

## Introduction

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The analysis of museum collections has been consolidated as an area of scientific research in continuous expansion of knowledge on materials, dating, authorship and origin, something necessarily achieved through the approximation and interaction of different professionals, methods and technologies. History, Art History, Archeology, Physics, Chemistry, as well as Conservation and Restoration, are some of the areas that have shaped an effectively interdisciplinary scientific field, whose results unfold to different stages of the curatorial cycle of museum collections. Beyond disciplinary boundaries, international collaborative projects have revealed the possibilities of giving visibility not only to museum collections that have not yet been studied and to the scientific information they gather, but to drive the expansion of knowledge from long-analyzed collections about which new and sophisticated analysis technologies might deepen the reflections.<sup>3</sup>

The University of São Paulo has been integrated into such interdisciplinary and collaborative efforts in multiple ways, based on the complexity of collections

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3. This is an effective example of the Modigliani Technical Research Study, which brings together researchers from European, US and Brazilian institutions, whose initial results were published in different issues of *The Burlington Magazine* in 2018, among which we highlight the article with researchers who are part of this dossier as authors, Professors Ana Gonçalves Magalhães, Márcia Rizzutto and Pedro Herzilio Ottoni Viviani de Campos. Cf. Centeno *et al.* (2018).

maintained by its units or even from external sources. More systematically, since 2013, a group of professors from different units of USP decided to join forces, bringing together the Humanities and the Exact Sciences, in order to produce new knowledge from the integrated study of museum goods. In that year, the Research Support Nucleus (*Núcleo de Apoio à Pesquisa – NAP*) of Physics Applied to the Study of Artistic and Historical Heritage (*Física Aplicada ao Estudo do Patrimônio Artístico e Histórico – FAEPAH*) was created, coordinated by Professor Marcia Rizzutto, from the Institute of Physics (*Instituto de Física - IF*), which brought together members of the IF itself, Chemical Engineering (*Engenharia Química da Poli*), the Museum of Contemporary Art (*Museu de Arte Contemporânea - MAC*), the Paulista Museum (*Museu Paulista - MP*), the Museum of Archeology and Ethnology (*Museu de Arqueologia e Etnologia - MAE*) and the Institute of Brazilian Studies (*Instituto de Estudos Brasileiros - IEB*).

The core objective of the nucleus was the use of noninvasive physical methods to analyze museum works and objects. Infrared reflectography (IR), X-ray fluorescence, digitized radiography, visible fluorescence photography with ultraviolet (UV) radiation are techniques used that can very much reveal hidden traces in paintings, sculptures, adorned furniture, ceramics; to characterize the pigments present in the works of art, their state of conservation and to reveal information on their surface like the retouched areas of a canvas.

Numerous innovative results from the cooperation of the various fields of knowledge involved in this NAP were disseminated in scientific events and articles. They also strengthened the group for the gestation of a broader project centered on the curatorial process through which museum collections go, from entering institutions to their diffusion. Entitled *Coletar, identificar, processar, difundir: o ciclo curatorial e a produção do conhecimento* (Collecting, identifying, processing, disseminating: the curatorial cycle and the production of knowledge), the project has received, since late 2017, funding from the São Paulo Research Foundation (FAPESP), under the modality Research Aid – Thematic Project. Having Professor Ana Gonçalves Magalhães, from Museu de Arte Contemporânea, as responsible researcher, it brings together dozens of researchers and scholars from the four statutory museums of USP — MP, MZ, MAE and MAC —, from IF, as well as faculty from UNICAMP and UNESP.

Similar initiatives aimed at integrating science and technology for the study, conservation and restoration of cultural assets are being developed in other teaching and research centers in the country, with promising investigations at the School of Fine Arts of the Federal University of Minas Gerais (*Escola de Belas Artes da Universidade Federal de Minas Gerais*), at the School of Architecture and Urbanism

of the Federal University of Pará (*Faculdade de Arquitetura e Urbanismo da Universidade Federal do Pará*), the Institute of Human Sciences of the Federal University of Pelotas (*Instituto de Ciências Humanas da Universidade Federal de Pelotas*), the Museum of Astronomy and Related Sciences (*Museu de Astronomia e Ciências Afins - MAST*) and the Oswaldo Cruz Foundation (*Fundação Oswaldo Cruz*), in Rio de Janeiro to name a few.<sup>4</sup> Some of these professionals from various specialties are members of the National Heritage Science and Technology Research Association – Science, Technology and Innovation (*Associação Nacional de Pesquisa em Ciência e Tecnologia do Patrimônio - Ciência, Tecnologia e Inovação – ANTECIPA*), created in 2015, which seeks to represent them not only on the national scene, but also with the European network E-RIHS – European Research Infrastructure for Heritage Science.

Considering this context of strengthening the groups we work with that the dossier *Interdisciplinary methods of analysis in museological collections* was suggested to the authors, in order to disseminate the recent research that has been carried out at the Museu de Arte Contemporânea and the Museu Paulista of USP, especially in the context of the Thematic Project, as well as at the Hercule Florence Institute (*Instituto Hercule Florence - IHF*), the result of dialogues with the areas of Nature Sciences and its Technologies.

The article that opens this dossier shows another successful cooperation between Ana Gonçalves Magalhães and Márcia de Almeida Rizzutto. Longtime academic partners, they have already unraveled the trajectories of the canvases by Italian artists Virgilio Guidi, Felice Casorati, Achille Funi and Mario Sironi and the paintings and traces beneath them. In this case, they looked into the *Self-Portrait* by Amedeo Modigliani, as the previous ones, which belongs to the Museu de Arte Contemporânea – USP collection, writing together with Dalva Lúcia Araújo de Faria and Pedro Herzilio Ottoni Viviani de Campos. Through provenance studies, reception and art criticism, physicochemical analysis and imaging, they shed new light on a canvas that is referential for the establishment of comparative parameters for the study of Modigliani's work, which houses paintings whose certification of authorship remains under discussion.

Márcia Rizzutto signs two more articles in co-authorship; however, the analyzed collections are of different typologies and institutions. The first, written with Francis Melvin Lee and Thierry Thomas, has the photographs produced by Hercule Florence in the 1830s as its object, belonging to the IHF collection. After acting as second designer of the Langsdorff expedition (1825-1829), the French artist settled in the village of São Carlos (today Campinas), a coffee growing region, and raised a family there. Among its many activities, it implemented the

4. Several initiatives can be known through the expanded summary of the studies presented at the 1<sup>st</sup> Meeting of the National Heritage Science and Technology Research Association (*Associação Nacional de Pesquisa em Ciência e Tecnologia do Patrimônio*), held on November 27 and 28, 2018, at the UFMG, Belo Horizonte, available at: <<https://bit.ly/2MpQDJA>>. Access on: Oct. 15, 2019.

first typography of the city and developed numerous inventions: photography, new printing techniques (autography, polygraphy and pulvography), inimitable paper (for paper money), recording the voices of animals in sheet music (zoophony) and types-syllables (precursor signs of shorthand). From X-ray fluorescence analysis, the text advances on the knowledge that had hitherto been about the materials and techniques employed in Florence's early photographic experiments, proving their originality in this field.

The second was written with the historian Rogério Ricciluca Matiello Félix and focuses on the discussion of the the archaeometric examinations results applied by both in pieces of furniture of the MP, targets of their master's dissertation entitled *Os móveis da terra: dinâmicas sociais a partir da produção e circulação do mobiliário em São Paulo (1700-1830)*, defended in 2018.<sup>5</sup> The combination of analysis methodologies of Applied Physics and methodologies of material culture analysis, allowed the data obtained on materials used in paintings, leathers and metals present in furniture to be cross-linked with information required in textual sources of different nature, renewing interpretations about the socioeconomic dynamics of the city of São Paulo in the seven hundred's and in the early nineteenth century.

It was also for a three-dimensional document—the prow of a canoe—, belonging to the Paulista Museum collection, that a multidisciplinary team turned their eyes to in 2016 and 2017. The group was composed by Maria Aparecida de Menezes Borrego, from the Museu Paulista, Bernardo Luis Rodrigues de Andrade, from the Naval Architecture and Ocean Engineering Department of the Polytechnic School (*Departamento de Engenharia Naval e Oceânica da Escola Politécnica*), both USP professors, undergraduate engineering students at the time - Pedro Henrique Bulla, Fillipe Rocha Esteves and Gabriel Bustani Valente -, and Gregório Cardoso Tapias Ceccantini, from the Laboratory of Plant Anatomy of the USP Institute of Biosciences (*Laboratório de Anatomia Vegetal do Instituto de Biociências da USP*), and his doctoral candidate Milena de Godoy Veiga. For the analysis of prow, the methods of historical analysis, short-range photogrammetry and wood anatomy were used to identify, digitally reconstitute the piece and to trace its trajectory in the institution. In addition to the article on multiple approaches to the artifact, the joint study favored the mounting of the exhibition *Viagens fluviais: homens e canoas na rota das monções*, exhibited at the Itu Republican Museum (*Museu Republicano de Itu*), in which the nautical piece is protagonist.

Finally, the dossier concludes with the article written by Professor Jorge Pimentel Cintra, from the MP, and the engineer Rodrigo Gonçalves, in which they

analyze the potentialities of applying 3D laser scan and drone aerophotogrammetry for museums. As part of Gonçalves' doctoral dissertation under development concerning LIDAR planialtimetric data, both performed the application of the technologies in the monument building of the Museu Paulista and, based on the obtained results, sought to broaden their knowledge about the studies of so-called augmented realities.

The many hands that have written each of the dossier articles by themselves already reveal the plurality of approaches used and the areas of science involved, but, first of all, they highlight the original results of the solidary research and fruitful dialogues between the two professionals from different backgrounds committed to the production of knowledge. There is no doubt, as Ina Hegert, Marcia Rizzutto, Francis Melvin Lee, Solange Ferraz de Lima and Jessica Curado have already noted in an article about another successful partnership between the Museu Paulista, the Instituto de Física and the Instituto Hercule Florence around Aimé-Adrien Taunay's notebook, that "Universities play a very important role in deepening and broadening multidisciplinary research for heritage preservation."<sup>6</sup>

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