

Guide 3

IN LISBON, DISCOVERING SCIENCE AND TECHNOLOGY PLACES OF KNOWLEDGE

ASTRONOMY



10

Detail of files in the Aula da Esfera
© Sandra Tacedo

THE CLASS OF THE SPHERE

The Discoveries contributed to the development of astronomy in Portugal. This contribution mainly involved the creation of centres of knowledge dedicated to the instruction of seafarers. In 1574, the king asked the Jesuits to establish the **Aula da Esfera** (class of the sphere) in the Colégio de Santo Antão, now the **Hospital de São José**, where the cosmography of the period was taught. The Aula da Esfera became a centre of knowledge in Lisbon for the latest scientific discoveries in Europe. You can still visit the former classroom (now the hospital's reception hall), which is decorated with azulejo tiles alluding to this subject.

10 Underground
Martim Moniz
Bus 767, 790

GEOGRAPHY



10

Roberto Ivens
© Sociedade de Geografia de Lisboa

EXPEDITIONS IN AFRICA

The **Sociedade de Geografia de Lisboa** was founded in 1875. With the purpose of drawing public attention to the issues of Ultramar, the Society promoted the first scientific and geographical expeditions in Africa. Under its auspices, famous explorers such as Serpa Pinto, Brito Capelo and Roberto Ivens crossed the region between Angola and Mozambique. These explorers prepared maps, took photographs and collected scientific data that contributed to deepen the knowledge about the African continent. The Society maintains a vast ethnographic collection which is worth knowing.

10 Metro Restauradores

CARTOGRAPHY



14/15

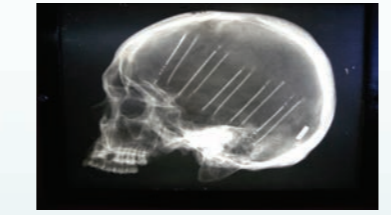
Windrose, Belém

THE CHARTS OF THE DISCOVERIES

The Portuguese navigators ventured gradually on the high seas due to the astronomical navigation techniques. In Lisbon, cartographers at that time produced nautical charts with latitude scales, including the first world navigation chart developed by Pedro Reinel (1504). These cartographers also produced some of the earliest planispheres. Portuguese nautical charts were much sought after in Europe. A famous example was the Cantino planisphere, which was drawn up in 1502 by a Lisbon cartographer and clandestinely sold to the spy Alberto Cantino who took it to Italy. Some of the most valuable charts from this period can be seen in **Torre do Tombo** and in the **Biblioteca Nacional**.

14 TT | Underground Cidade Universitária
15 BN | Underground Entrecampos

MEDICAL SCIENCES



6/7/8

X-ray made by Egas Moniz

TROPICS AND NEUROSCIENCES

If you have travelled to distant countries, you have probably visited a travel clinic. This is the most visible face of the **Instituto de Higiene e Medicina Tropical**. The institute, which dates back to 1902, has been a world pioneer in the teaching and research of tropical diseases, and it is still outstanding in this field today. But Lisbon has also contributed to other branches of medicine: visit the **Museu Egas Moniz at Faculdade de Medicina de Lisboa** and see the instruments used by the Portuguese Nobel Prize laureate in his first cerebral angiography and prefrontal leucotomy. At the **Centro para o Desconhecido da Fundação Champalimaud** there are guided visits where you can learn about state-of-the-art research in the area of neurosciences and oncology.

6 IHMT | Tram 15. Bus 714, 727
7 MEM | Underground Cidade Universitária
8 FC | Bus 98

ENGINEERING AND ARCHITECTURE



2/3/4

Engraving of the Aqueduct, 1760
© Biblioteca Nacional

INGENIOUS WORKS

In 1373 King D. Fernando built a gigantic new city wall in Lisbon, with 5.3 km in length and 77 defence towers, which became one of the city's engineering landmarks. In the 18th century, the 58-kilometre **Aqueduct of Águas Livres** was built, whose masonry arch over the Alcântara valley is the largest in the world. Later on, Lisbon was rebuilt after the 1755 earthquake. The buildings in the **Baixa Pombalina** were a milestone in seismic engineering, since their masonry walls have a three-dimensional timber structure – known as the 'gaiola pombalina' (Pombaline cage) – which absorbs the movements caused by earthquakes. All over the city you can find examples – such as the Pala Siza Vieira (Portugal Pavilion) in **Parque das Nações** – which reveal that the charm of Portuguese architecture and engineering is alive and well.

2 Aqueduct of Águas Livres | Bus 702
3 Baixa Pombalina (downtown) | Underground
Baixa-Chiado
4 Parque das Nações | Underground Oriente

ACADEMY OF SCIENCES



1

Academy reception hall
© Academia das Ciências de Lisboa

UNIFYING KNOWLEDGE

The notion that the scientific universe is a single, all-encompassing entity emerged in Portugal in the second half of the 18th century with the foundation of the **Real Academia das Ciências de Lisboa**. For the first time ever, the Academy brought together scientists of various disciplines in a **collective approach to science** in order to promote the nation's scientific and cultural development. The Academy published memoirs dedicated to various scientific fields, in particular the new science of economics (through the 'Economic Memoirs of the Academy'). If you wish to visit the Academy of Sciences you should make your way to the magnificent Convento de Jesus.

1 Tram 28. Underground Rato, Baixa-Chiado

From aeronautics to astronomy, from cartography to geography, from medicine to natural sciences: meet the places and institutions that marked the history of science in Lisbon and in the world. Other titles:

- 1 Wandering the Streets**
Is it possible to explain the beauty of Lisbon? Perhaps not the beauty, but all the rest you can.
- 2 Biodiversity in the City**
Century-old trees, dragonflies, owls and bats. A look at the biodiversity of Lisbon.
- 4 Tastes of the City**
Discover the physics and chemistry behind the *pastéis de Belém* or the traditional *ginjinha*.
- 5 Rocks and hills**
How were the hills and valleys of Lisbon formed?

Pavilion of Knowledge-Ciência Viva
Situated in the Parque das Nações in Lisbon, the Pavilion of Knowledge Ciência Viva is the largest interactive science and technology centre in Portugal. Major thematic exhibitions and hundreds of interactive exhibits encourage visitors of all ages to explore and experiment the physical world. Physics, mathematics, technology and other areas of knowledge are spread over an area of 11,000 m². Science and the thrill of discovery are brought together under the same roof. Workshops, seminars, scientific laboratories and other activities make this place a house of science for everyone. Timetable: Tuesday to Friday (10h-18h), Weekends and Public Holidays (11h-19h) Underground and Train (CP): Oriente Bus: 28

Coordination José Sarmento Matos

design: alvadesigns, ilustrador: João Fazenda



IN LISBON, DISCOVERING SCIENCE AND TECHNOLOGY PLACES OF KNOWLEDGE

Many people have inhabited Lisbon and left their culture and knowledge as a legacy to the city. In the 16th and 17th centuries the harbour of Belém was the point of departure for the caravels which discovered new worlds. These voyages of discovery led to developments in many scientific fields, such as navigation, astronomy, cartography, geography, medicine and natural sciences, which had a profound influence on the European scientific mentality. Lisbon was also the birthplace of the Universidade Portuguesa (Portuguese University), of which the Escadinhas da Escola de Estudos Gerais (steps of the School of General Studies) remain as evidence. Today, Lisbon continues to be a centre of learning. It is also a city that seeks a better knowledge of itself. Did you know that by inventing olisipography, Lisbon became the only city in the world with a science entirely devoted to itself?

For more information about science and technology in Lisbon, visit www.pavconhecimento.pt

BOTANY



19/20
21/22

Tropical Botanical Garden
© Tropical Botanical Garden

THE BOTANICAL GARDENS

Peppers, maize and potatoes are some of the species from the New World that came to Lisbon through the hands of the Portuguese Discoverers. The propagula and seeds were brought to the capital because of their agricultural and therapeutic importance and, from there, circulated around the world. Botanical gardens dedicated to studying exotic species and supplying pharmacies with medicinal plants began to appear in Europe in 1543. The 18th century in Lisbon saw the creation of the **Jardins Botânicos da Ajuda** and the **Marquês de Angeja** gardens, the latter of which is now the site of the **Museu Nacional do Traje**. In the mid-19th century the **Jardim Botânico da Escola Politécnica** and the **Jardim Botânico Tropical** were opened. All these gardens allowed the open-air acclimatisation of tropical species which makes them almost unique in Europe.

- 19 JB Ajuda | Tram 18
- 20 Museu do Traje | Underground Lumiar
- 21 JB Politécnica | Underground Rato
- 22 JB Tropical | Tram 15

NAVAL ARCHITECTURE



13

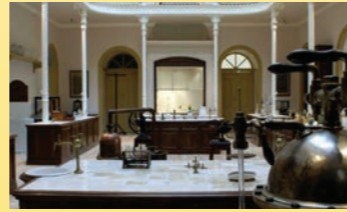
Model of a lateen caravel
© Museu da Marinha

THE RIBEIRA SHIPYARD

In the 15th century, the caravel, using the lateen sail, became the appropriate ship for sailing the Atlantic facing its winds. It was from Lisbon that the caravels set forth to discover the new world. Lisbon was also home of the Arsenal da Ribeira das Naus, one of the largest naval shipyards in Europe, which features in many of the depictions of the city from the 16th century onwards. The Ribeira das Naus was where the caravels and other ships were built, including *naus*, galleons and hookers. To find out more about the development of Portuguese naval architecture, visit the **Museu da Marinha**.

- 13 Tram 15. Bus 714, 727, 28, 729, 751, 201

CHEMISTRY



18

Laboratório Chimico
© Museu da Cidade (City Museum)

THE CHEMISTRY LABORATORY

The **Laboratório Chimico** was established in the Escola Politécnica de Lisboa in 1844. At the time, the laboratory was one of the centres of scientific progress in Europe. Generations of future chemists, pharmacists, doctors and even engineers studied there. After 150 years the laboratory closed down in 1999, but reopened in May 2011 with its original design and currently displays its vast collection of scientific instruments and equipment. It is well worth visiting one of the last examples of a 19th century European teaching and research laboratory.

- 18 Underground Rato. Bus 758, 773, 790

ARCHAEOLOGY



11/12

Museu do Teatro Romano
© Museu da Cidade (City Museum)

THE CIVILISATIONS OF LISBON

The ancient occupation of Lisbon has left archaeological remains all around the city. One of the first archaeological projects, following the 1755 earthquake, revealed the **Roman Theatre**. More recently, deep underground construction works have revealed archaeological structures from other periods, such as the **Rua dos Correios site**. Here you can see successive building works in the town dating from the 5th century BC Phoenician occupation to the Pombaline period. The Museu da Cidade is now responsible for over 150 archaeological projects in the capital.

- 11 Museu do Teatro Romano | Bus 737. Tram 28
- 12 Rua dos Correios | Underground Rato, Baixa-Chiado

OCEANOGRAPHY



16/17

King D. Carlos
© Aquário Vasco da Gama

THE OCEANOGRAPHIC KING

For many Lisbon residents the **Aquário Vasco da Gama** represents their first contact with the aquatic world. The aquarium is also a notable museum and its foundation in 1898 was a reflection of the enthusiasm for oceanography in Portugal. Part of the museum houses the collections that King D. Carlos I, its founder and a keen oceanographer, accumulated during his 12 oceanographic surveys (1896-1907) of the Portuguese coastline and the Azores. The king studied marine resources, currents and the topography of the ocean's depths. **The Oceanário de Lisboa** also plays a key role in research and awareness raising for the sustainable development of the oceans.

- 16 Aquário Vasco da Gama | Bus 76
- 17 Oceanário de Lisboa | Bus 28, 400 Underground Oriente

AERONAUTICS



9

Engraving depicting the 'passarola'
© Biblioteca Nacional

THE 'BIG BIRD'

While the desire to fly has always been a human aspiration, one of the first attempts made by humans was in Lisbon. In 1709, inspired by his faith and some knowledge of aerostatics, Father Bartolomeu Gusmão built a flying machine. Despite reports of the priest flying over Lisbon in this machine, which was known as the 'passarola' ('big bird'), there are no records of this event. What is proven is that in the same year, in the presence of the Portuguese Crown, Bartolomeu raised a prototype of the air balloon several metres off the ground. Bartolomeu's achievement has never been recognised, even though it occurred 74 years before the Montgolfier brothers' balloon. Better luck had the navy officers Gago Coutinho and Sacadura Cabral, who made the first air crossing of the South Atlantic in 1922, from Portugal to Brazil. See a replica of the aircraft that made this crossing in **Belém**.

- 9 Tram 25. Bus 28

PALAEONTOLOGY



5

Cranium of a crocodile that lived in Chelas
© Museu Nacional

CROCODILES IN LISBON

15 million years ago Lisbon had a hot, humid climate and was inhabited by a variety of large vertebrates. Marvila and Chelas were the territory of mastodons and sabre-tooth tigers, and giant crocodiles lived in what is now Chelas. Lisbon's prehistory was revealed by excavations, and much of this legacy can now be found in the **Museu Geológico**. The museum, founded in 1857 as the Geological Commission of the Kingdom, was a pioneer in geological and archaeological studies in Portugal and contains important collections of palaeontology, geology and prehistoric archaeology. It is well worth a visit.

- 5 Tram 28. Underground Rato, Baixa-Chiado

