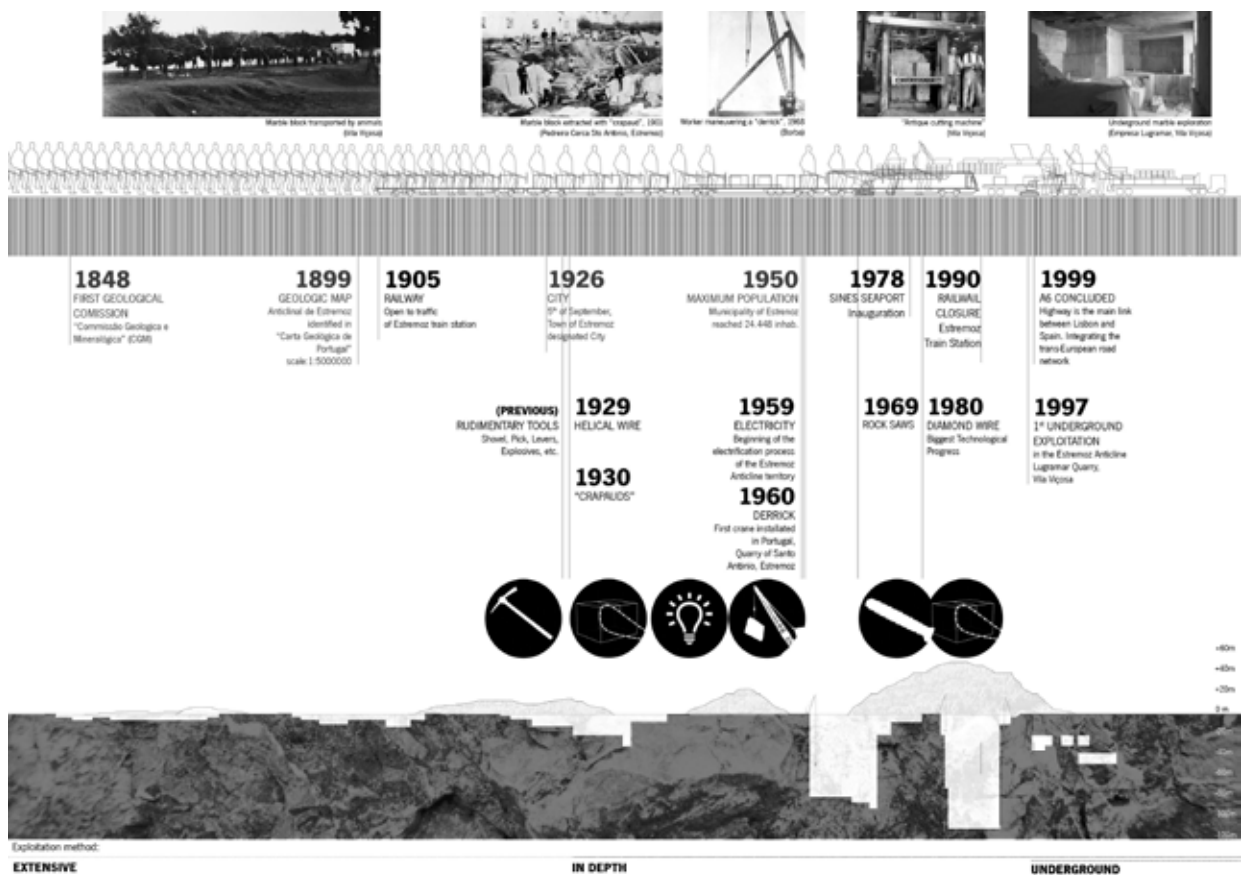
This concept demonstrates the relationship between the extraction methods and the *in situ* technics ceaselessly applied in the architectonic and urban heritage of the city of Estremoz. Through marble, the connection between all layers and scales of the city are interrelated.

### **Here: Within the Quarries**

The Estremoz Anticline is a geological structure of outstanding mineral wealth, 40km long by 7km wide that encompasses the boroughs of Estremoz, Borba, and Vila Viçosa. In this region, communities are strongly related to the exploitation of its natural resources.<sup>2</sup> The use of local mineral reserves has been established within the framework of architecture and the decorative arts, a practice that recalls ancient civilizations.<sup>3</sup> Synthetically, the Estremoz quarrying process is focused on the removal of marble fragments out of the bedrock mass. Due to the large-scale establishment and labour intensity characterizing this industry, marble exploitation continues to be the economic sector that most directly influences the environmental balance of the Anticline's landscape.

Recognition of the value of Estremoz marble resources grew with its association with the industrialization process that occurred over a 60-year period, between 1930 and 1990. The introduction of innovative manufacturing techniques (applied *in situ*) and the employment of a wide trade strategy (supported by the expansion of the corporate structure) reinforced the presence of Estremoz marble as a product and its presence on the international scene. *Figure 1* summarizes the technological advances introduced in local quarrying during the last century. The speed and fervour introduced by new labour procedures sustain the productivity record levels achieved,<sup>4</sup> and the landscape changes were consequently verified.

The Portuguese mining industry began in 1929 after the cessation of the use of rudimentary work tools (not mechanical). At that time the application of helical wire introduced higher cutting speeds and higher production levels. In 1930, jack screws ("crapauds") were incorporated in the extraction process, simplifying the collection and displacement of excavated materials. Later, the appearance of the diamond wire machine (1980), pointed out by some authors as "the greatest technological advance experienced by the sector" (Luz, 2005, p. 51), ensured the increase of speed and productivity of this industrial sector. The distinct features and the quality of Estremoz sculptural marble were widely crafted into unique local masterpieces, which are considered a Portuguese national and local heritage. Technical enhancement was achieved, and the continuous transference of matter



1. Chronology of the extraction methods, from the 19<sup>th</sup>-20<sup>th</sup> c.

across borders promoted a global-scale consuming proportion, which will be further discussed in the final topic *Here and Out-here*.

### **In-Here: Within the Urban Heritage of Estremoz**

In Estremoz, use of this material (Fig. 2) is widely displayed in the locally built heritage: in its streets, squares, private and notable buildings. The permanent continuity of its presence is clearly visible and reinforces the inextricable relation of marble to the city's character.

***The origin of the term "Estremoz" can be intrinsically connected to marble, while building and ornament material, as suggested by the conjunction of the toponymical elements "estr" ("estr" = "str", meaning "bright") and "mós" (plural for "mó" ie, stone) (CRESPO, s/d).***

(Costa, 1992, p. 23)

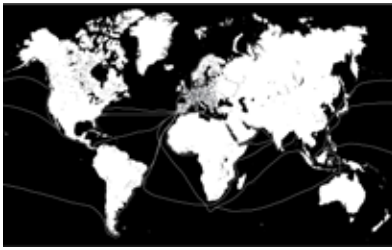
For example, the foundations of Estremoz's donjon (a 13-14<sup>th</sup> c. tower) were assembled with stone extracted from the surrounding marble quarries. Indeed, the structure is "completely solid until the first floor" (Cunha, 2004, p. 51); moreover, the medieval tower is entirely built with marble (Fig. 2). The use of Estremoz marble across the city



2. Topological cross-scale drawing, the relationship between the quarries and the marble built heritage in Estremoz (right-side: Estremoz Dojon's details).

reveals the employment of an ancient knowledge, which continues to prove a unique relationship between man and the territory he inhabits.

The visual and spatial contiguity between the quarries and the internal spaces of the city are permanent. In this particular case, the effect imposed by man on territory discloses the relationship between the architectural conception and the act of collecting the matter needed to build it. Toward the second half of the 20<sup>th</sup> century, proximity to the extractive areas and the industrial progress performed by the marble's sector expanded the access to the marble, a matter until then considered 'noble' and also inaccessible. Yet in vernacular architecture, the use of marble in exterior dwellings is mainly associated with ornamental purposes: doorjambs, windowsills, stairs or, especially noticeable in buildings from the late 1960's, the covering of entire façades; on the other hand, the interior of these dwellings are replete with functional details such as marble kitchen countertops, sinks, walkways, and walls. The extensive local use of marble reveals the constant rapport of local communities with this type of matter. However, through the action of *subtraction* and *addition* of matter for building purposes, this duality constantly redefines the outline of the city as it re-shapes the extractive areas (Fig. 2). The existence of built heritage in this region testifies the long-term tradition of Estremoz marble as being the basal constructive element of the city's living space.



3. Global marble network.

### Here and Out-Here

The gradual transmission of marble from the Estremoz Anticline began to interrelate with the Mediterranean people. Later, this diffusion expanded globally and strengthened the social, cultural and economic link between Estremoz and the rest of the world. To illustrate how this matter has traversed space, *Figure 3* maps the marble network that connects Estremoz with the rest of the world. Five main communication routes constitute this relationship:

**Roman roads.** “In the Roman period, pieces of art made with Estremoz Marbles were exported abroad and can be found in museums and archaeological sites throughout Europe and North Africa countries” (Lopes e Martins, 2014, p. 1).

**Maritime routes.** “During the maritime expansion, altars, stairways, columns, statues, etc., were carried as ballast in the holds of ships. At the destination the Portuguese had built monuments which can now be found in South America and Africa countries” (Lopes e Martins, 2014, p. 1).

**Railways.** The Estremoz railway presented a short operative time (1905-2009). The movement (motion) of the marble beyond / out of this region continued between 1905 and 1990. This path crossed the Estremoz Anticline and settled in physical proximity with the quarries of Estremoz, Borba, and Vila Viçosa.

**Road networks.** Local road structures consist in a series of complementary routes that interlink local housing settlements with the macro scale network (which ensures, for example, the connection between Lisbon and Caia, toward Madrid). Furthermore, in 1999, the A6 motorway was completed, thus becoming the main link between the country’s capital and Spain. The A6 is part of the trans-European road transport network. These infrastructures ensure freight transport from the Estremoz Anticline.

**Contemporary maritime routes, departing from the port of Sines.** Due to its geographical proximity to the Anticline area of Estremoz, the port of Sines is strategically sited to export marble products, as it is the main port on the Iberian-Atlantic coast. Linked with the land routes, this deep-water port has ensured that its cargo will reach distant destinations since 1978.

The lines introduced on the world map reveal the traces of the motion of Estremoz marble over time. By approximation, the presented interpretation expresses the most significant connections between the origin of marble extraction and its final application sites.

### Out-Here: Across the World

This article aims to demonstrate that the transferring process of Estremoz marble goes far beyond the extractive areas (quarries). Granted, transmission of the extracted raw materials from of the Estremoz Anticline have always been a characteristic of this industry,

and initially this activity was mainly dependent on human strength and limited by the assistance of animal-drawn vehicles. Latterly, the gradual establishment of a mobility network allowed a more efficient dispersion of the product. As a result, today Estremoz marble remains in great demand abroad, especially in Europe and the Middle East.

During the Roman period, Estremoz marble was used on a large scale and mainly applied in sculptural or architectural heritage mostly located in the South and Centre of Portugal. By the time when of Lusitania was the capital, marble (from Vigária, Vila Viçosa) was used to build columns and create decorative elements of the Roman Theatre of Mérida (16<sup>th</sup> c. BC). Furthermore, “Its use reache[d] *Conimbriga* where several architectural elements carved in marble from the area of Estremoz and Vila Viçosa can be found” (Alarcão, 1988, p. 135-136). During the second century, the bases of the columns and capitals of the Roman Temple in Évora were also executed from this material. (Luz, 2005, p. 27-28)

The old method of handling this stone reflects a specific form of interaction between man and landscape, which affirms the value of the Estremoz marble as a common vocabulary of this global heritage. By approaching each monument from its elemental matter, architecture crosses the geologic expression given by time and the intelligence imprinted by man on that stone. Thus, according to Pollak (2006, p. 129), “There is no inherent, assignable scale to architecture, landscape, or city, [but] there is a range of scales associated with each set of practices”.

Figure 4 illustrates the intrinsic relationship between the Estremoz Anticline and four specific Iberian architectural elements in which marble was employed, namely: The Church of Santa Maria de Estremoz (top); the Roman theatre of Mérida, Spain (center); the Pillory of Estremoz, Estremoz (left); the Fountain of Portas de Moura, Évora (center), and the Roman Temple of Diana, Évora (right). As evidenced by this interpretive drawing, architecture simultaneously encloses the measure of the human body and the rhythm of geological time, thus revealing the ability of marble to act as a topological link between architecture and landscape.

Europe still is the world region where there is more information about the heritage built with Estremoz marble. Although the number of architectural references is small,<sup>6</sup> the heritage scientifically identified is specified on the map (Fig. 5). This topological map has been intentionally enlarged accordingly to the number of buildings known. The focus is not the metrical measure of the land, but the relevance of the used marble. The presence of these monuments is marked on the plans and sections. This representation includes: the Jerónimos Monastery main chapel in Lisbon; the fountain located in the Giraldo square, the Roman Temple of Diana, the Misericórdia Church, the Palace of Dom Manuel in Évora; The Church of Santa Maria in Estremoz, the Roman Theatre in Mérida, Spain and the Palace of Versailles<sup>7</sup> in France.



4. Topological section, the relationship between the Estremoz quarries and the built heritage.



5. Topological map of marble use in Europe.

As presented, the map can be further expanded to include a larger number of countries and continents. For instance, in Brazil Estremoz marble can be found in Rio de Janeiro and in Cairu (Bahia), in the sacristies of the 17<sup>th</sup> century Franciscan convents of Santo António. Following the vocation of this industry to grow through global unions, a “cartography is less a conclusion than an on-going process” (Jarvis, 1998).

During the past 6 decades, the Estremoz marble sector has spread out internationally, determined by a major technological and infrastructural boost; however, as we see from presented map, this is not a recent phenomenon. Since the time of the Roman Empire, Estremoz marble has been the preferred matter and has been displaced to distant points of the world. In becoming a part of the noble spaces of ancient societies, Estremoz marble repeatedly reveals the topological closeness in time of “distant” cultures.

### **Conclusion: The Common Matter of a Global Heritage**

The heritage of marble reveals an expanded field (Silva, 2011) – a field where the limited spaces we inhabit are infinitely stretched by time.

***I would not fail to mark it with the seal of Time, the idea of which imposed itself upon me with so much force today, and I would therein describe men, if need be, as monsters occupying a place in Time infinitely more important than the restricted one reserved for them in space, a place, on the contrary, prolonged immeasurably since, simultaneously touching widely separated years and the distant periods they have lived through – between which so many days have ranged themselves – they stand like giants immersed in Time.***

(Proust, 1927)

The existence of Estremoz marble confirms a legacy transversely established through time and space. The specific mutable condition of this matter redefines the limits of architectural research and explains the global magnitude of this discourse. Hence, the topic of the “Topology of Marble” brings to the fore the urgency for us to recognize the interdependence of the geological, industrial, and commercial nature of Estremoz’s built heritage. Furthermore, if in simple terms topology is the “study” (logos) of “place” (topos), Estremoz marble asks us to perceive place not constrained to a physical location, but as a space that, though recognized as a concrete territory, becomes a ceaseless motion of folded processes. Itself and out-self are intertwined; and being inside the place is not enough. Estremoz marble is evidence of matter that surpasses the limits, by travelling in all directions (Corajoud, 2000, p. 44).

We talk about *between*, *across*, *through* and the fundamental actions of transformation occurring in territory. The tendency to interpret heritage as a static place, fixed in a predetermined time and space is thus questioned and explored from a new perspective. The



heritage of Estremoz marble “percolates” (Serres & Latour, 1995, p. 58) transdirectionally. In this article, two major motions were mapped: between extraction and construction (using the city of Estremoz as specific example), and between the local quarries and the distant places where the marble was used. There is much more to be discovered. More buildings to investigate. More motions to be understood. More pleats to be unfolded from a crumpled handkerchief of marble.

1 → “Concentrating more than 99% of the total active marble quarries in the country” (Luz, 2005).

2 → For example “terra rossa” (the topsoil present in the Estremoz Anticline, with clay characteristics), sustenance of Estremoz’s typical pottery, as well as well-known products such as ‘North Alentejo olive oil’, the ‘Controlled Origin Wine’, ‘Alentejo Honey’, ‘Estremoz marble’, etc.

3 → The first known reference to the use of marble refers to a tombstone ordered by the Carthaginian Capitain Maarbal in 370 BC (Luz, 2005).

4 → The exploitative apogee of the Estremoz Anticline has been registered since the 1980s. Since then it has been registered as the largest increase of extracted matter.

5 → Notable urban applications of Estremoz marble include the monumental fortress of Estremoz (13-14<sup>th</sup> c. and later in the 17<sup>th</sup> c.) and hydraulic infrastructures such the “Couraças” tower (13<sup>th</sup> c.) and the “Gadanha’s” lake (17<sup>th</sup> c.).

Architectural masterpieces such as the delicate ornamentation of the Queen Saint Isabel de Portugal Chapel (17-19<sup>th</sup> c.), and the rigor of Santa Maria Church (16<sup>th</sup> c.) are valuable testimonies of Portuguese history and culture.

7 → Due to the lack of scientific research interlinking the geological, industrial, commercial and architectural data of the Estremoz Anticline.

8 → “There are references to the exportation of Portuguese marble for the court of Louis XIV at Versailles, just as it marks its presence at the Paris Exposition in 1855 (SIROR, 1981)” (Costa. 1992. p. 23).

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