WHEN URBAN GEOLOGY MEETS CULTURAL TOURISM

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Abstract

The region of Algarve (Southern Portugal) has a rich geological history, whose testimonies are the different rock types, their structures and the fossils. These can be found not only in the countryside, in quarrels or in the cliffs, but also in the towns, in the building-stones of monuments, other edifices or pavements. The state and the way of weathering of the stones informs about their exposition and durability. By observing the stones, they can tell us about their origin and age.

Joining this history with the history of the buildings and their art, and knowing (or presuming) the local of the provenience of the building material, it is possible to get a more complete image of the whole context, including, for instance, the transport possibilities. If there are any "exotic" stones, that is to say stones whose origin was far from the visited site, we may take conclusions about trading connections in the country or even overseas.

The inclusion of Urban Geology in the usual paths of cultural tourism will enrich the touristic offer of a town. It is aimed to people with historical and scientific interest and can be participated by persons with reduced mobility. The stones and eventually the fossils can be observed in the town during the whole year, at any weather, without the need of pollutant cross-country vehicles or long and exhausting walking-tours. Therefore, Urban Geology is a very interesting complement of the Cultural Tourism in the Algarvian towns.

Keywords: Urban Geology, Cultural Tourism, Natural Heritage, Cultural Heritage, Algarve, Portugal

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1. INTRODUCTION

The region of Algarve (southern Portugal) is one of the most visited touristic sites of Europe. Its main attractions are the beaches and the Mediterranean climate, so every year thousands of people, Portuguese and foreigners, come to spend their vacations there. In the last years the tourists' habits have been changing. Many tourists want to learn about the heritage, tangible and intangible, of the region they are visiting, instead of spending a lot of time at the beach.

The Algarve has an extension from east to west of about 140 km, and from north to south of about 40 km. There are three main landscape units which build up the Algarve region: in the north, a mountain chain of shale rocks with heights from about 200 to 400 m, which culminates in the "Serra de Monchique" with 900 m above sea level, is sparsely populated and has low agricultural capacity. To the south, the "Barrocal", a hilly region, whose main rocks are limestone, has better ability for agriculture and is more populated. Finally, along the coast in the south, the "Litoral" is densely populated with a lot of touristic explorations and other economic activities.

The main cities of Algarve are Faro, the capital of the district, Loulé, Portimão, Lagos, Tavira, Vila Real de Santo António, Silves and Aljezur. The cultural heritage, both tangible and intangible, is influenced by Roman, Visigoth, Arabian and Christian occupation. However, a big number of buildings was destroyed in the earthquake of 1755, so a large part of the former architectonic heritage is lost. Beside the cultural heritage, there is natural heritage, which reveals itself mainly in the cliffs of the coastal areas in the western Algarve and in the watt coast with islands in the eastern part.

Tourism is the most important economical factor of the Algarve. In the last years, there was a significant boom in this branch: The total revenues of the algarvian hotel establishments rose from 521.848.000€ in 2009 to 1.076.233.000€ in 2017. This corresponds to a growth of 106,6% in 9 years. In the same period, the overnight stays per 100 habitants grew from 2918,5 to 4586,9. This means an increase of 57,2% (PORDATA, 2018).

The methodology used for the elaboration of this article involved bibliographic and webgraphic research, the study of topographic and geologic maps, discussions with colleagues and specialists, and visits to the locations and museums. The experiences obtained by the preparation and orientation of guided visits in the field and in the city were an invaluable contribution to this work.

Previous works about examples of urban geology and cultural tourism exist, among others, about Lisbon (M. L. Rodrigues, Machado, & Freire, 2011), Madrid (Spain), focussing the degradation and decay of building stones (Perez-Monserrat, Buergo, Gomez-Heras, Muriel, & Gonzalez, 2013), some locations in France (Société Géologique de France, n.d.;

Wever et al., 2017), in Poland and Czech Republic (Chylińska & Kołodziejczyk, 2018), and the cities of Lausanne, Turin and Rome, emphasizing the growing use of digital mobile application technology (Pica et al., 2018). Guidebooks about urban geology in Algarve (Portugal) have been published about the cities of Faro, Lagos and Tavira (L. A. Rodrigues & Agostinho, 2016a, 2016b, 2016c).

2. CULTURAL TOURISM

In 2017, the General Assembly of the United Nations World Tourism Organization (UNWTO) agreed that "*cultural tourism is a type of tourism activity in which the visitor's essential motivation is to learn, discover, experience and consume the tangible and intangible cultural attractions/products in a tourism destination. These attractions/products relate to a set of distinctive material, intellectual, spiritual and emotional features of a society that encompasses arts and architecture, historical and cultural heritage, culinary heritage, literature, music, creative industries and the living cultures with their lifestyles, value systems, beliefs and traditions*" (UNWTO, 2018b).

The main target of cultural tourism is the cultural heritage. According to the International Cultural Tourism Charter – Managing Tourism at Places of Heritage Significance (1999), "*heritage is a broad concept and includes the natural as well as the cultural environment. It encompasses landscapes, historic places, sites and built environments, as well as biodiversity, collections, past and continuing cultural practices, knowledge and living experiences. It records and expresses the long processes of historic development, forming the essence of diverse national, regional, indigenous and local identities and is an integral part of modern life. It is a dynamic reference point and positive instrument for growth and change. The particular heritage and collective memory of each locality or community is irreplaceable and an important foundation for development, both now and into the future*" (ICOMOS, 1999).

Cultural tourism holds an important share in world tourism. It is estimated that more than 39% of all international tourism arrivals in 2017 had their destination to enjoy cultural heritage (UNWTO, 2018a). The same report states that the main emphasis of cultural tourism is moving from the tangible heritage towards the participation and consumption of cultural practices (Richards, 2018). These practices may include, besides intangible heritage like traditions, gastronomy etc., even "experiences" and "adventure trips". The growing numbers also show that cultural tourism escaped from a niche-market, whose visitors have relatively high education levels and high income, to a market of mass tourism, whose range of people is much wider (ib.). In consequence, many key sites are overcrowded, as the authors experienced in Rome in August of 2018, where it was impossible to get near the Trevi Fountain because of the massive accumulation of visitors at this place.

3. URBAN GEOLOGY

The definition of urban geology can emanate from different points of view. On the one hand, it can be seen within the context of engineering, architecture and urbanism and may be defined as *"The study of the interaction of human and natural processes with the geological environment in urbanised areas, and the resulting impacts, and the provision of the necessary geo-information to enable sustainable development, regeneration and conservation"* (Culshaw & Price, 2011, p. 4). According to the same authors, urban geology is considered as an important part of engineering geology to be used for the prevision and minimization of impacts and to aid urban development, regeneration and conservation.

On the other hand, urban geology can be described from the cultural and touristic point of view, which includes the area of geotourism. In a broad sense, geotourism corresponds to a tourism segment which is focused on the sustainable use of the geoheritage, which includes the geological, geomorphological, pedological, hydrological and scenic heritage, among others, together with the cultural heritage (tangible and intangible) of the visited place (M. L. Rodrigues et al., 2011). This concept joins natural heritage with cultural heritage and can be used as a sustainable form of promotion, development (*ib.*) and protection of areas with a rich and miscellaneous heritage.

To emphasize the complex and diverse character of geotourism, the following list shows the most important reasons of its appeal to tourists (Chylińska & Kołodziejczyk, 2018):

1. Location of cities in areas of geological interest or occurrence of geosites within the city.
2. Urban architecture and building materials of natural stone.
3. Protected green enclaves with geotouristical interest.
4. Industrial urban areas and landscapes, originated, for example, by mining activities.
5. Museums and expositions related to Earth Sciences and geoheritage.
6. Natural geographical occurrences which shape urban areas.
7. Results of unforseen large-scale geological and geomorphological phenomena or catastrophes which hit an urban area.

The present article is focussed on the second item of the previous list, this means, it deals with the building and decorative stones of buildings, monuments, pavements, etc. By observing the stones and their mineral and fossil content, they reveal the story of their origin, their provenience, the treatment they were subjected to and their way of interacting with the environment, i.e. the state of weathering by environmental influences. The stones deliver form and colour to the building, being an important contributor of its esthetical aspect. So, a natural dimension is added to the architectonic, artistic and historic dimension of the building, joining the cultural and the natural heritage (L. A. Rodrigues & Agostinho, 2016a).

In many cases, the building stones are responsible for the image of a site or a city. Because of their characteristic colour and kind of weathering they give a typical aspect to the buildings and places, contributing to the *genius loci*. For instance, a lot of buildings and fountains in the city of Rome have been built or coated with marbles or travertine, giving them a clear, almost white colour. The cities of Oporto and Santiago de Compostela have a dark aspect because of the granite stones used in most of the edifications, and Lisbon, with many buildings made of "lioz" (clear limestone with rudist fossils) and white marbles, together with other materials, is called "the white city" in some guidebooks (Michelin Green Guide, 2010).

The history of the use of building stones can contribute to the construction history of edifications and parts of the cities. The oldest buildings were constructed mainly using local stones, because it was onerous to carry them from the quarry to the construction site. As the mode of transport improved (by ship and train), the use of stones from other regions became possible and turned to be more and more common (Wever et al., 2017), as it happened in Algarve with its long maritime history. The existence of "exotic" stones, i.e. stones whose origin is far from the visited site, permit to draw conclusions about former trade and traffic relationships with other countries or continents. Today, it is usual that a lot of building and ornamental stones are imported even from China or Brazil to Europe.

The study of the stones the urban heritage is built up with, and the determination of their provenience (if possible), permit to establish a kind of urban stratigraphy based upon the succession of different building materials, which gives precious information about the development of the city, especially when buildings have been repaired after damages (Wever et al., 2017). In Portugal, the Catalogue of Portuguese Ornamental Stones (Moura, 1994) constitutes a very useful tool which can be applied for the identification of ornamental stones used in buildings, as well as for the discovery of their origin.

City buildings constituted of natural stones can be considered as on-site urban rock laboratories, where it is possible to watch forms and results of weathering of the stone material in their façades. The forms, causes, processes and mechanisms of stone decay are related with the interaction of the material with the environment and increased by air pollution and wrong treatment of conservation (Perez-Monserrat et al., 2013). Thus, urban geology turns into an aid to attract attention to the problematics of environmental problems.

The built heritage of a city can be viewed as an outdoor geological museum. The buildings exhibit geological features, artistic-historical values and diverse conservation measures (*ib.*). The stones and their mineral and fossil content are accessible in an urban environment and can be visited during the whole year, at nearly any weather. They can be watched without the need of pollutant cross-country vehicles or to undertake long and exhausting walking-tours. As the heritage buildings usually are prepared to be accessed by disabled persons, these are enabled to participate in practical geology without having to move

in a quarry or in the terrain. By the same reason, urban geology is a way of natural tourism for many seniors and might become a precious contribute to inclusive tourism (Kéroul, n.d.).

As this subject is aimed to children and adults with historical and scientific interest, the touristic offer in a city will be enriched by the inclusion of urban geology into the usual paths of cultural tourism. This means the creation of geologic-cultural tours, installation of information panels, working-out and printing of booklets or leaflets, providing of digitalized online information using GPS and corresponding applications for smartphones, training of specialized guides, and other measures. For example, there are books about urban geology and paleontology in the Algarvian cities of Faro, Lagos and Tavira (L. A. Rodrigues & Agostinho, 2016a, 2016b, 2016c). The book series "Balades géologiques", edited by Société Géologique de France, contains geological guidebooks of several French towns (Société Géologique de France, n.d.). Some cities like Lausanne, Turin and Rome already feature geological guides powered by mobile technology application (Pica et al., 2018).

4. CULTURAL TOURISM AND URBAN GEOLOGY IN FARO: SOME EXAMPLES

Faro is currently the capital of the Portuguese district with the same name and head of the diocese of Algarve. The city has a long, rich and diversified history (Paula & Paula, 1993). Its first traces with the name Ossónoba go back to the 4th century B.C., during the colonization of the western Mediterranean area by the Phoenicians. From the 2nd century B.C until the 8th century after Christ, it was occupied by the Romans and the Visigoths. In 713, it was taken by the Arabs. Only a few rests of their heritage have been conserved (figure 1). After the regain by the King of Portugal, D. Afonso III, in 1249, the town was named Santa Maria de Faaron (or Santa Maria de Faaram). During the following centuries, Faro prospered because of its geographical position, its harbour and the commerce with salt and agricultural products (Câmara Municipal de Faro, 2018; Paula & Paula, 1993).

Figure 1. Arab portal with horseshoe arch in the Porta da Vila town gate, Faro.

Source: Authors.

In 1540, Faro was appointed to Town by King João III, and the head of the diocese of the Algarve was transferred from Silves in 1577. The plunder and arson by English troops led by the Count of Essex in 1596 damaged the ramparts and churches, having provoked considerable heritage and material harms. In the period of the Restoration War (1640/1668), Faro was surrounded by a new belt of ramparts, which included built and agricultural areas (*ib.*).

During the 17th and 18th centuries Faro expanded, but in 1st of November of 1755, the earthquake known as the "Lisbon earthquake" destroyed not only the capital of Portugal, but also big areas of the south of Portugal, especially in the Algarve. Faro suffered heavy damage in its heritage: churches, monasteries, the bishop´s palace, the castle, the ramparts, barracks, storehouses and many other civil buildings were demolished and ruined (*ib.*).

Until the end of the 19th century, Faro stayed inside the ramparts of the 17th century (*ib.*). In the last decades of the 20th and in the beginning of the 21st century, the development of Faro experienced a great impulse mainly caused by the improvement of traffic connections with the rest of Portugal and Spain, the foundation of the University of Algarve and the growing tourism.

Although there were some events of severe destruction, Faro maintains a rich cultural heritage (Paula & Paula, 1993). This heritage can be explored by several ways, for instance

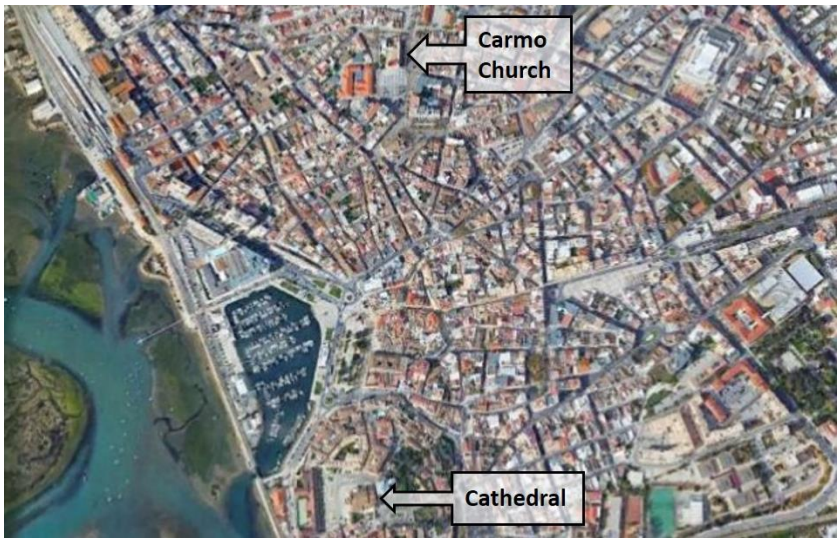
by routes. There is a path which follows the traces of the former Jewish community in Faro (information verbally obtained, 21.11.2018); however, some panels of this path disappeared or are damaged. As many heritage buildings in Faro are occupied by storks and their nests, and being the stork an ex-libris of the city, a pedestrian trail of the storks was proposed (Gonçalves, 2014), which joins cultural heritage with natural heritage. An urban geological trail may be one to be created.

As some examples of urban geology in heritage buildings, the authors present, beyond other buildings, the cathedral and the Carmo church (figure 2). Both have architectonic and artistic features which make them worth a visit. The admiration of their cultural richness can be complemented by the observation and interpretation of characteristics found in the building and ornamental stones, expanding their history by the addition of natural facts.

4.1 Faro Cathedral

After the regain of Faro from the Arabs, in 1249, the mosque which was constructed over the rests of a Roman temple was transformed into the church of Santa Maria in 1277. When the head of the diocese was transferred from Silves to Faro, in 1577, the church was appointed to be the seat of the bishop. The damages provoked by the attack of the English troops and the earthquakes required several phases of reconstruction, changing the original aspect of the church in a significant way. Today, the building shows the features of several construction phases and interventions, with gothic, mannerist and baroque elements (Paula & Paula, 1993).

Figure 2. Satellite image of Faro with the localization of the cathedral and Carmo church.

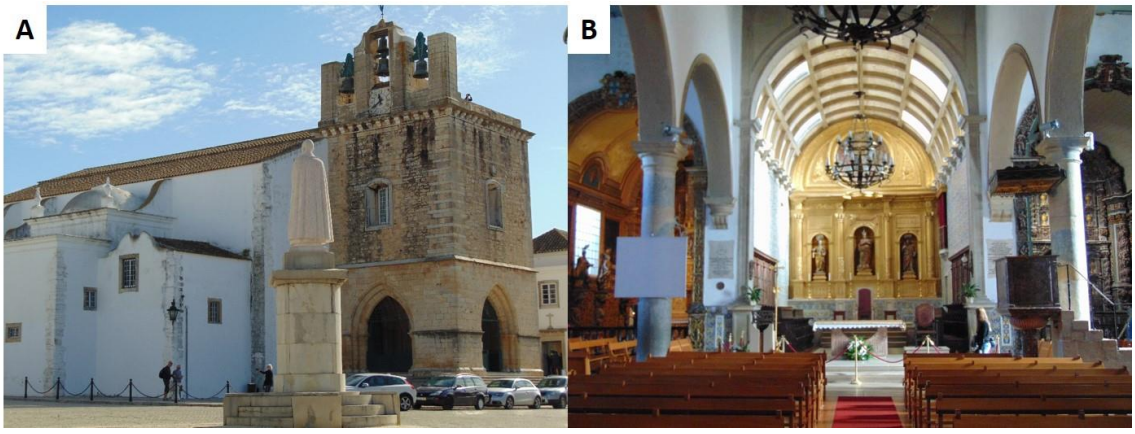


Source: Google Earth (accessed on 19.11.2018), altered by the authors.

The bell tower has a gothic origin and stands out from the western façade of the cathedral (figure 3A). It is supported by three pointed arches and rises from an elevated ground which is accessed by staircases (L. A. Rodrigues & Agostinho, 2016a). The interior of the church is characterized mainly by its mannerist style and consists of three naves, which are separated by Doric columns and round arches (figure 3B). It has a main chapel and seven other side chapels which were constructed in different periods. A great part of the decoration was executed in baroque style, with gilded woodcarvings and tiles (Paula & Paula, 1993). The organ from the 18th century and the altarpieces are noteworthy examples of this style. Outside the church there is a small chapel built up by human bones and skulls.

The building stones of the gothic bell tower (13th century) are made of limestone, whose provenience is not sure. As Faro lies in a coastal plain constituted by recent and quaternary loose sediments, which are not capable to be used as construction material, the building stones cannot originate from the immediate neighbourhood of the town. Probably they were extracted in quarries in the hills north of Faro, and had to be carried onerously to the building site. The limestone may be of Middle or Upper Jurassic age, with an age of about 175 to 145 million years (International Commission on Stratigraphy, 2018), is more or less marly (with a share of clay) and contains trace fossils which were created by organisms who lived in the sediment and caved the galleries to find food and protection (figures 4A and 4B). Also, they are affected by weathering, shown up here in numerous cavities in the stones, giving them a cellular character (figure 4C).

Figure 3. Faro Cathedral. A – Exterior with gothic bell tower; B – Interior.



Source: Authors.

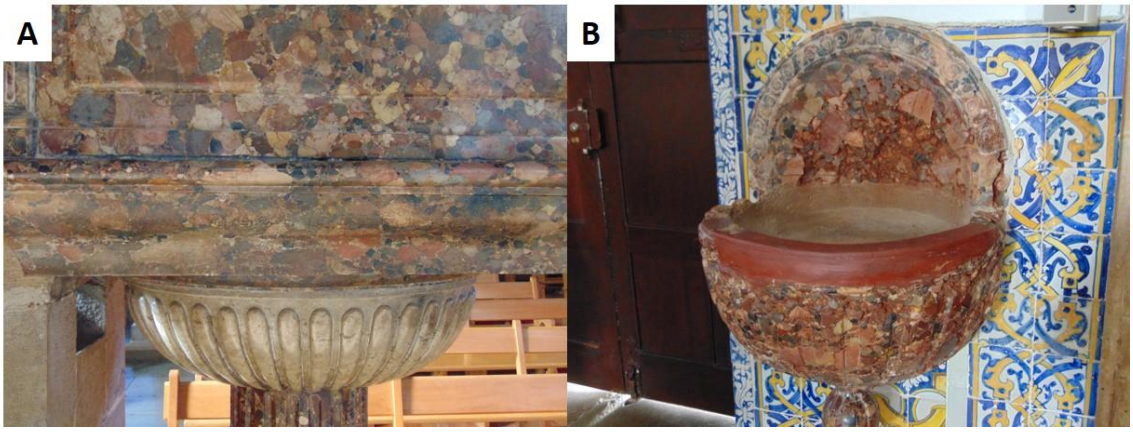
Figure 4. Exterior of the cathedral. A – Trace fossil in the narthex of the cathedral; B – Trace fossils (*Planolites)* in the staircase to the narthex; C – Cellular structure originated by weathering of the limestone.

Source: Authors.

The interior of the cathedral was furnished later, in renaissance and baroque epochs. The improved transport facilities made it possible that the stones used for the pulpit, chapels and holy water basins were extracted in quarries at a major distance. So, material with origin from the region of Lisbon and the Alentejo can be found.

The pulpit was made in the 18th century and has a lavish canopy made of decorated carved wood to emphasize its theatricality (L. A. Rodrigues & Agostinho, 2016a). It is made of a colourful stone material (figure 5A) which was explored in the Serra da Arrábida (south of Lisbon) and is called "Arrábida breccia", of Upper Jurassic age, about 160 million years ago (International Commission on Stratigraphy, 2018). A breccia is a sedimentary rock composed of angular fragments with a size larger than 2 mm and a natural agglutinating material. The angularity of the components shows that there was no or only a short distance of natural transport before their deposition and consolidation. The extraction site of this stone lies in the region of Setúbal, at a distance of about 250 km from Faro. Another part of the pulpit consists of a beige coloured limestone, with rare fossils, whose age and provenience are unidentified (L. A. Rodrigues & Agostinho, 2016a). The holy water basins are made of Arrábida breccia, too, and show clear signs of degradation and loss of components, especially in the parts which were in contact with the water, probably as a consequence of the dissolution of its agglutinating material (figure 5B).

Figure 5. Interior of the cathedral. A – Arrábida breccia and beige limestone in the pulpit; B – Holy water basin made of Arrábida breccia, with signs of degradation.



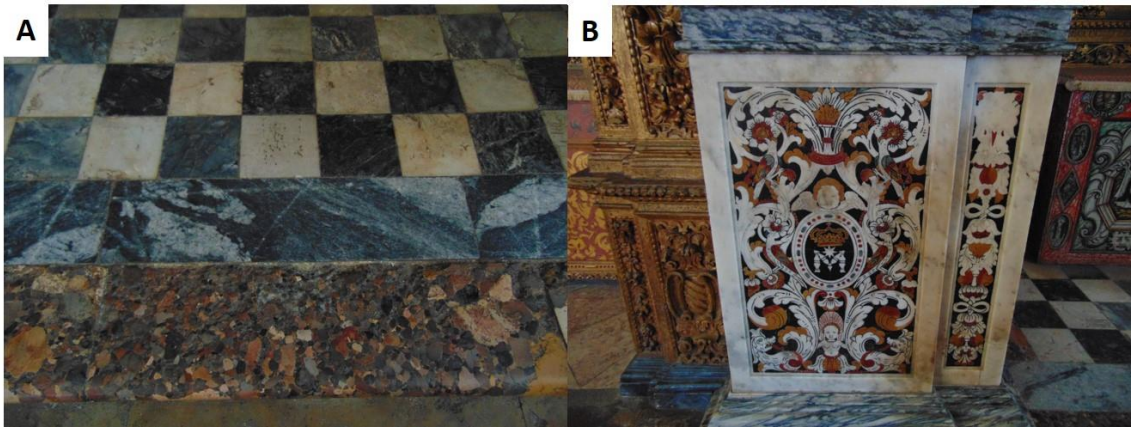
Source: Authors.

In the baroque Capela da Nossa Senhora dos Prazeres, the floor is made of Arrábida breccia, a grey marble and alternating bright and dark marble tiles (figure 6A). Marble is a metamorphic carbonatic rock whose pre-existing material (limestone) was subjected to high natural pressure and temperature, by which its texture and structure was changed. The bright marble corresponds probably to crystalline marble from the region Estremoz-Vila Viçosa-Borba, and the darker one may have been extracted as Ruivina marble from Vila Viçosa (L. A. Rodrigues & Agostinho, 2016a). The marbles have a Late Cambrian to Lower Ordovician age, about 500 to 470 million years ago (International Commission on Stratigraphy, 2018), and had to be transported over a distance of about 250 km.

At the sides of the chapel there are panels made of fine blades of several types of stone with different colours, which are cut in previously defined forms and joined, like a puzzle (figure 6B). This technique is similar to wood inlay and is called "Pietra dura" (Italian: "hard stone") (Editors of Encyclopaedia Britannica, 1998).

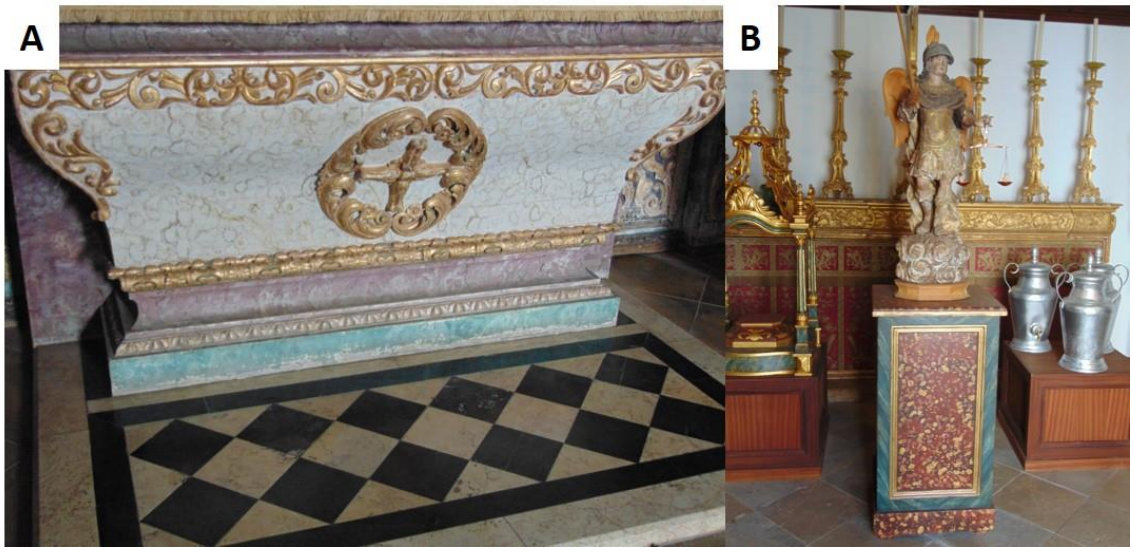
In the baroque Capela das Almas, the bright tiles of the floor are made of "lioz", a recifal limestone of cretaceous age, that is, about 95 million years (International Commission on Stratigraphy, 2018), with rudist fossils which is extracted at the north of Sintra. On the front side of the altar, several stone structures were imitated by painting, partly by the technique of marbling (figure 7A). From the bottom up, there can be seen imitations of "green marble", "violet marble" and "lioz" with the suggested fossils. In the courtyard of the cathedral, in the Capela de São Miguel, the pedestal of the baroque statue of the archangel has panels with painted "Arrábida breccia" (figure 7B).

Figure 6. Cathedral, Capela da Nossa Senhora dos Prazeres. A – Floor with Arrábida breccia and bright and dark marble tiles; B – "Pietra dura" work in panels.



Source: Authors.

Figure 7. Cathedral. A – Capela das Almas with lioz-like painted frontside of the altar; B – Capela de São Miguel with pedestal imitating Arrábida breccia.



Source: Authors.

4.2 Carmo Church

From 1713 to 1719, the Carmo church was built by the Ordem Terceira de N.ª Sr.ª do Monte do Carmo, which occupied an empty place inside the ramparts of the 17th century. The church has a symmetric façade made in D. João V style (figure 8A) and is a fine example of baroque architecture (Paula & Paula, 1993). Inside, the church has one nave with the main chapel, four lateral chapels and a baroque organ (figure 8B). The decoration is made of "azulejo" tiles and gold carving. A chapel made of human bones and skulls (19th century) is located in the former cemetery (figure 8C).

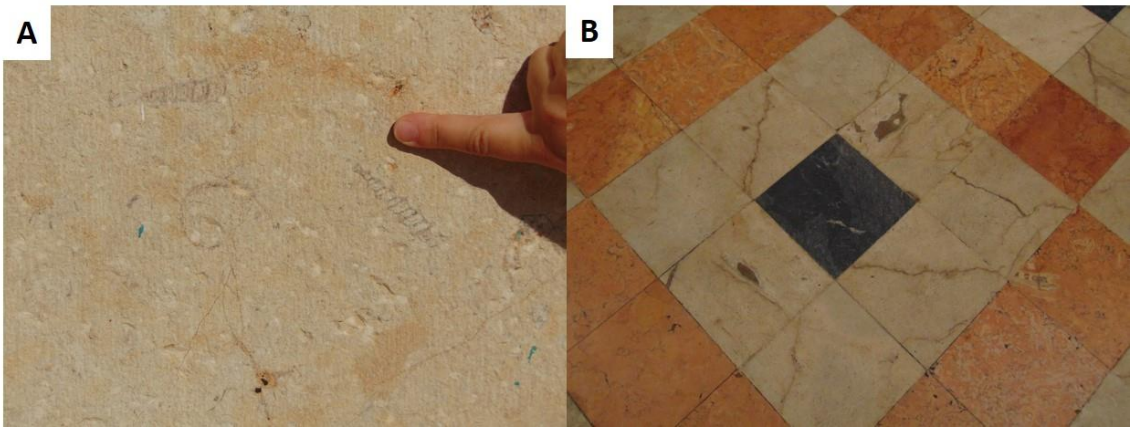
Figure 8. Carmo church of Faro. A – Baroque façade; B – Interior; C – Bone Chapel.

Source: Authors.

On the outside, the portals and columns are made of Bordeira limestone (L. A. Rodrigues & Agostinho, 2016a), from Upper Jurassic, with an age of about 160 million years (International Commission on Stratigraphy, 2018). The limestone is dolomitic and shows mollusc and sponge fossils (figure 9A). It was explored in quarries near Santa Barbara de Nexe, about 15 km from Faro (L. A. Rodrigues & Agostinho, 2016a). The floor in the entrance of the church (figure 9B) is composed by stone tiles made of yellow lioz, bright marbles probably from the area of Estremoz (Alentejo) and dark Ruivina marbles from Vila Viçosa (*ib.*). These stones have already been described in the cathedral.

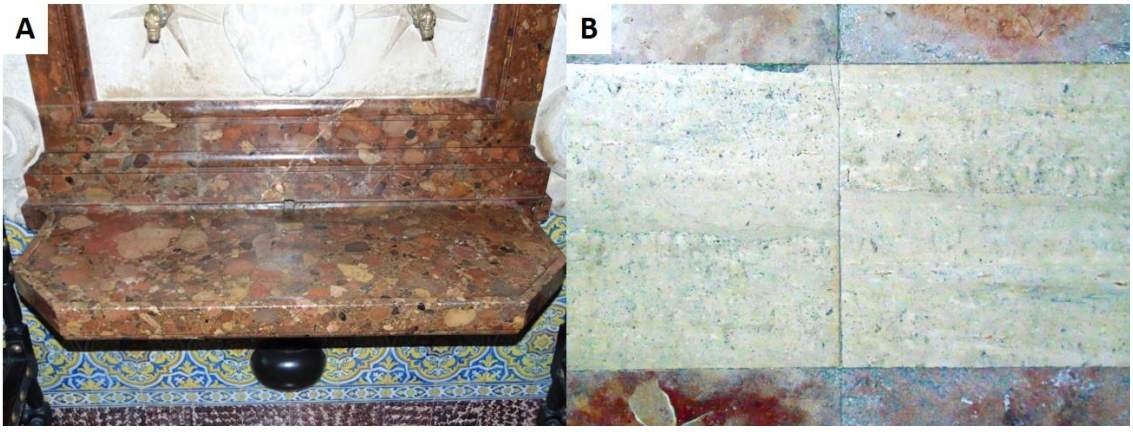
In the sacristy of the Carmo church, the wash basin is made of Arrábida breccia, the same material as in the cathedral's pulpit (figure 10A). The floor is covered with tiles made of travertine stone. The travertine is a carbonate stone with a fibrous or banded aspect and frequent cavities. Its colour varies from white, tan, cream-coloured to rusty brown. It was originated by precipitation of calcium carbonate from solution in sweet water. Its main use as construction material was in Italy, having been made a lot of buildings in Rome of this stone. Today, it is still used as ornamental stone. In Portugal, travertine as ornamental stone of Pleistocene age, with an age up to 2,5 million years (International Commission on Stratigraphy, 2018) is explored at Condeixa-a-Velha, near Coimbra (Moura, 1994), at a distance of about 400 km from Faro. It is not sure if the stone comes from this place or if it was imported from abroad.

Figure 9. Carmo church. A – Bordeira limestone in the exterior with gastropod fossils; B – Lioz limestone (yellow), dark and bright marble tiles in the entrance.



Source: Authors.

Figure 10. Carmo church, sacristy. A – Wash basin made of Arrábida breccia; B – Travertine made floor tile.



Source: Authors.

4.3 Examples of Urban Geology in Common Buildings

Ornamental stones can improve the appearance of architectonically dull buildings. The façade of an empty store in the Doutor Rodrigo Davim Street was coated with ornamental stones made of nepheline syenite, which give a more precious look to the outside pillars (figure 11A and B). The stone is built up by crystals which solidified in an intrusive body of

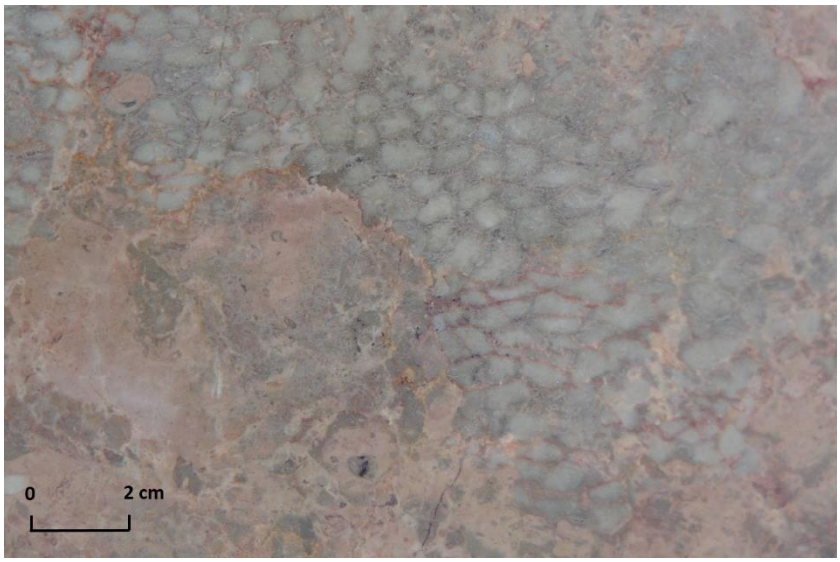
alkaline rocks (Terrinha et al., 2013). In Portugal, these rocks are obtained only in the Serra de Monchique (Western Algarve) and used as material for pavements and walls.

The façade of a pharmacy in the Alportel Street has a covering made of Algarve breccia, a recifal limestone with Kimmeridgian age (Upper Jurassic; about 155 million years ago) (International Commission on Stratigraphy, 2018) named "Calcários recifais do Cerro de Cabeça", which looks broken and where fossils of corals, sponges, seaweed and others are frequent (figure 12). This type of limestone is explored as an ornamental stone in the hills located in the north and northwest of Faro and near Tavira.

Figure 11. A – Building in the Dr. Rodrigo Davim Street. B – Detail of the covering stone.

Source: Authors.

Figure 12. A – Ornamental stone with fossil coral colony at the outer side of a pharmacy in Alportel Street.



Source: Authors.

5. CONCLUSIONS

The urban cultural heritage, mainly the buildings like churches and castles, make an impression on the visitor not only by their size and form, but also by their history. The usual kind of history, that is to say the beginning and the end of their construction, the architects who constructed them, the wars and crises they had to come through, the damages and reconstructions they suffered, the rulers they were subjugated to, the people who used them, and so on, can be expanded by the stories the building stones can tell. These stories are about the time and the environment in which they were originated, the organisms they gave shelter to, the place and kind of their quarrying, the kind of transport to the building site, the treatment they were subjected to, the kind of masonry, finally the weathering, wear and decay which gave them their actual appearance.

The information given by the diverse stone material is capable to be a precious complement to the cultural heritage and its history. The stones supply this heritage bringing in a natural component. Cultural tourism takes advantage of the *genius loci*, the feeling that is provided by the cultural and natural heritage. The color of the building stones, their surface and their arrangements in masonry or pavements and in artistic and architectural elements increase the emotions, especially when the visitor has some knowledge about them. So,

geology can be considered as a part of human life and culture (Wever et al., 2017). It is a natural heritage which in fact makes part of cultural heritage.

Many urban heritage buildings (and others) are made of natural stones, whose observation and study present no physical difficulties. They have an easy access and they can be visited during the whole year. As they are worked and often polished, it is possible to recognize and explain their macroscopic features without instruments. This process should be promoted by folders, guided tours, information tables, digital online information, and other media. As the target group consists in culturally and scientifically interested people, who might pay for accompaniment and instruction, urban geology may be an economically interesting branch of tourism. It also enriches the existing touristic offer of a city. The easy access to the sites makes it possible to people with special needs to visit them and to learn about them. Thus, urban geology can be a contribution to the inclusive tourism (Kéroul, n.d.) and enlarge the range of the possible customers.

Urban Geology arouses curiosity in the people. In nearly all guided visits, the authors were asked about the matter by people who did not accompany the visit, but showed a great interest. It is an effective way to disseminate geological topics and to attract new followers (Wever et al., 2017), providing a better knowledge of the cultural heritage and drawing attention to its protection and conservation. But urban geology is not only an aid for the protection of the cultural heritage, it is also a great helper in the environment protection, because many geological processes are relevant for the ecological conditions of a location.

Usually, people associate geologists with scientists who work with hammers. In urban geology, this is not allowed for understandable reasons. Urban geology means geology practiced without hammer!

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