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Between Science and History: The IAP-PM Museum of the Faculty of Medicine of the University of Coimbra in Transformation

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ABSTRACT: This article aims to present the history of the creation and evolution of the Museum of Pathological Anatomy at the IAP-PM (Institute of Pathological Anatomy and Molecular Pathology), located within the Faculty of Medicine at the University of Coimbra. Created as an aid to the study of medicine, this museum has accompanied the various phases of this institute, including the creation of the discipline of Pathological Anatomy, its emergence as a distinct field, and its evolution into an institute, also marking the passage of numerous famous figures through it. This article aims to summarise not only these aspects but also to explore the museum's immense and diverse collection, which has grown over the decades from the Pathological Anatomy preparations, which benefited from the contribution of distinguished doctors from Coimbra, such as Bissaya Barreto and Daniel de Matos, to the Collection of Anatomical Models, which dates back to 19th-century French artisans. Next, this article refers to a few projects that are underway through European investments (PRR) since the creation of digital applications such as a Virtual Museum, a Macroscopy Simulator, and Pathobox. We also explore the adoption of a new exhibition discourse to integrate this new digital vision, which has long been necessary in this Museum.

KEYWORDS: Museums, Medicine, Pathological Anatomy, History.

INTRODUCTION

Nowadays, museums play a fundamental role in preserving, interpreting and promoting heritage, acting as privileged spaces for the production and dissemination of knowledge. In addition to their purpose of safeguarding heritage assets, these very special institutions act as dynamic agents of cultural mediation, promoting social dialogue and bringing the public closer to the diverse narratives that museum objects convey.

In this context, the Pathological Anatomy Museum of the IAP-PM of the Faculty of Medicine of the University of Coimbra stands out for its collection, the central axis of its identity, of historical and scientific value, which documents the History of Medicine, scientific re-

search and medical education, contributing to ethical, academic and social reflection on health and disease.

Currently, the Museum extends beyond its traditional role of supporting specialised teaching, highlighting the exhibition and educational value of its collection. Accordingly, the analysis of the collection and its relevant location reveals the challenges inherent in its conservation, management and communication, particularly in a context marked by rapid technological changes and new public expectations.

In this sense, the University and the Institute have invested in the design and implementation of projects that aim to enhance the Museum and its collection, made possible by european fundings *(PRR- Recovery and Resilience Plan funding*). These initiatives are mainly related to the adoption of new technologies, such as 3D digitalisation of the collection and installation of interactive digital displays in the museum space, which also involves the development of preventive conservation actions, historical research, heritage management and the creation of scientific and educational content, seeking to respond to the current challenges of museology and the needs of the Museum itself.

From a methodological point of view, the research is grounded in a qualitative approach, appropriate for interpreting scientific museum contexts, based on the analysis of historical sources, direct observation of the museum space and the organisation of the collection, as well as a bibliographic review of specialised literature in the areas of Museology, History of Medicine and Scientific Heritage. This approach allows for a deep understanding of the Museum as an institution, the narratives associated with its collection, and the objectives supporting the projects currently in development.

This article, divided into three fundamental points related to the history, collection, and rehabilitation of the Museum, aims to highlight the importance of this initiative, which reinforces the value of the Museum of Pathological Anatomy and its medical- scientific heritage, framing it within current museological practices defined by the specific challenges and characteristics of the field.

HISTORICAL BACKGROUND

Located in the Faculty of Medicine, the current Institute of Pathological Anatomy and Molecular Pathology of the University of Coimbra, along with its Museum, has its origins in the University's Anatomical Theatre, founded during the Pombaline Reforms (Reforma Pombalina), a period of renewal applied to education and various spheres of Portuguese life [1].

Thus, within this important intellectual movement that drove the renewal of academia in the face of new scientific principles, the Faculty of Medicine of the University of Coimbra, naturally inserted in this context, founded new establishments fundamental to the teaching of medicine in the 18th century, including the Anatomical Theatre, which emerged as an important space for the observation of patients, cadavers and their pathologies, representing the pedagogical and practical function of teaching anatomy [2].

In the 19th century, in Coimbra, an important figure in the history of the future Institute of Pathological Anatomy Museum emerged: Dr Carlos José Pinheiro, an anatomy demonstrator who prepared hundreds of anatomical specimens, which were preserved and organised in a museum space dedicated to normal, pathological and tocology anatomy. He published significant works, including the *Inventario Scientifico das Peças e Preparados do Theatro Anatomico da Universidade de Coimbra*, in 1829 [3].

His successor, Sebastião de Almeida, professor of anatomy until 1859, together with his disciple, Inácio Rodrigues da Costa Duarte, were responsible for acquiring anatomical specimens, dissection instruments, books and anatomy atlases. Sebastião de Almeida was later replaced by Calisto Inácio de Almeida Ferraz, Director of the Anatomical Theatre and the Museum of Normal Anatomy from 1860 onwards, who imported wax specimens and plastic substances, preserving the existing natural specimens in phenolic glycerin [1].

In the field of Pathological Anatomy, it was Francisco António Alves, professor at the Faculty of Medicine, who founded the Cabinet of Pathological Anatomy in 1861 [4]. Under his direction, the first catalogue of the Cabinet, *Catálogo dos Gabinetes de Chimica Médica e Anatomia Pathologica da Universidade de Coimbra*, was published in

1865, with hundreds of specimens forming its collection [4]. Thus, the Cabinet, the basis of the current Institute and Museum, underwent a period of evolution, parallel to the affirmation of Pathological Anatomy as an individualised discipline:

> *"Special museums are founded; iconographic collections multiply; journals and monographs become commonplace; the statutes of our University recognise the advantage of cadaveric research; anatomical societies are organised, and the 17th and*

early 19th centuries represent flourishing periods for Pathological Anatomy. Portugal did not fail to recognise these advances;" [5].

Francisco António Alves was succeeded by Júlio de Sande Sacadura Botte, the second professor of pathological anatomy, who, following in the footsteps of his predecessor, published a new catalogue of the Museum in 1877, entitled *Catologue des Cabinets d'Anatomie Pathologique et de Chimie médicale - Cordonné avec la coopération de Préparateurs*, which lists the specimens in the collection, also mentioning their preparers, Manuel Justino de Azevedo and Daniel de Matos [4].

In the 20th century, the discipline of Pathological Anatomy was transferred to Raimundo da Silva Mota, who took over as Director of the Cabinet of Pathological Anatomy from 1885 to 1904, being responsible for the continuous growth of the museum's collection, which had around 1,400 specimens at the time [4].

> *"When Prof. Raimundo Mota died in 1910 (...), "the museum constituted a precious collection of all types of lesions. (...). Its collections of embryology, monstrosities, lesions from bubonic plague and cerebrospinal meningitis are interesting from all points of view..."* [4].

In 1910, the year that marked the establishment of the First Republic (Primeira República) in Portugal, structural changes were implemented across various sectors, including university education, which benefited from important reforms [6]. In this context of reorganisation and transformation, the Cabinet became an Institute in 1911, under the direction of Luís dos Santos Viegas, at a time when institutions were placed under the supervision of universities, enabling the creation of new centres of research and teaching [7].

> *"The renovation of the old offices, museums and university laboratories was not limited to a simple nominal change, but involved significant transformations in terms of their organisation, structure and scope of action. In addition to their traditional functions of supporting theoretical teaching and introducing experimental work, they took on additional responsibilities in the areas of practical teaching and scientific research."* [6].

Thus, we are faced with an extensive scientific movement that justifies the developments that took place at the Institute and its Museum during the first decade of the 20th century. The Institute began to publish scientific archives, which indicate the exponential increase in acquisitions for the Museum between 1912 and 1914, allowing the collection to grow by 152 new specimens: *"(...) originating from hospital operations, the urban clinic, and autopsies performed at the Institute (...) including extremely curious and rare cases (...)"* [7].

These important figures, published under the direction of Luís dos Santos Viegas, with the support of João Marques dos Santos, assistant and future director at the Pathological Anatomy Laboratory, attest the history, objectives, and achievements of the institution. The 'historical news' article, written by Marques dos Santos, refers to the expansion of the space carried out at the time:

> *"The three rooms that were part of the old corridor of the Faculty library were adapted, one into a cloakroom, where, through independent side doors, access is gained to the Institute's Museum and the respective General Laboratory; another serves as a dissection and assembly room (...) and a third as a private laboratory for the Assistants. (...) there are complete collections of dyes, various chemical reagents, records of the specimens collected (...)"* [7].

It also notes that the Museum is full of specimens and that visitor access is regulated to avoid disrupting school services, suggesting that the Museum is already somewhat open to the public [7]. In the 1930s, the Museum's opening to the public was formalised by the Decree of 9 March 1931, published in the Diário da República (Official Gazette of Portugal), which set out opening hours and admission prices, thereby authenticating the community character the Museum has come to embody.

In the early 1940s, the Estado Novo, a dictatorial regime under the leadership of António de Oliveira Salazar, established an administrative commission aimed at radically redesigning the city of Coimbra, guided by the need to rebuild the Alta (Upper Town of the city) and remedy the serious unsanitary conditions in the surrounding neighbourhoods. This controversial plan gave rise to a vast urban and architectural intervention, which irreversibly altered the appearance of the University of Coimbra over the following decades [8].

From 1942 onwards, the discipline of Pathological Anatomy was held by Michel Mosinger, and the acting management of the Institute was ensured by Augusto Vaz da Serra:

> *"New horizons opened up; studies in Pathobiology began, services were set up in the then new Faculty of Medicine (in 1955), teaching methods were remodelled, and an era of experimental Pathology began, which came to fundamentally mark the work of Michel Mosinger."* [4].

As the culmination of this transformative process, the emblematic Faculty of Medicine building was inaugurated on 29 May 1956, established next to the Paço das Escolas, now the headquarters of the Institute of Pathological Anatomy and its Museum [8]. From 1960 onwards, the Institute was directed by Renato Trincão, a professor of pathology, who focused his efforts on preserving the Museum. This was evidenced by the creation of the '*Exposição iconográfica e bibliográfica comemorativa do 1.º centenário da Cadeira de Anatomia Patológica de Coimbra*' in view of the celebrations marking the first centenary of the establishment of the discipline of Pathological Anatomy, "*installed in its magnificent Museum filled with several thousand anatomical pieces and about 200 wax pieces*" [9].

In addition to the museum collection, the exhibition featured several photographs of macroscopic pieces, histological documentation from the collection, graphs, historical documents, bibliographic works from the Institute, and instruments [9], confirming the existence of an important collection that, in this exhibition, was curated to facilitate public understanding and appreciation.

The passing of Renato Trincão in 1996, on the eve of the new century, marks the beginning of the Institute's contemporary era, with Manuel Matos Beja as director until 2003, followed by Lina Carvalho, who will hold the position until 2025. During Lina Carvalho's directorship, Dr. Rosa Gouveia, an anatomical pathologist and technical specialist at the University of Coimbra, played a key role in the organization and development of the Museum, carrying out significant work in structuring and preserving its collections.

The Museum continues to play an important role in the educational and scientific fields within the Institute. However, it lacks modern museum resources and techniques, making it difficult to safeguard its historical heritage and create new methods for exhibitions, expanding its reach to a broader audience. Since April 2025, the Institute and its Museum have been under the direction of Vítor Sousa and from May onwards, the Museum has been undergoing technical refurbishment, carried out by the new museological team.

COLLECTIONS

Having established this, the largest collection at the Museum is undoubtedly the Pathological Anatomy preparations, i.e. biological specimens from autopsies, carefully preserved — mostly in formalin solution — to illustrate various pathologies affecting different organs and systems of the human body.

At the end of the 19th century, the process of fixing and preserving organic tissues was influenced by the introduction of formalin (by Blum, in 1893) and by procedures for preserving colour in specimens fixed in formalin, discovered by Kaiserling in 1896, which influenced the use of this chemical compound in scientific and museum contexts (10).

This was also the museum's first collection, by Professor Carlos José Pinheiro, preparer of specimens at the Anatomical Theatre at the time. Unfortunately, the referred specimens have not survived to the present day.

However, the Museum was enriched by the work of other doctors who came after Carlos José Pinheiro, and today it is possible to find around two thousand pieces distributed throughout the museum, offering a unique perspective on the morphological changes caused by diseases and allowing for a deep understanding of pathological anatomy.

Alongside the Pathological Anatomy preparations, there is another equally important collection from the same period, the Anatomical Wax Collection. This section of the Museum brings together anatomical models made mainly of wax, whose main purpose is their use in the study of different dermatological diseases, many of which are rare or currently eradicated. This work with wax is an art that has been perfected by various craftsmen until it went hand in hand with clinical rigour, where it gained greater visibility in teaching due to its realism, becoming the perfect learning aid and an essential tool for the prevention of STDs at the time (11). The collection includes several works by two famous artisans and important wax sculptors of the time: Jules Baretta and Pierre Vasseur, from Saint-Louis Hospital and Maison Vasseur-Tramond, respectively.

To create these anatomical moulds, it was required a patient with a pathology to be preserved, a doctor to assess the area, and an artist to produce the piece. For this production, the artisan first made a plaster mould of the area of interest, to which melted wax was applied with other organic and inorganic materials that were kept secret by the artisan (12). After drying, it

moved on to the finishing stage, where it was painted, and real hair was added, inserted one by one (11). Created with great scientific and artistic rigour, these moulds were fundamental to the teaching of medicine in the 19th and 20th centuries.

In addition to these collections, we also have the Osteological Collection. This section of the collection displays human bones — complete or fragmented — that are preserved for educational, scientific, and anatomical-pathological diagnostic purposes. The specimens on display allow direct observation of various bone pathologies, visible to the naked eye or in histological sections, including fractures, infectious lesions, degenerative processes, and tumour formations. Through these remains, it is possible to understand how certain diseases affect the human skeleton and how knowledge about the body has evolved.

The next section of the museum presents a unique collection of Dehydrated Anatomical Specimens — human organs, tissues and bones carefully prepared without the use of preservative liquids. Unlike specimens immersed in formalin, these specimens have undergone special dehydration and preservation techniques, allowing them to be exposed to the air. This method reveals, with remarkable clarity, anatomical details and pathological changes that are sometimes difficult to observe in liquid form.

Another curious collection is the Calculi Collection, which refers to solid formations or stones that develop in different parts of the human body from the crystallisation of mineral salts and other organic substances. These calculi can be surgically removed or eliminated naturally and then sent for laboratory analysis to determine their chemical composition and origin.

Other collections in the Museum stand out more in the area of preparation and information about the pieces found in the Museum, such as Chemical Reagents, Instruments and Documentation.

The reagents, once used in the preparation and conservation of anatomical specimens, represent fundamental techniques of pathological anatomy in the 19th and 20th centuries, illustrating the scientific and laboratory evolution of medical education at the faculty. Like the reagents, the historical instruments were used mainly for research and diagnosis at the Institute. Among the items on display are microscopes, microtomes, slides, scales, thermometers and various laboratory utensils.

Finally, the museum includes a documentary collection with medical records, clinical photographs, histological analyses, and visual comparisons of before and after various treatments. These materials complement the anatomical models and instruments, reflecting the methods of observation, diagnosis, and research used at the Institute, and bear witness to the evolution of medical knowledge over time.

Due to the value attributed to this collection and its importance to the University of Coimbra, the museum is undergoing a renovation process with the aim of modernising, conserving and breathing new life into the site through a technological development enabled by european fundings (*PRR - Recovery and Resilience Plan*).

PROJECTS

Therefore, this funding has enabled the Institute to invest in equipment for 3D scanning and augmented reality, as well as the devices needed to ensure the compatibility and full functioning of the software purchased.

At the same time, two digital applications are being developed as part of the HfPT (Health from Portugal) project. The Macroscopy Simulation app is designed to teach one of the most important procedures in the field of Pathological Anatomy, allowing users to practise the fundamental steps of macroscopic practice. The target audience for this software includes medical students, pathology residents and technicians in training.

The application integrates several stages of the process, from the digitalisation of the organ, through orientation, description, measuring, staining, cutting and sampling. This approach contributes to greater accessibility to practical teaching, promoting the development of technical skills in a safe and pedagogical way without spending resources directly on Pathological Anatomy Services.

The Virtual Museum app aims to provide users with complete and integrated visiting experience. In addition to the exhibition dimension, this technological innovation aims to support the systematisation and organisation of the collection through the creation of a future digital database.

This platform, currently in beta version, will make the collection accessible to the public, facilitating its study and promoting the participation of researchers, students, and the public, who will be able to con-

tribute to the analysis and research of the pieces in the collection.

In addition, the app plays an important role in illustrating and understanding different pathologies, as the museum's specimens are currently being digitalized for integration into this app. This will allow any user to view the pieces currently on display at the Museum digitally, broadening access to heritage and reinforcing its educational and scientific function.

Finally, the IAP-PM developed, in cooperation with the technology partners BMD Software, the PathoBox system, a PACS system for diagnostic in daily routine practice, educational and scientific objectives used predominantly in the field of Pathological Anatomy, developed to support routine diagnostics, teaching, training and the dissemination of knowledge in pathology. In general, it is a digital platform that integrates pathological cases, bringing together images, digital models, virtualised samples and multimedia content, organised for diagnostic, educational and research purposes.

DIGITALIZATION PROCESS

As mentioned above, the Museum's collection consists of several collections, whose conservation methodologies vary according to their nature and the materials they are made of. The use of formaldehyde requires the adoption of strict safety measures during its handling. Therefore, the use of personal protective equipment (PPE) is mandatory, namely nitrile gloves, PAPR (Powered Air-Purifying Respirator) respirators and disposable gowns.

The handling of historical objects requires great care, both because of their fragility and because of the lack of detailed information associated with some pieces. These circumstances make the digitalisation process particularly demanding and time- consuming. Most collections can be digitalised by a single operator; however, the collection of anatomical pieces in preservative liquid requires the support of the museology team, technician and pathologists from the Institute, ensuring the safety of the procedure and the preservation of the pieces.

The process begins with the removal of the specimen from the Museum's display cabinet and its transport to the Service's Macroscopy area, where there are adequate working conditions, namely a large workbench and an air extraction system, which is essential for reducing exposure to potentially toxic substances. The glass container is first cleaned externally, followed by the removal of any glue or silicone present on the lid, until it can be opened safely.

Subsequently, the specimen is removed from inside the container, ensuring the removal and storage of the container in a safe area. The specimen is then carefully cleaned and secured in a stable position to minimise or avoid handling during the scanning process.

Once scanning is complete, the glass container is cleaned again, and the procedure is used to replace the preservative liquid with a less harmful one (glycerol + antifungal). The specimen is then returned to the container and remains in quarantine for about a week. This period allows for monitoring, adjustments and verification of the absence of fungi or other substances that could compromise the conservation of the specimen. After this control phase, it is sealed with silicone and returned to the Museum, ensuring its preservation and continuity in the museum collection.

INVESTMENT IN EXHIBITION DISCOURSE: PROSPECTS FOR CHANGE

Within the scope of ongoing technological investment, the renovation of the Museum's exhibition discourse plays a central role. The main objective is to update and innovate the ways of communicating with the public through the introduction of interactive tables and digital billboards distributed throughout the exhibition route.

Despite this modernisation, the Museum will retain its original spatial and logistical organisation. The museum team has chosen to preserve the historical order of the space, respecting the layout of the cabinets and the traditional configuration of the rooms, to safeguard the identity and authenticity of the site. In this context, the digital displays and interactive tables complement the existing exhibition discourse, allowing the c ontent to be updated without compromising the historical integrity of the Museum.

These digital devices will have an informative and educational function, providing contextualised content directly linked to the collections on display in the corridors and rooms. They aim to enrich the visitor's experience, promoting a deeper, more accessible and interactive understanding of the museum objects.

In addition, these tools will enable the creation of temporary or modular thematic exhibitions aimed at raising awareness and educating people about health issues, addressing topics such as breast cancer, sexually transmitted infections, and the harmful effects

of smoking. At the same time, they will contribute to the interpretation of historical exhibitions and the influence of research carried out by prominent medical figures, such as Bissaya Barreto and Daniel de Matos, whose specimens are widely represented in the Museum's collection.

The interactive tables will also be used to integrate advanced digital content, including educational applications such as the Macroscopic simulation, as well as other interactive resources related to the Museum and the field of medicine. In addition to the scientific aspect, this equipment will support the historical contextualisation of the space through the compilation of images, books and other documentary sources, allowing visitors to build an informed view of the history of the Museum and its institutional framework.

CONCLUSION

The Museum of the Institute of Pathological Anatomy and Molecular Pathology is a testimony to the evolution of medical education, scientific research, and museum practices in Portugal from the 18th century to the present day. Its origins in the Anatomical Theatre of the Pombaline Reform, the progressive enrichment of its collection throughout the 19th and 20th centuries, and its institutional consolidation as an Institute reflect not only the development of Pathological Anatomy as an autonomous discipline, but also broader transformations in scientific, pedagogical, and social thought.

The collections that make up the Museum reveal a scientific heritage of high historical, technical, and artistic value. These collections offer insight into the evolution of medical knowledge, diagnostic and teaching methodologies, as well as the relationship between science, art, and clinical practice, underscoring the Museum as a unique space for the transmission of knowledge and scientific heritage.

In light of contemporary challenges, the current phase of museum and technological rehabilitation is a decisive moment for the preservation and enhancement of this heritage. The focus on digitalisation, augmented reality, educational applications, and new exhibition narratives reflects a clear effort to reconcile the preservation of the Museum's historical identity with the need for innovation, accessibility, and openness to more diverse audiences. This process not only reinforces the Museum's educational and scientific function but also expands its role as an agent for the dissemination of knowledge and health education.

In this way, the IAP-PM Museum today stands as a space in continuous transformation, where past, present, and future come together. The integration of new technologies, combined with respect for the authenticity of the place and its collection, allows the Museum to project itself into new forms of research and learning, ensuring the continuity of its mission and relevance in the national museum and scientific landscape.

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