



**European Geosciences Union
General Assembly 2016**

Vienna | Austria | 17-22 April 2016



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Portuguese Ornamental Stones: Identity and Cultural Heritage

Community of Portuguese Language Countries (CPLP)

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Summary

1. Reasons to choose the theme
2. Maritime expansion of Portuguese people from the XIV Century
3. Trading products: stones and other materials
 - i. Portuguese Ornamental Stones Used in Maritime Expansion
 - a. Stone characterization and identification problems. Objects and methods of study: Analytical procedures
 - ii. Identity, Cultural and Stone Heritage
4. Examples around the World
5. Forthcoming issues and call for partnerships
6. Conclusions

1. Reasons to choose the theme

- Since de XV century, with the Portuguese maritime expansion, Portugal build religious and administrative monuments in South America, Africa and Asia.
- Much of these monuments have Portuguese dimension stones in noble parts (facades, corridors and altars).
- These stones tell us a story of ancient epic journeys, really achievements, “only compared” with the arrival of man on the Moon in the Twentieth Century.
- There’s a huge, and great, value databases of Portuguese Architectural Heritage around the World (for instance):

<http://www.monumentos.pt/> (SIPA - Information System for Architectural Heritage)

Nevertheless, only in a few cases the varieties of stone used in each monument is referred. Only tell that “stone” was used but not specified which kind or what were is origins.

PURPOSE: Complete these information identifying stones use in each monument or building and enrich his history!



SIPA Network Recursos Produtos e Serviços Publicações Revista Monumentos Notícias Agenda Forte Sacavém

APRESENTAÇÃO

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...only in portuguese...

O QUE É O SIPA

O SIPA – Sistema de Informação para o Património Arquitectónico é um sistema de informação e documentação sobre património arquitectónico, urbanístico e paisagístico português e de origem ou matriz portuguesas gerido pelo Instituto da Habitação e da Reabilitação Urbana, I.P. (IHRU).

[mais](#)

PRINCÍPIOS

O património arquitectónico, urbanístico e paisagístico, enquanto relevante componente do património cultural de um país, de uma região ou de uma comunidade, é um poderoso factor de distinção e de identificação sociais de indivíduos e de populações, bem como um motor de qualificação e de desenvolvimento de lugares e territórios.

A gestão e desenvolvimento do SIPA orientam-se pelo princípio segundo o qual a produção e aquisição, a conservação, a divulgação e difusão



1. Reasons to choose the theme: **32747 data in 29 countries!**

➤ <http://www.monumentos.pt/> (SIPA - Information System for Architectural Heritage) refers:

- 32707 data in **Portugal**;
- 237 data in **Angola**;
- 175 data in **Mozambique**;
- 163 data in **Brazil**;
- 105 data in **São Tomé e Príncipe**;
- 65 data in **China**;
- 52 data in **Cape Verde**;
- 46 data in **India**;
- 32 data in **East Timor**.
- 28 data in **Guinea-Bissau**;
- 5 data in **Morocco**;
- 3 data in: **Italy; Oman; Senegal, Spain and United States**;
- 2 data in: **Ghana; Iran; Malaysia; Paraguay**;
- 1 data in: **Bahrain; Benin; Ethiopia; Gambia; The Netherlands; Japan; Kenya; Myanmar; Tanzania**.



http://www.monumentos.pt/Site/APP_PagesUser/SIPASearch.aspx?id=0c69a68c-2a18-4788-9300-11ff2619a4d2

2014/10/16

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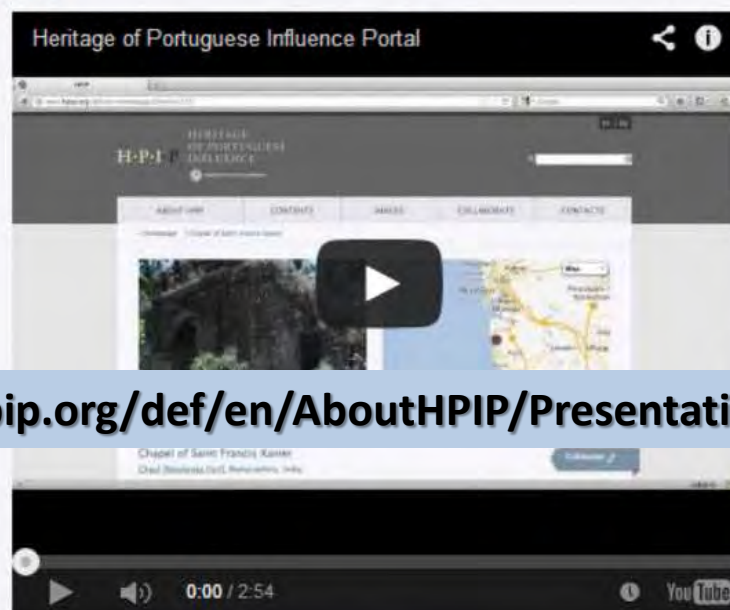
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Heritage of Portuguese Influence/ Património de Influência Portuguesa (HPIP) is the natural evolution of the project *Portuguese Heritage*

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Recente

2014

2013

2012

2011

2010



Worldwide Heritage of Portuguese Origin


Património de Origem Portuguesa no Mundo
Site de artes/humanidades

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PESSOAS

10.487 gostos

SOBRE

 Património de Origem Portuguesa no Mundo | Portuguese Heritage around the World

FOTOS



Património de Origem Portuguesa no Mundo partilhou uma ligação.
9/10

Os portugueses ao encontro da sua História: A inesquecível Índia.



Os portugueses ao encontro da sua História: A inesquecível Índia
fugas publico.pt



WIKIPÉDIA
A enciclopédia livre

Seven Wonders of Portuguese Origin in the World

Sete Maravilhas de Origem Portuguesa no Mundo

Origem: Wikipédia, a enciclopédia livre.

7 Maravilhas de Origem Portuguesa no Mundo é uma lista de construções edificadas em outras partes do mundo, com o apoio do IPPAR e dos Ministérios da Educação e da Cultura. Segue as escolhas das **Novas Sete Maravilhas do Mundo** e das **Sete Maravilhas do Mundo**. A organização do evento é o ex-comissário europeu da cultura, o português João de Deus. O objectivo do concurso foi divulgar a cultura portuguesa e promover a pré-selecção de 27 obras representativas da herança portuguesa. Em 2007, 22 destes monumentos estavam classificados entre os 100 monumentos mais votados entre o público.

...it is so serious that a worldwide contest was made!



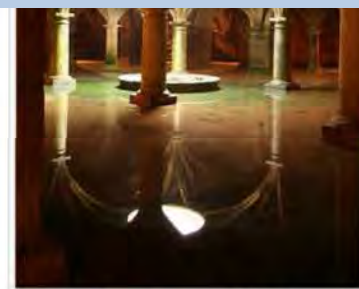
Fortaleza de Diu (1535-1536), portão de armas, Guzerate, Índia





Cisterna Manuelina da Fortaleza de Mazagão (1513-1541), Marrocos

http://pt.wikipedia.org/wiki/Sete_Maravilhas_de_Origem_Portuguesa_no_Mundo

País	Local	Monumento
Irão	Ormuz	Fortaleza de Ormuz
Malásia	Malaca	Centro Histórico de Malaca
Omã	Mascate	Fortaleza de Mascate
Angola	Luanda	Convento do Carmo
Cabo Verde	Santiago	Cidade Velha de Santiago
Etiópia	Margem norte do lago Tana	Gorgora Nova
Gana	São Jorge da Mina	Castelo de São Jorge da Mina
Marrocos	Mazagão	Cidade Fortificada de Mazagão
Marrocos	Safi	Fortaleza de Safi
Moçambique	-	Ilha de Moçambique
Quênia	Mombaça	Fortaleza de Jesus de Mombaça



Winners

Ordem de sorteio	País	Local	Monumento
1	 Índia	Diu	Fortaleza de Diu
2	 Marrocos	Mazagão	Fortaleza de Mazagão
3	 Índia	Goa	Basílica do Bom Jesus de Goa
4	 Cabo Verde	Santiago	Cidade Velha de Santiago
5	 R.P.China	Macau	Igreja de São Paulo
6	 Brasil	Ouro Preto	Igreja de São Francisco de Assis da Penitência
7	 Brasil	Salvador	Convento de São Francisco e Ordem Terceira

1514 AD

2



1565 AD

5



4



1495 AD

3



1594 AD

6



1766 AD

1585 AD



7

1



1535 AD

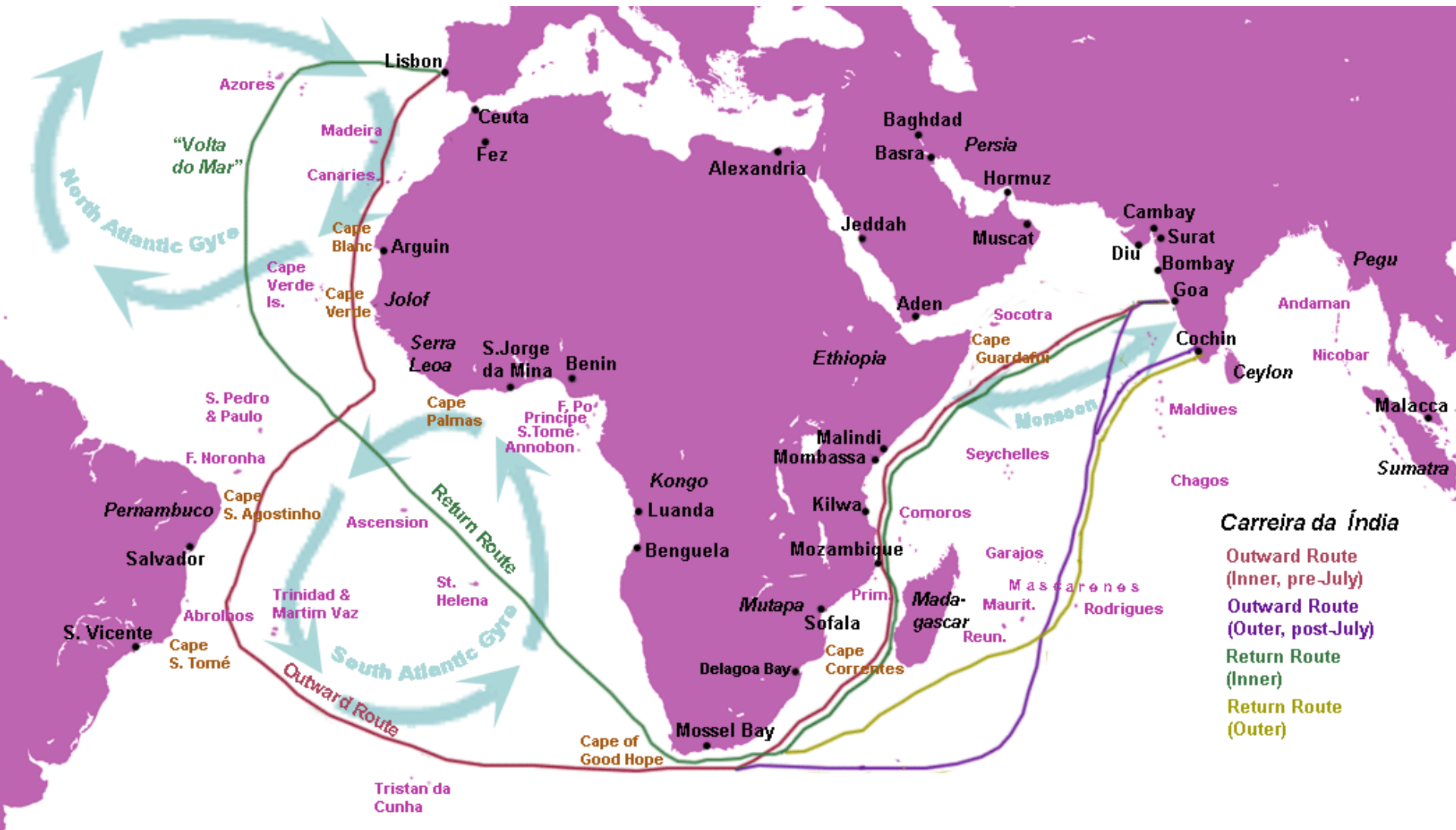


2. Maritime expansion of Portuguese people from the XIV Century



2

2. Maritime expansion of Portuguese people from the XIV Century



3. Trading products: stones and other materials



i. Portuguese Ornamental Stones

a. Stone characterization and identification problems. Objects and methods of study: Analytical procedures

The provenance identification could be a problem when destructive analytical procedures cannot be realized.

Some stones are so characteristic that there is no doubt in their identification. These are the case of most Portuguese limestone's used in the maritime expansion:

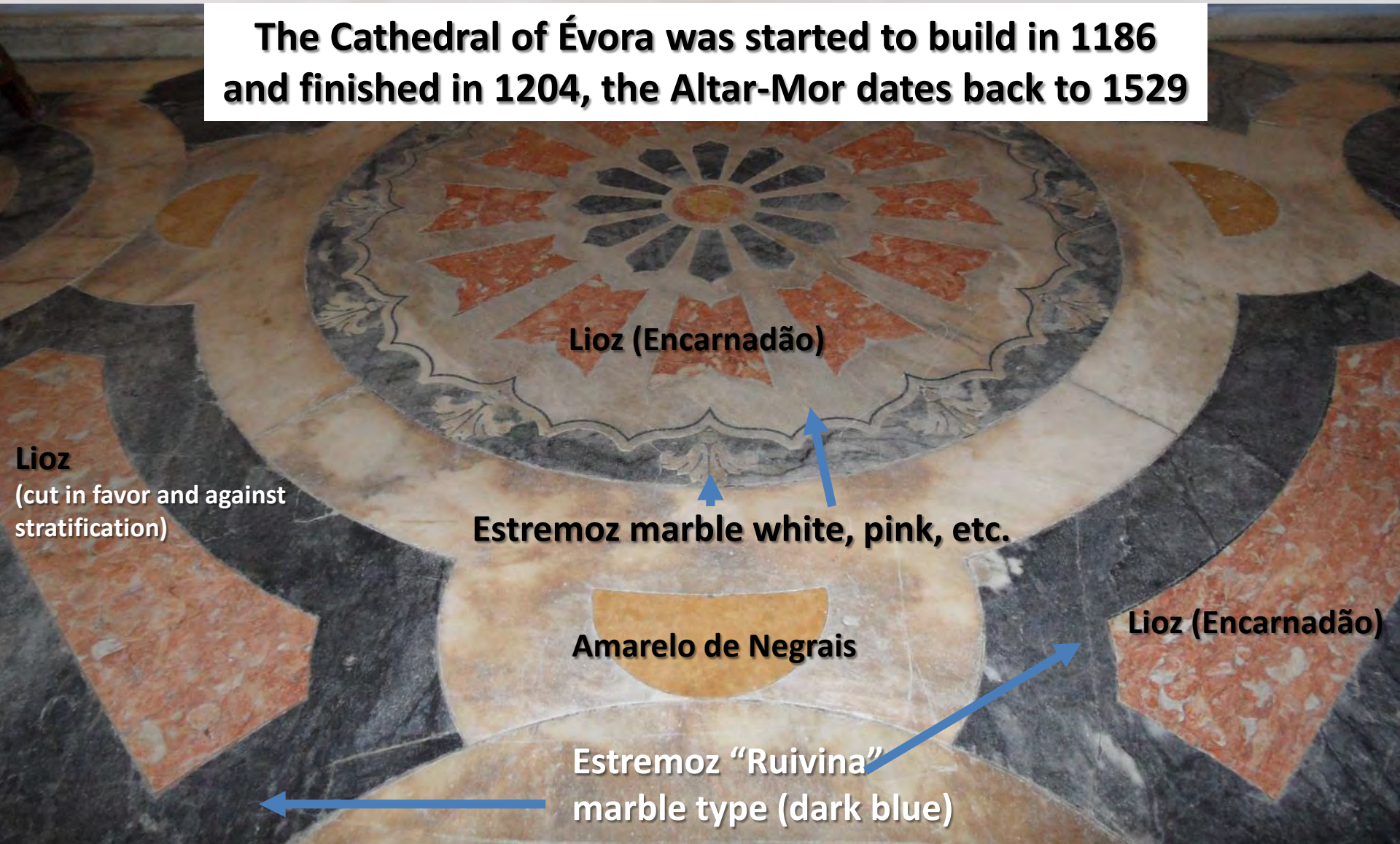
1. **Lioz varieties** (White, Pink, Yellow and Grey) – Recifal limestones of Cenomanian age exploited near Lisbon (Pêro Pinheiro - Sintra region);
2. **Negro de Mem Martins**, a black limestone of Upper Cenomanian age with white calcite veins (Mem Martins, Sintra);
3. **Brecha da Arrábida**, a Middle Jurassic intraformational carbonate breccia with great color variety. The exploitation was ceased since the Arrábida mountain range, South of Lisbon, have been considered National Natural Reserve;
4. **Marble from Estremoz** – Some varieties are really unique and easy to identify, others requires analytical, and somehow destructive procedures (From Estremoz – Borba – Vila Viçosa anticline structure, Alentejo – South Portugal).

3. Trading products: stones and other materials



- i. Portuguese Ornamental Stones Used in Maritime Expansion
(principal varieties)

The Cathedral of Évora was started to build in 1186 and finished in 1204, the Altar-Mor dates back to 1529



3. Trading products: stones and other materials

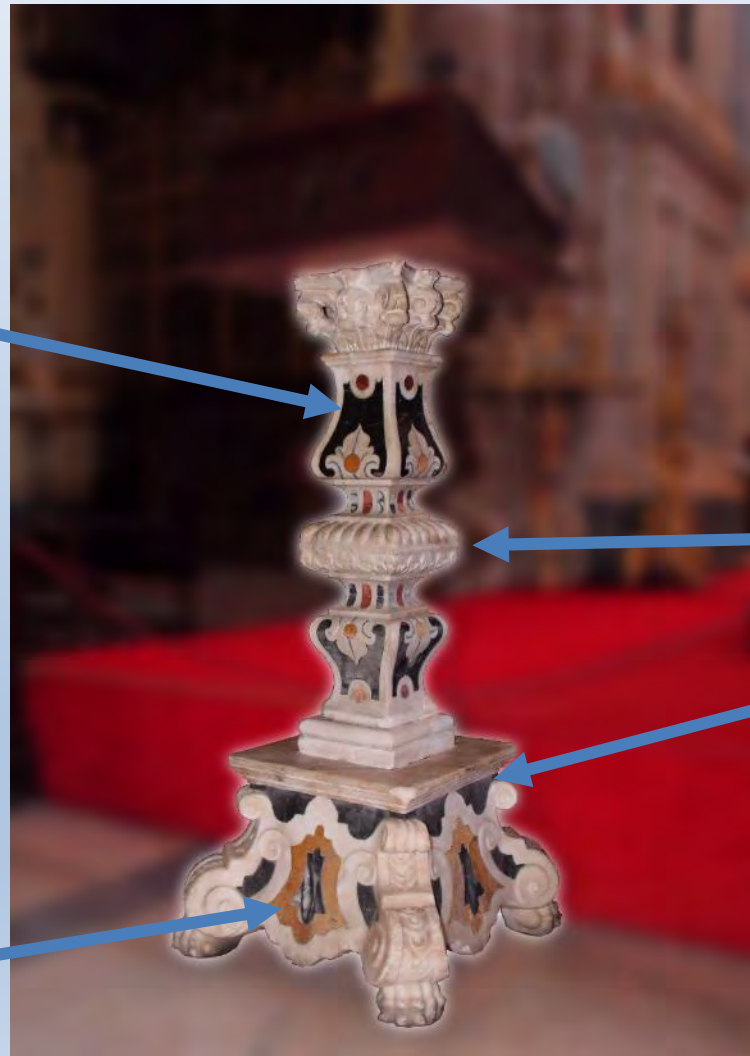


- i. Portuguese Ornamental Stones Used in Maritime Expansion
(principal varieties)

Negro de Mem Martins
(Mem Martins black limestone)

Estremoz white marble

Estremoz “Ruivina” marble



Amarelo de Negrais
(Negrais yellow limestone)

3. Trading products: stones and other materials



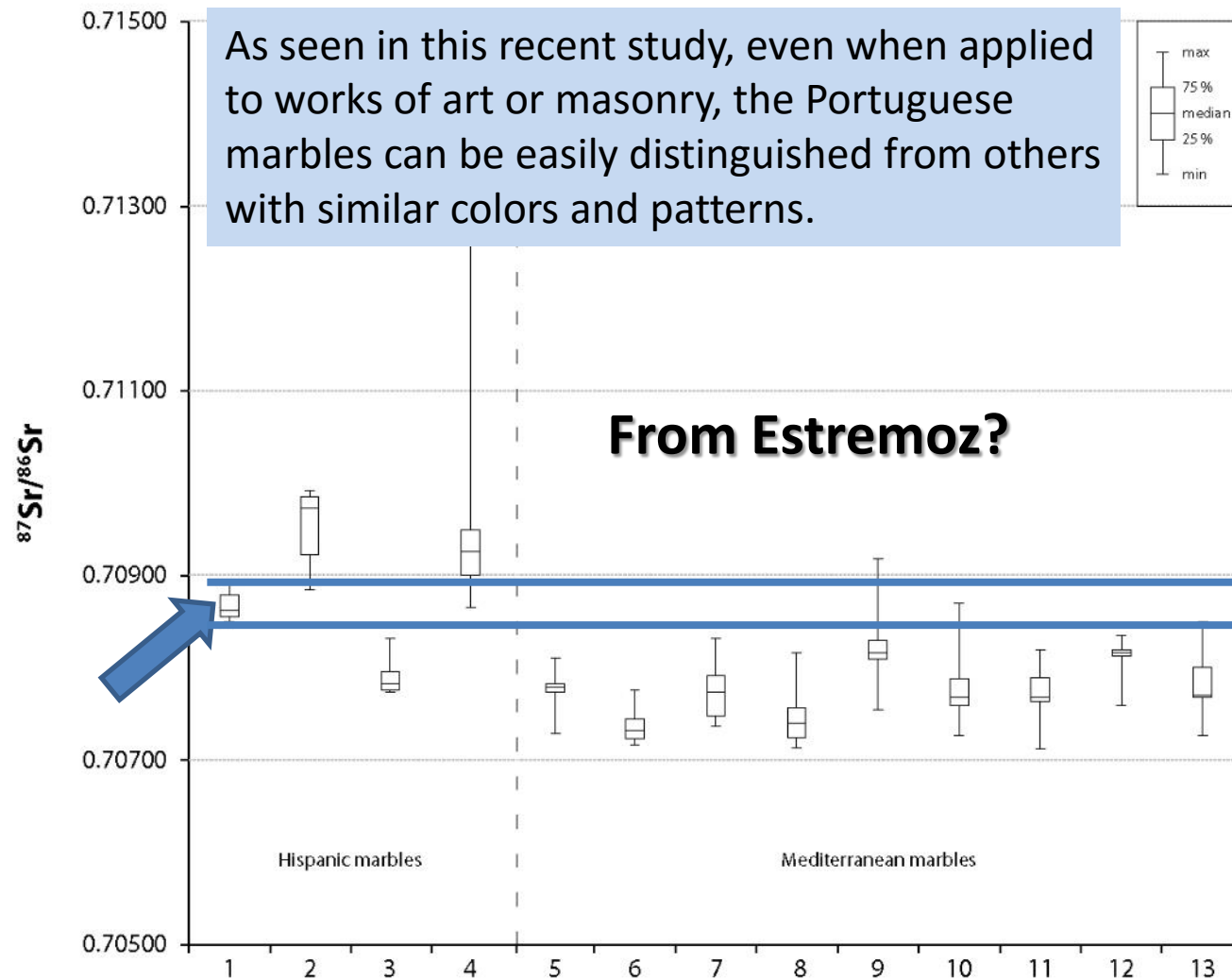
- i. Portuguese Ornamental Stones Used in Maritime Expansion
(principal varieties)





The Portugues "Lioz" From ship ballast to art in Bahia

Silva, Z. C. (2007) – O Lioz Português de lastro. De navio a arte na Bahia, Edições Afrontamento, Porto, ISBN 978-972-36-0924-0, 156 p.



1. Estremoz (9)
2. Viana do Alentejo (8)
3. Almeria (8)
4. Almaden de la Plata (11)
5. Carrara (57)
6. Hymettos (17)
7. Naxos (31)
8. Paros (40)
9. Pentelikon (27)
10. Thasos (48)
11. Aphrodisias (30)
12. Dokimeion (7)
13. Proconnesus (12)

Taelman, D. *et al.* (2013) (Estremoz); Brilha, *et al.* (2005), Gärtner, *et al.* (2011), Pentia, *et al.* (2002) (Mediterranean marbles); and Morbidelli, *et al.* (2007) (other Hispanic marbles).

Box-and-Whiskers plots of the $^{87}\text{Sr}/^{86}\text{Sr}$ isotope ratios of the Estremoz marbles compared with the main classical marbles and the main Iberian marbles. Sample size for each area is indicated in brackets.

ii. Identity, Cultural and Stone Heritage

Most of the Portuguese monuments built in the "new discover" territories were made after the similitude with the ones existing in Portugal. Schools of architecture made sure to build impressive buildings that would last over the centuries.

The Se Cathedral of Goa (dedicated to Santa Catarina) is, perhaps, one of the most emblematic examples with three naves and a height of 36 meters.

Is an architectural landmark in old Goa with an impressive power of evangelization to the point of saying that anyone visiting Goa becomes Catholic... An excess, certainly, but emphasizes the monumentality of the building.



[\(1510\) 1562 – 1619](#)

Originally had two towers, but in 1776 one of the towers collapsed and was not rebuilt.



(a)



(b)

Partial representation of the architectural complex featured at the Bom Jesus do Monte Sanctuary – also known as Bom Jesus de Braga Sanctuary (a) – and also of the architectural complex at the Bom Jesus de Congonhas Sanctuary in Minas Gerais, Brazil (b).

Pictures and texts *in* Costa, A. G. (2013).

When there was enough geological knowledge in terms of local raw materials that could be used as dimension and ornamental stone, the Masters Carvers and Stony Masonry workers who had moved to work and guide the construction of buildings, formed Schools of Arts and develop their own factories.

One of the most emblematic case is **Antonio Francisco Lisboa (Aleijadinho)**, Ouro Preto, Minas Gerais – Brazil, ca August 29, 1730 or, more likely, 1738 – Ouro Preto, November 18, 1814). Architect, sculptor and painter, of Portuguese descent, was primarily responsible for a Baroque-Rococo School Arts of Minas Gerais in the XIX Century.

To create his perfect and most emblematic sculptures, the "*Brazilian Michelangelo*" chose "**soapstone**", a steatite found in Minas Gerais.



Prophets, Churchyard of the Sanctuary of Bom Jesus de Matosinhos, Congonhas do Campo.



Church of São Francisco de Assis in São João del-Rei, Aleijadinho project modified by Cerqueira.



Soapstone: Regarding this stone, Costa, A.G. (2013) stated that "*based on the comparison with monuments from the Italian and Portuguese baroque, or even considering the monument from Brazil's Northeast, it can be stated that the **limestone** used in those **was replaced** in Minas Gerais **by soapstone**, Identified by means of the petrography steatite. Due to the ease with which it can be worked, its use occurred essentially within the sculptural art and in the production of ornamental elements.*"



Examples of the use of soapstone in the production of ornamental elements such as in the medallions installed onto frontispieces at the São Francisco de Mariana chapel (a) and in the Nossa Senhora do Carmo chapel, in São João d'El Rey (b), Minas Gerais, Brazil.

Pictures and texts *in* Costa, A. G. (2013).

4. Examples around the World



Maputo Cathedral (Lourenço Marques), Mozambique. Arqº Marcial Freitas e Costa designed in 1936, build in **1944**.



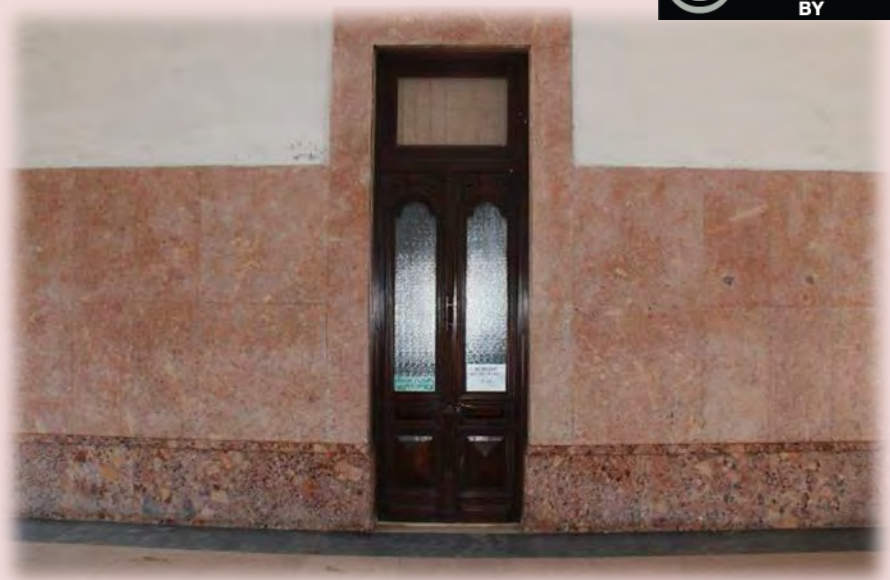


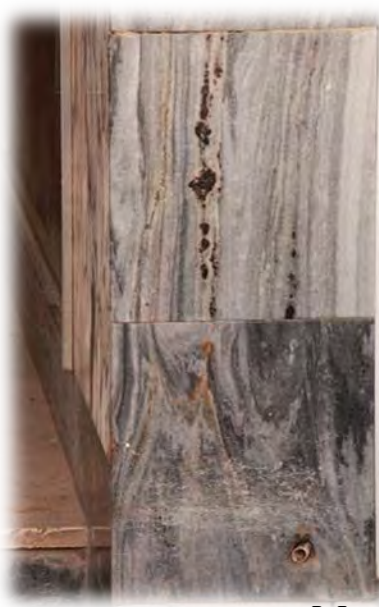
The “only” and unique Marinela quarry, Estremoz anticline, Portugal





Railway Station, Maputo – Mozambique





Maputo, MZ



Inhambane; MZ

**Vitória, ES
Brazil**



**Vitória, ES
Brazil**







PALÁCIO DO GOVERNO

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02-7256

Dili, East Timor



5. Forthcoming issues and call for partnerships



PT EN



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How to study stone provenance?

Leonardo da Vinci PROJECT START-APP - [NEWSLETTER 1](#)



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in the Sixteenth century

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The **Cultural Heritage is a buttress for sustainable development of the regions** and the consequent improvement of their quality of life.

The **rehabilitation** and enhancement of heritage can have a direct impact on populations, contributing to the areas of regional and urban planning and creation of **jobs in services**, tourism and small businesses, **providing cultural identity and memory**, the community.

1. Development of methodologies and integrated conservation projects suited to regional particularities;
2. Study and scientific support of the archaeological, architectural, artistic and cultural heritage of the region.
3. Use of local resources, including technical and traditional knowledge.
4. Advanced training through the promotion of short courses and direct training to technical staff
5. Promote activities of publicity for the leading population to their awareness of issues related to culture and heritage

As a **multidisciplinary team** involving experts and specialists in conservation and heritage comprising different areas of knowledge such as history, art history, conservation-restoration, chemistry, geology and biochemistry divided into 3 different units (Unit Safeguard, Unit of Materials Research and Educational Resource Unit) that work seamlessly.

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- >> Optical Microscope LEICA DM2500M
- >> Optical Microscope LEICA DM2500M
- >> Stereozoom Microscope LEICA M205C
- >> Variable pressure scanning electron microscope HITACHI 3700, energy dispersive X ray spectrometer : SEM-EDS BRUKER Xflash 5010SDD
- >> Raman Microspectrometer HORIBA XPlora
- >> X ray microdiffractometer with Linxeye detector PANalytical X'Pert Discovery

Chromatography

- >> Liquid chromatograph with mass spectrometer THERMO LCQ Fleet
- >> Gas chromatograph with mass spectrometer SHIMADZU GCMS-QP2010 Plus

Other Equipment

- >> Thermogravimetric and differential thermal analysis equipment NETZSCH STA 449F3 Jupiter
- >> UV-Vis spectrophotometer HACH DR-5000

Sample preparation

- >> Sputter coater for electron microscopy EMITECH
- >> Grinding and polishing machine STRUERS ROTOPOL-35
- >> Ultrapure water system Merck Millipore Milli-Q Integral

Micro & Nano samples are the only requirements!...

<http://www.hercules.uevora.pt/>

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- >> Portable X-ray unit SCANNA CR 35 SEC with X-ray source 150kV (XR150) and 300 kV (XP)
- >> High resolution Infrared reflectography camera OSIRIS with InGaAs detector
- >> Visible, IR and UV fluorescence photography

Point analysis

- >> Colorimeter and spectrometer Datacolor Check II Plus
- >> Portable X-ray spectrometer Bruker Tracer III SD
- >> Portable X-ray spectrometer with AMPTEK detector and Mini-X X-ray source
- >> FTIR portable spectrometer BRUKER with reflection, transmission and Pt-ATR modules

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Non-destructive in situ analysis!...

6. Conclusions

- There is no shortage of databases related with the architectural heritage of Portuguese origin in the World;
- None of the databases makes references to materials and much less to ornamental rocks used in its construction;
- The cultural heritage enhance the built heritage services and create employment. For such, buildings and monuments must be in perfect preservation conditions;
- Ignorance of the materials used and behavior of ornamental rocks in different climates does not allow the simple transposition of restoration protocols applied in Portugal to the rest of the World.

6. Conclusions

- The inventory of materials used and the study of their behavior in different weather conditions will lead to a set of best practices for restoration and conservation;
- Use of analytical methods that require very small quantities of raw materials, not causing damage to objects of study;
- Non-destructive *in situ* tests can also be performed, guiding for laboratory analysis to be done *a posteriori*;
- The identification of raw materials whose geological reserves is scarce allows defining geological protection areas.

Ongoing projects:

1. **CALCITEC:** Calcário azul e alteração cromática – inovação e tecnologia”, cofinanciado pelo Fundo Europeu de Desenvolvimento Regional (FEDER) através do COMPETE – Programa Operacional Fatores de Competitividade (POFC). Projeto 3457 - 08/SI/2015;
2. **COLOURSTONE:** ALT20-03-0145-FEDER-000017 – ColourStone - Cor de mármore e calcários comerciais: causas e alterações – ColourStone - Colour of commercial marbles and limestone: causes and changings;
3. **FLEXSTONE:** Novas Tecnologias para a Competitividade da Pedra Natural. Concurso nº 09/SI/2015 – POCI-01-0247-FEDER-006375;
4. **Microtextural (nanotextural) anisotropy of marbles and granites:** Implications of stone deterioration used in construction. CRUP – Luso-German Integrated Program Action, 2016.





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Thank You for your attention

Obrigado

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