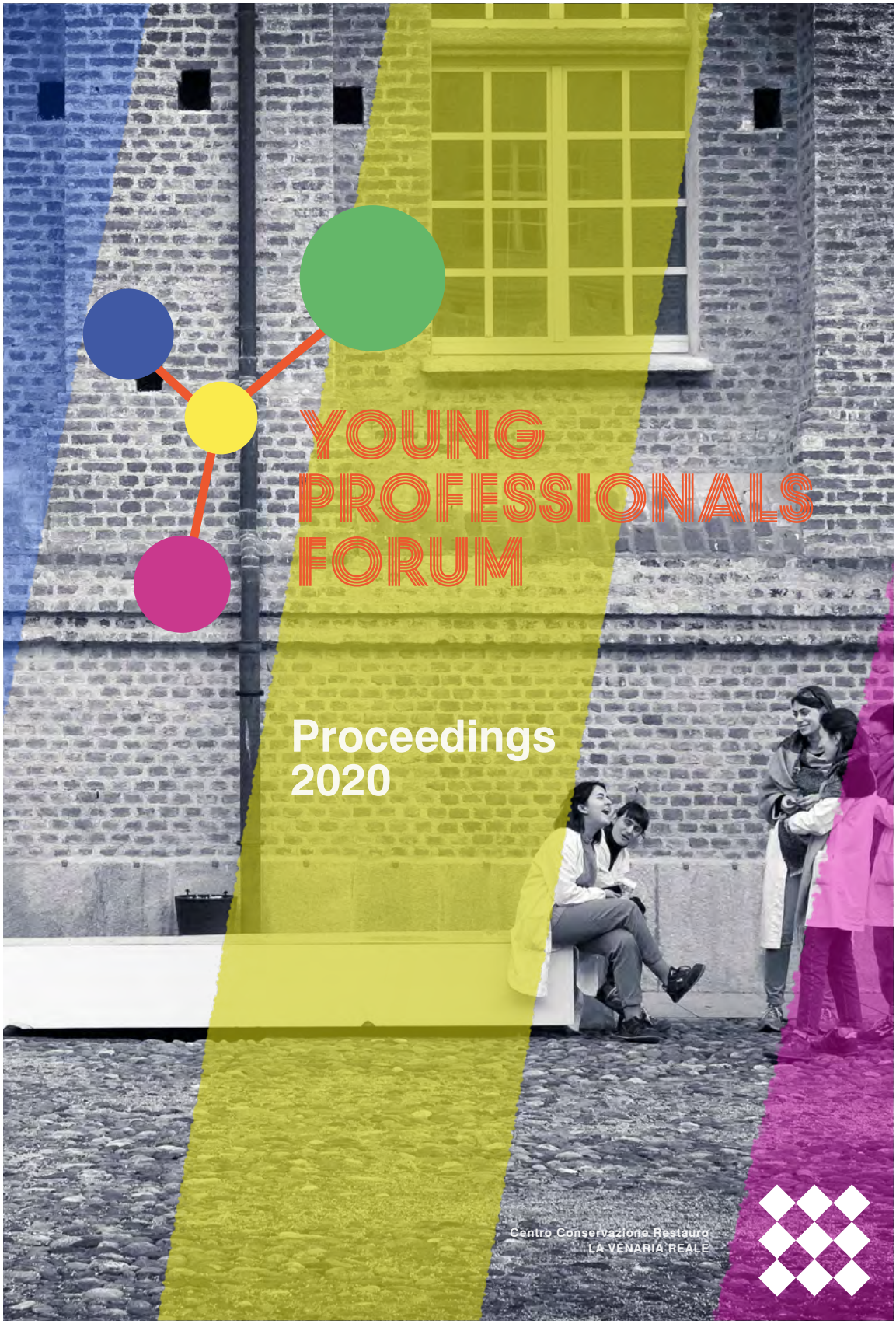
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LA VENARIA REALE

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YOUNG PROFESSIONALS FORUM

EMERGING SKILLS FOR HERITAGE CONSERVATION

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First edition

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SUMMARY

INSTITUTIONAL INTRODUCTION

The first edition of the Young Professionals Forum was an edition born to welcome all the young participants as guests of our Center, to share thoughts and analysis together, in order to lay the foundations for building a community of young professionals of cultural heritage, a community that would have taken its first steps here, and would have grown over time to find itself enriched with new experiences and new resources, still with us, the following year. The health emergency due to the COVID epidemic, which unfortunately we all know, a few months earlier made us face a very difficult choice: we should have canceled the YPF or try instead to convert it into a digital forum, transforming a problem into an opportunity? We did not want to give up the possibility of gathering around our Center many young professionals of conservation and restoration, young people coming literally from all over the world, young people who could contribute, with their ideas and experiences, to develop an interdisciplinary platform for exchange and comparison, which in this complicated historical moment, we believe it's more important than ever to plan and support.

Our Center for fifteen years has dedicated all its resources to the care of the cultural, artistic and historical heritage, moreover we host the Degree Course in conservation and restoration of the University of Turin, which every year enriches the cultural heritage panorama (both in Italy and abroad) with new highly specialized professionals. It was therefore logical and natural for us to place among our main development objectives the organization of the Forum, which we wanted to represent the first international event focused on skills growth, comparison between industry professionals and opening to wider and more diversified audiences. The choice of the themes on which the four sections were based, arose from the need to broaden the scope of our reflection, stimulate synergies between preservation professionals, curators, art historians and scientists, and enhance the interdisciplinarity and the experiences of individual professionals in order to build a common vision.

Now we know that the choice we made a few months ago was the right choice and we couldn't be more proud to realise how many people were connected with us the 2nd of July and how incredibly high was the quality level of the abstracts that the young professionals submitted to the evaluation of our scientific committee, which I have to thank so much for the extraordinary work accomplished during these months. Furthermore, I couldn't end without pointing out that we couldn't have done all this without the support of Compagnia di San Paolo, which was the first one to believe in this project and its potential, and without the participation of our great international partners, ICOM, IIC, CNR, ICCROM and UniTo who immediately accepted this challenge.
And finally, I really need to thank our Secretary-General, Sara Abram, who was the tireless engine and the real heart of this project, since its genesis.

Stefano Trucco
CCR President

Compagnia di San Paolo is a private foundation and institution. It dates back in the XVI century, that means it has a long tradition of being part of the history of the Torino territory, and supporting arts and culture is one of its core activities where to deploy the money that we can put on the table, considering the results of our endowment.

We are founding partners of the Centro Conservazione e Restauro "La Venaria Reale" and we see it with great favour because it's an institution that has been able to consolidate its reputation in the scientific domain reaching significant achievements lately, in the last year. For this reason, the last year we decided to put additional money on the Centro to support its strategic multiannual plan in which one of the directories is the internationalisation. This today event is one of the main activities within this streamline.

We consider that it can help in enhancing the attractivity of our territory, considering exactly the young professionals in this fascinating field of restoration in arts and culture and also considering Venaria and Torino as one of the reference points on the map for exchange among communities of professionals generating further opportunities and contributing under the supervision of the chairman Stefano Trucco and all the staff of the institution of research and education.

I also mention the new secretary general, so an institution that has been able and is able to renew itself, to continue working along the line of excellence and so I'm very happy to be here today and to wish all of you a great job and a great meeting.

Alberto Anfossi
Fondazione Compagnia di San Paolo
Secretary General

FOREWORD

Nowadays, the preservation, conservation and transmission of cultural heritage all demand a great deal of preparation: in technical adeptness, scientific disciplines and the humanities. But above all, we need to be interconnected, to know our own contexts and cultures well, and we need to fuse our different perspectives and to share our research and discoveries. These are the reasons why we created the Young Professionals Forum: from the very first steps, we envisioned a meeting rather than a scientific conference, a location (which has necessarily become virtual) in which to meet, establish relationships, swap experiences, and above all, our own visions.

Working in conjunction with the scientific committee, every session has been dedicated to one of the following themes: Ethics and Practice of Restoration, Diagnostics and Technologies Applied to Conservation, Museum Professions and History of Conservation. We have deliberately focused the forum's attention on the four general themes, four general categories in which everyone can freely express his or her own personality and point of view.

The Forum aims to offer an open, inclusive platform for exchange, a place for the young people involved to compare experiences, research, perspectives, and expectations. The goal is for the new generations of professionals to become acquainted: in fact, in recent decades the growth in awareness, the level of technical-scientific training and the many opportunities for specialization have had a significant impact on the skills that today's restorers, scientists and art historians can offer to conserve our cultural heritage.

Today, our goal is to turn this event into the beginning of something new and we intend to work hard to keep this network alive and strong, offering its participants opportunities for training, keeping up to speed, and professional networking. We will be asking for your opinions and suggestions on the topics to be dealt with, trying to offer some answers to the needs that you consider priority. This publication, which gathers the presentations selected for the first edition of the Forum, is a basic way to contribute to knowledge of the most interesting contemporary issues. These essays also represent a sort of snapshot of "new skills in the conservation of cultural heritage", as stated in the Forum's pay-off.

Sara Abram
CCR Secretary General

INVESTING ON THE FUTURE OF RESTORATION OF CULTURAL HERITAGE

We live in an era facing profound social, environmental and technological changes. Changes which are affecting our ways of living. Which constantly push us to quickly update our knowledge, references and languages. And which also concern all the professions related to culture and its diverse expressions.

In this scenario, it becomes important, more than ever, for those ones who work in the culture sector, and in particular for those ones engaged in training the cultural professions of the future, to understand the dynamics in progress and to identify and address the possible paths of innovation. On these convictions, when with the Santagata Foundation team we worked on drafting the Strategic Plan of the Fondazione Centro per la Conservazione e il Restauro dei beni culturali "La Venaria Reale", it came pretty natural to conceptualize and ground all the development priorities of the plan on the evolution of the restorer profession.

A profession that already today requires to acquire awareness and skills on many complex issues, much beyond the scientific ones. The professional figure of the restorer is in fact increasingly called by the competition to equip itself with multidisciplinary and trans-sectoral skills, to dialogue with a moltitude of actors, to move in international contexts, and to use technologically advanced tools. Among the measures proposed in the Strategic Plan, the Young Professionals Forum is certainly the one that is most explicitly aimed at working on the next future professionals of restoration.

Investing in young people means in fact an opportunity to generate sharings, dialogue, alternative narratives. And, by doing this, an occasion for understanding the emerging geographies of restoration, new tools, languages, forms of production and conservation of cultural heritage. In other words, it aims at having a greater ability to perceive the evolution of the demand expressed by the sector and, consequently, to be better equipped to comply with it.

The experience conducted with the first edition allowed already to draw a significative balance, and to collect inputs towards innovation to face the challenges of the evolving markets. Working on the continuity of the Forum, and building an effective community of knowledge and practice is now the next challenge.

Alessio Re
Fondazione Santagata per l'Economia della Cultura Secretary General

INTRODUCTION

It is an honour for me today to have this opportunity to address the future and speak to young professionals, who are, in fact, the future of our profession.
Today's topic "From Conservation to Cultural Heritage Management" invites introspection. Allow me to recall at this point the Burra Charter, which describes conservation in terms of the protection and enhancement of cultural heritage. However, by conservation, we also mean techniques, methods, technologies and so on. Management is often interpreted as more than political decision making. In fact, over the years, conservation has increasingly been integrated into the management of cultural heritage and this has marked the evolution of ICCROM.

This shift is in response to the challenges of the globalization of cultural heritage. This evolution began in the aftermath of the Second World War, when the emphasis was placed on the protection of monuments and sites, as well as the finds in museums, and the emphasis was placed on physical intervention, aimed at ensuring the restoration of objects, buildings and monuments in their original state, according to the principles of the Venice Charter for the care of cultural heritage and implementation of restoration processes. The Charter introduces the concept of significant issues, those that absolutely must be examined. It also contextualizes the cultural heritage in relation to its conservation and protection. It also takes into consideration the intangible aspects of cultural heritage, showing itself to be more complex, more complete if you prefer.

At the beginning of its activities, 60 years ago, the "Rome Centre", as ICCROM was then called, was aimed at providing advice and developing training modules on the technical aspects of conservation. Today, ICCROM, with an office in Rome and a regional office in the Emirate of Sharjah and with more than 137 Member States, has enriched its capacity to assist member countries.
But there is also another important aspect to consider: what are the different voices of heritage? Laurajane Smith developed the concept of "authorized heritage", but there is also "unauthorized heritage". Communities involved in heritage management - and no longer just heritage professionals - have begun to consider cultural heritage issues. In other words, who defines the assets? If we reflect on the recent events of the pandemic, we understand how much the monuments or the collections themselves are linked to well-being, and the fundamental role they play in society.

Cultural heritage is in the interest of the communities living on the sites, but also of those whose life and activity is conditioned by the cultural heritage itself. We think of the closure in recent months of places of cultural heritage and the effect it has on people's well-being.
Emphasizing the importance of cultural heritage within society is no longer something we can ignore, as it has an impact on how we create the next generation, the younger generation taking the place of current professionals. It is no longer just about training, but about the development of social skills and the ability to listen to different voices. The management of a site cannot ignore the socio-economic and environmental aspects. Preservation now requires a much more holistic approach.

The events triggered by COVID-19 have made us aware of the need to cooperate and the fundamental role of cultural heritage in post-pandemic reconstruction. ICCROM has appealed to governments, institutions and individuals to consider cultural heritage as essential for the recovery of communities. ICCROM has also launched a webinar programme and, although this is a solution eminently dictated by necessity, I believe that it allows us, in reality, to democratize knowledge and, consequently, the knowledge of cultural heritage, permitting, as in today's event, a large presence from all over the world.

Movements like Black Lives Matter can also affect cultural heritage. In fact, it is not just a question of the subject itself but of the fact that it is a problem that concerns us, such as the statues that are destroyed. What we need to understand is how to deal with these situations and, above all, how to listen to other voices, other than the dominant voice, in what we do, in our studies or in our practice. If we can do this, I think heritage conservation and management will be in a better position to build the future.

Webber Ndoro
ICCROM General Director

SESSION 1

CONSERVATION ETHICS AND PRACTICE

Michela Cardinali
Sarah Stannage

The decision-making process which accompanies the choices to conserve cultural heritage on a daily basis needs an unflagging acceptance of ethical and moral responsibility with respect to the future life of artefacts, finds, sites/monuments, and all the testimonies which characterize our cultural and historical memory. It is precisely the importance of this critical act which led to the theme of ethics being included in the act of conservation in a dedicated area of the Young Professionals Forum. This proposal, welcomed by the participants at the international meeting, made it possible to quickly shape the relationship existing today between the theory and practice of conservation and an initial rapprochement of technical-operational data to the values conveyed by the interventions themselves. In this highly particular historical, cultural and economic moment caused by the ongoing pandemic, it is necessary to re-establish continuity with these values and to animate the comparison and connection between the professions, eliminating the distances that have suddenly been generated. The reality is that distances do exist and can have different origins and duration, but they can nonetheless be overcome through our ability to evolve and innovate ourselves and our way of operating and living our profession. Consequently, the Young Professionals Forum represents a real opportunity to concretely respond to this need for innovation and evolution of the discipline and to achieve the important goal of intercultural aggregation of young professionals from our scientific community. The aim is to meet new allies and colleagues to rely on and collaborate with for the conservation of our cultural heritage and for the development of and interconnection between the different disciplines. The potential offered by the forum was well understood by many young people, who sent their contributions and shared their experiences with us, fully grasping the spirit of this forum and the opportunity for connection and exchange. The selection of the contributions was approached as a reinterpretation of the moral thinking and ethical criterion related to the different operational contexts and was carried out in a spirit of synergy and comparison by Sarah Stannage (IIC, *International Institute for Conservation*, Executive Director). Despite the

distances, differing experiences and skills involved, we reached the end of our selection process with the same list of names, finding ourselves faced by a very interesting critical and methodological scenario.
In fact, the contributions selected also allowed us to constructively raise questions about aspects which unite and differentiate us in the methodological and technical spheres. Conservation and restoration have always been understood in very different ways depending on the sociocultural context and the evolution of conservation and restoration theories. In this sense, the contributions proposed in this thematic area allow us to get to know this richness and variety of experiences and to share the intercultural panorama of the ethical concept. From moments of crisis, such as the one we are experiencing, we can grasp the opportunity to question our ways of thinking, but also living, ethics, pushing ourselves towards new perspectives.
With greater exchange and synergy between professions and specializations, the development of our discipline is guaranteed, achieving a shared conservation practice which can enhance exchanges between cultures. The ethical principles on which the interdisciplinary relationships necessary for the conservation of Cultural Heritage must be based include respect for cultural diversity, intercultural inclusion, and education in the sense of belonging and the sharing of data, to promote the development of both innovation and research.
Finally, to the young professionals who make up our community of practice and who have actively participated in the forum, I would like to suggest:
- promote a responsible ethical approach to the heritage of art, technical knowledge, stories and memories;
- open your minds and show your sensitivity;
- strengthen identity and relations by promoting intercultural inclusion and accessibility to knowledge.

Michela Cardinali

During what has been one of the most challenging periods in living memory, there are many dimensions to the Covid-19 pandemic and its impacts on a world already feeling the effects of climate change. While the impacts will be felt for many months, if not years to come, these challenges are bringing us together in solidarity internationally by increasing our shared collective experiences during these times of isolation.
As we enter a new territory for conservation, IIC acknowledges and applauds the perseverance and generosity shown over these last few months to contribute to discussions on conservation ethics and practice. More specifically, the focus created by the Young Professionals Forum (YPF) on this theme provides an opportunity for critical reflection from within the field. This in turn gives an opportunity to explore the role of conservators in a changing society. It is both the moral basis defined by the codes of ethics together with the analytical, scientific and often interdisciplinary approach that underlies conservation, providing evidences of past knowledge, and the ways by which these maybe conveyed into the future.
Exploring the tangible as well as intangible will require conservators to engage not only with multidisciplinary methods but also multidisciplinary communities to understand the meanings and values which they seek to preserve, leading to questions regarding the purposes of conservation itself.
The critical thoughts and decision-making processes framed by conservation ethics and practice are embodied within the selected papers and are ultimately captured by the shared vision of this forum to create a common understanding among conservators, scientists, art historians, curators, cultural heritage professionals around the world.

Sarah Stannage

INDIGENOUS KNOWLEDGE SKILLS AND PRACTICES

IN CONSERVING DRY-STONE WALLS AT GREAT ZIMBABWE WORLD HERITAGE SITE

Munyaradzi Elton Sagiya
PhD Candidate - University of Zimbabwe and Curator - National Museums and Monuments of Zimbabwe

INTRODUCTION

Built in dry-stone walling architecture, Great Zimbabwe (20° 16' 60" S, 30° 55' 60" E) is one of the largest and famous archaeological sites in sub-Saharan Africa. The site is administered by the National Museums and Monuments of Zimbabwe (NMMZ), a parastatal under the Ministry of Home Affairs and Cultural Heritage. It is was gazetted as a national monument in 1937 and enlisted on the United Nations Educational and Cultural Organisation's (UNESCO) World Heritage List in 1986. The site is located in south-central Zimbabwe, 27km east of the city of Masvingo. Since the late 18th centuries up to the present, Great Zimbabwe has been subjected to both amateurish and professional multi-disciplinary investigations concerning who built it, how, when and why the state later on collapsed around the 16th century[1]. Today an enormous corpus of academic literature is available on Great Zimbabwe in comparison to other similar archaeological sites in southern Africa. This scenario often provides a misleading impression that almost every aspect of the site has been extensively researched and published. However, relying on my work experience at the site as well as review of literature, there are still gaps in knowledge about Great Zimbabwe and how to conserve its material remains, in particular the dry-stone built architecture. One of the unexplored key research issues pertains to what has been the role of indigenous knowledge, skills and practices in the conservation of the dry-stone walls which constitute the major physical fabric of the site (fig. 1). This question arises against the background of the scholarship's emphasises on privileging 'western' or 'scientific' knowledgies and conservation approaches[2], often ignoring the local expertise and practices. In this article, I examine and explore the contribution of traditional stonemasons towards the conservation of dry-stone walls at Great Zimbabwe.

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WINNER OF THE SESSION 1

1. Great Zimbabwe World Heritage Site (Source: Author: 2016)

fig. 1

GREAT ZIMBABWE:
A DRY-STONE BUILT CULTURAL HERITAGE

There are more than 360 similar dry-stone built archaeological sites of varying sizes, types and significance, predominately located in Zimbabwe with few in neighbouring countries of Botswana, Mozambique and South Africa (fig. 2). These archaeological sites monumentalise the development of the complex state societies that were established and flourished between 11th and 18th centuries in southern Africa[3]. However, prior to the extensive researches by archaeologists and other scholars from related disciplines, places such as Great Zimbabwe were interpreted as lost civilisation and attributed to foreign authorship[4]. The debate on the origins of Great Zimbabwe

[1] Bent 1892; Hall 1905; Randal-MacIver 1906; Caton-Thompson 1931; Whitty 1961; Bruwer 1965; Gayre 1972; Chirikure and Pikirayi 2008; Huffman and Woodborne 2020.
[2] Whitty 1961; Walker, Dickens 1992; Ndoro 1995.
[3] Pikirayi 2001; Huffman 2007; Pwiti *et al.* 2013.
[4] Bent 1892; Hall 1905; Gayre 1972.

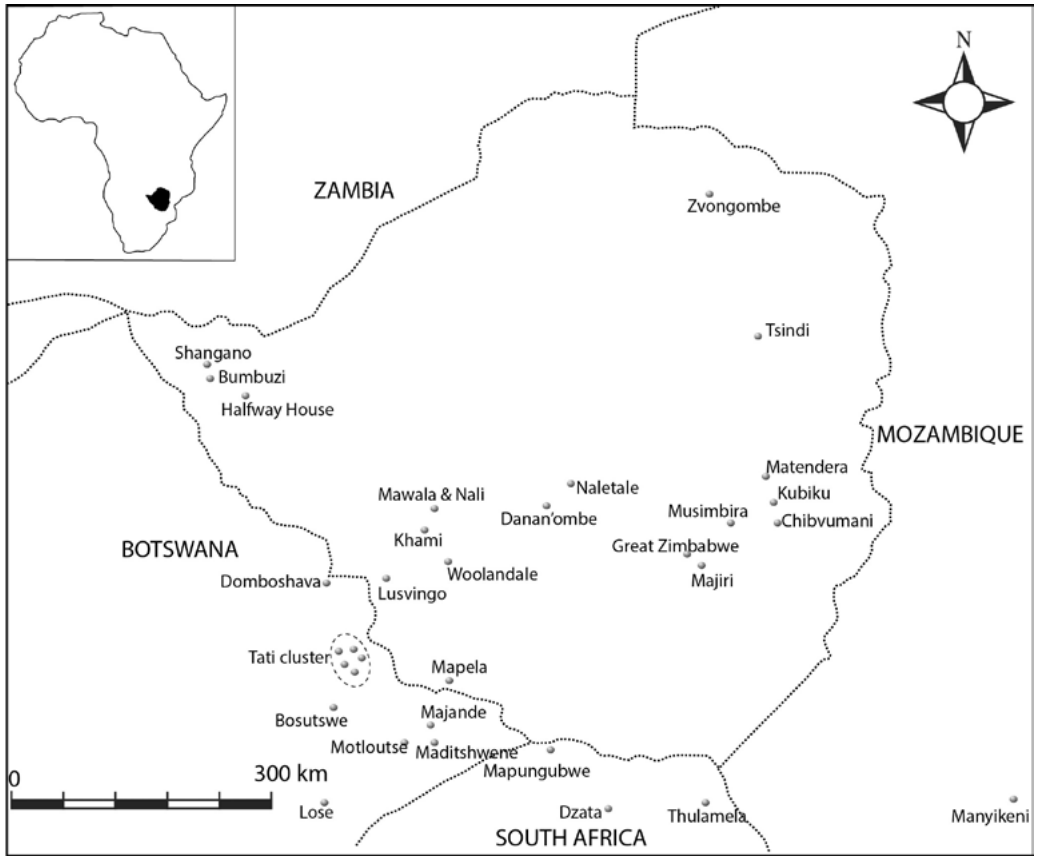

fig. 2

2. Distribution map showing some of the dry-stone built archaeological sites in southern Africa (Source: Tawanda Mukwende, 2020)

culminated in what is best known as the 'Zimbabwe controversy'. Central to this controversy was the question on whether Great Zimbabwe had been built by foreigners such as Phoenicians, Arabs and Egyptians or it was the 'civilisation' of the indigenous people whose descendants are still found in Zimbabwe. The nature and intricacies of the debate on the origins of Great Zimbabwe has been extensively published elsewhere[5]. My aim here is to describe the materiality of the dry-stone architecture at Great Zimbabwe, with focus on the construction materials and walling attributes.

Architecturally, Great Zimbabwe has been categorised into four main zones named the Hill Complex, Valley Enclosures, Great Enclosure and the Peripheral Sites (Chenga, Nemanwa and Mtero). Constituting these different components are dry-stone walls built from biotite granite and quarried from the surrounding bedrock outcrops[6]. These walls which varies in height between 1 and 11m and width of 1-4 m were constructed without mortar or cement. This masonry technique, in which the stone blocks were

[5] Chanaiwa 1973; Garlake 1982; Mahachi, Ndoro 1997; Sinamai 1997.
[6] Dube 1991; Chikwanda 2006.

fig. 3

3. Chevron decoration at the Great Enclosure of Great Zimbabwe (Source: Author, 2020)

interlocked, enabled the stability of the dry-stone walls. There are two types of walls at Great Zimbabwe, the free-standing and retaining walls. The free standing walls were constructed with two facades tied in –between with skilfully packed undressed stone blocks, known as core material. Walls built in free standing typology demarcated space into enclosures of varying sizes. Retaining or platform walls were built with one outer face of coursed blocks, behind which core material was packed as backfill material. Houses built of clay or pole plastered with clay/adobe *(dhaka)* and roofed with grass were built within enclosures and on platforms. Dry-stone walls at Great Zimbabwe were also endowed with decorations in form of monoliths, conical turrets, herringbone and the double chevron pattern (fig. 3).

One common technique, which was shared by the builders of the dry-stone walls, was their skill to in-cooperate natural granite boulders within the matrix of their man-made structures for formulating a symbiotic landscape. At first glance, it can be assumed that the original builders of Great Zimbabwe were guided by a site plan during their construction work. To be able to build the complex enclosures of varying sizes and the matrix of passages, the builders would have worked from a plan. However, previous architectural studies[7] have revealed that the site was built without any preconceived plan but walls were constructed and altered over many years to suit the needs and taste of the original builders. It

[7] Chipunza 1994; Ndoro 2005; Chikwanda 2006.

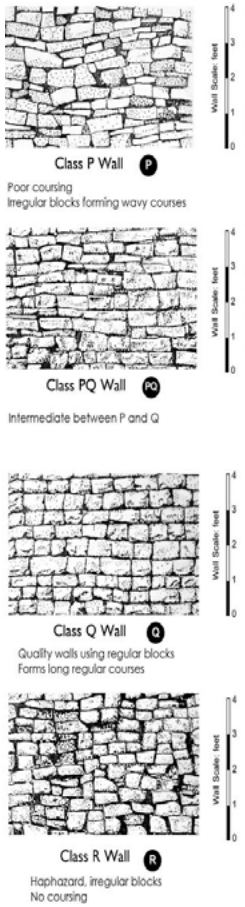

fig. 4

4. Construction styles after Anthony Whitty (1961)

is vital to note that the builders of dry-stone walls did not use any modern building equipment such as spirit levels or builder's line. The original builders would have, however, depended much on their traditional skills and experience to construct the walls.
In 1959, the architect Antony Whitty studied the architecture of Great Zimbabwe and classified the walls into four styles: Poor (P), Poor-Quality (PQ), Quality (Q) and Rough (R) (fig. 4)[8]. Although the differentiating of dry-stone walls into four styles has been questioned recently[9], Whitty's wall classification has been used in recording and documentation of conservation work at Great Zimbabwe and other similar sites. Basing on the shape and size of face blocks, quality of workmanship and general aesthetic appearance, P-walling was built of irregular blocks producing short coursed walls. Quality walling refer to those walls built with rectangular stone blocks laid in relatively even and level courses. Rough-style walling is the one built with irregular shaped blocks that are simply piled and wedged together. In the Poor-Quality style construction characteristics are intermediate between poor and quality walling.
Great Zimbabwe 'ruins', as some would like to refer, continue to serve as an important and sacred place to the descendants of the original builders and to the nation at large[10]. The site is embedded in social, economic, educational and political national values. Speaking during an official opening of the renovated Great Zimbabwe site museum in 1998, the former President of Zimbabwe Robert Mugabe had this to say: «Great Zimbabwe is an important symbol, for it shows this generation what we as a people were capable of achieving. It encourages us to reach for greater heights in our fight to rebuild Zimbabwe. Great Zimbabwe will remain an important unifying symbol that should inspire us to defend our national sovereignty and hard won independence so that we continue to affirm and promote our cultural identity»[11].
Due to these values and other nationalistic considerations, the post-colonial government has been spearheading conservation programmes at Great Zimbabwe as shall be demonstrated in the ensuing sections. International conservation experts have been, and continue to be, outsourced towards assisting the local conservation team in the restoration and other major conservation work at Great Zimbabwe. Recently, in 2019 experts from Italy were engaged to enhance the monitoring system of dry-stone walls. As a result, a real-time automated wall monitoring system has been installed on an experimental basis to operate alongside the regular and general eye monitoring of dry-stone walls, a task that has been manually undertaken by the traditional stonemasons since early 1980s. Thus, in comparison with other similar archaeological sites in the country, Great Zimbabwe is fairly looked after by the state. However, such attention has not eliminated structural problems. In the next section, I briefly outline some of the major problems confronting the dry-stone walls at Great Zimbabwe.

STRUCTURAL PROBLEMS AND CAUSES

Stone, in particular granite, can be considered as one of the most resistant building material. In spite of its durability, structures built of stone such as the dry-stone walls at Great Zimbabwe are not immune to collapses, structural stresses and other conservation problems. These challenges are caused by a myriad of factors that include the weaknesses embedded in the construction techniques, natural causes, animal and human effects. Here I will not exhaust the dry-stone walling's structural problems and their causes, but I will only focus on few major ones. As I have mentioned already, dry-stone walls at Great Zimbabwe were constructed of stone blocks laid on top of each other, without any binding material between the blocks. With time, the roughness of the stone blocks have resulted in formation of voids within walls which cause failure. For instance, core blocks can move within the spaces thereby causing wall instabilities. The use of wedges at some walls has also resulted in structural problems. That is, some of the wedges become fragile and break. Additionally, dry-stone walls were mainly built on unprepared foundations. As a result, some of the structural problems of the dry-stone walls at Great Zimbabwe have been caused by foundation failure.
Animals constitute one of the major threats to the dry-stone walls at Great Zimbabwe. The 720 hectares state-protected estate is home to a large population of monkeys and baboons. Baboons have a tendency of searching for scorpions, roots and other food stuff within dry-stone walls. In the process, stone blocks are displaced and removed, leading to collapses and structural instabilities. Of recent, cattle have also resulted in structural problems at Great Zimbabwe (fig. 5). The barbered wire, that used to enclose the estate, has been vandalised and stolen. During summer season, cattle from the local communities graze within the Great Zimbabwe monument. At the site, the cattle have a habit of 'rubbing' themselves on dry-stone walls, an act that often result in collapses (personal observation).
Being a world heritage site, Great Zimbabwe is the second most

[8] Whitty 1961.
[9] Shenjere-Nyabezi *et al.* 2020.
[10] McGregor 2005; Fontein 2006.
[11] NMMZ File H/4.

fig. 5

5. Cattle grazing within dry-stone walls at Great Zimbabwe (Source: Author, 2015)

visited tourist destination in the country after the Victoria Falls, located on the northern national boarder with Zambia. In a bid for best photographic shots, some of the tourists climb on walls. Although there are signposts and even security personnel who prohibit tourists from doing such acts, the occurrences remain common at Great Zimbabwe. Thus, some top stone blocks topple and in some cases sections of the wall collapses as a result of tourists' activities. All these problems, affecting the dry-stone walls, and many others not articulated here, require effective conservation programmes and approaches.

CONSERVATION HISTORY OF DRY-STONE WALLS AT GREAT ZIMBABWE

The repair and restorations of dry-stone walls commenced with the original builders themselves, who built, restored and maintained these structures[12]. Evidence depicting repair and restoration work by the original builders has been recovered during restoration projects at Great Zimbabwe[13]. As such, the conservation history of Great Zimbabwe pre-dates the colonial era (1890-1980). However, until the mid-2000s, the popular assumption has been that conservation of built heritage in Africa was only introduced by the Europeans in early 19th century. Scholars such as Webber Ndoro (2000) and Elgidius Ichumbaki (2016) argues that African communities had their own regulatory frameworks and approaches to the conservation of built heritage sites. For example, prior to colonisation of 1890, Great Zimbabwe was looked after by the traditional custodians from Nemanwa and Mugabe respectively. The custodians would screen those entering the site based on their purpose, when they want to enter and how. As such, throughout the pre-colonial era Great Zimbabwe was protected through the customary laws and restrictions. The fact that the first Europeans to arrive at the site find most parts intact give evidence for some form of conservation system in place.

The European philosophies and practices of conserving Great Zimbabwe were then firstly introduced in 1902 when Richard Nicklin Hall was appointed curator by the colonial government. Although excavations were not part of his mandate, he undertook extensive but misguided work that ended up being a major threat to the conservation of Great Zimbabwe. Hall was dismissed in 1904. After almost 5 years without direction following the sacking of Hall, the conservation of Great Zimbabwe deteriorated to alarming levels, which prompted the governing regime of that time to commission Frederick Masey, in 1909, to carry out a condition survey of the site[14]. As argued by a number of writers[15], Masey produced one of the earliest credited conservation document for Great Zimbabwe. Amongst a number of recommendations, Masey highlighted the need to reconstruct collapsed walls as well as appointing a resident curator, mandated with the day to day conservation of the monument. On the basis of Masey's recommendations, St Claire Wallace was appointed curator in 1911, and he worked at the site up to 1948. During this period Wallace reconstructed a number of walls: notably, all entrances at the Great Enclosure and the entrance to the Western enclosure in the Hill Complex[16].

After the departure of Wallace, conservation work at Great Zimbabwe experienced a period of moratorium (1950s–late 1970s), a phase of no serious repair of walls and other related conservation measures. Wallace's successors, such as Monroe, Sanders and Hodges, did not engage in any sort of serious restorations or reconstructions[17]. In 1980, political freedom was gained. The country formerly known as Rhodesia was renamed Zimbabwe after this archaeological site, a development which largely activated the post-colonial regime's efforts of

[12] Ndoro 2001; Gutu 2016; Gurira *et al.* 2017.
[13] Chikwanda 2006; Mukwende 2011.
[14] Masey 1911; Matenga 1996.
[15] Ndoro 2001; 2005; Fontein 2006; Sinamai 2013.
[16] Matenga 1996; Ndoro 2001, 2005.
[17] Matenga 2015; *pers.com.*

rehabilitating and developing Great Zimbabwe into a world class tourist's destination. In 1982, Zimbabwe became signatory to the World Heritage Convention of 1972 and, with very limited 'indigenous' heritage experts, the government had to rely on intergovernmental heritage organisations such as UNESCO and ICCROM for assistance. Consequently, the country received a number of technical support and consultants from UNESCO and other international institutions. Of note was Hamo Sasson, a consultant from UNESCO who was engaged in 1982 to examine Great Zimbabwe so as to advise the best ways of conserving the site[18]. Jose Rodrigues (a geotechnical engineer) and Landolf Mauelshagen (photogrammetrist) are also some of the international experts who once assessed the Great Zimbabwe and gave numerous recommendations, with most being adopted by NMMZ.

The assistance that the government of Zimbabwe received from UNESCO and other international well-wishers in the early 1980s for conserving Great Zimbabwe, arguably ushered in a conservation ethos, emphasising the concept of authenticity, encouraging research, publication and employment of skilled personnel in field of archaeology, surveying or engineering in conservation work. For example, a research and conservation centre was established at Great Zimbabwe and officially opened in 1990. This centre, which is still existing, constituted by archaeologists, surveyors, technicians, among others, was meant to promote national and international conventions and protocols of restoration and conservation. As such, the major conservation/restoration projects in this period resonated with these ethos[19].

A number of walls were repaired on the Hill Complex from around mid-1980s to the late 1990s[20]. In 1994 a decision was taken to carry out a large-scale restoration of the western entrance to the Great Enclosure, considering the safety risk posed by a bulge and the apparent misconception by Wallace in 1915 that it was an open entrance[21]. Procedures and processes that were undertaken during that interventive work were consistent with national and international conservation guidelines. For instance, the restoration work was informed by reference to documentation in the archives and books[22]. The application of anastylosis using a colour coding system -to make sure that stone blocks dismantled from the wall returned to their original positions during rebuilding – is testimony of rigorous adherence to the conservation ethic (fig. 6).

The adoption of the international frameworks highlighted above, obliged traditional stonemasons working on dry-stone walls to operate within both national and international conservation

[18] Sasson 1982.
[19] Matenga 1996; Fontein 2006.
[20] Ndoro 1995, 2001, 2005; Matenga 1996.
[21] Matenga 1996.
[22] *Ibidem.*

fig. 6

6. During the restoration of the western entrance to the Great Enclosure, 1995 (Source: Author)

principles regardless of their experience or different opinions they held. More so, the interests of local communities or the indigenous knowledge were ignored at the expense of international guidelines and frames of operation[23]. In this regard, conservation of stonewalls became a highly academic science that could not be comprehended by those who were not 'formally' educated. Local communities were not consulted. Even today fewer attempts have been made to extensively document the knowledge, skills and practices of the traditional stonemasons and their contribution towards the conservation of Great Zimbabwe.

Mupira[24] has noted that, although Zimbabwe has well established methods of conserving dry-stone walling that have been disseminated to other countries in southern Africa, it has not yet developed a home-grown charter specifically meant to guide the conservation of the dry-stone built heritage. This remains a challenge for young and upcoming conservators in Zimbabwe and southern Africa as a whole. The country continues to rely

[23] Ndoro 2001.
[24] Mupira 2011.

more on conventions and charters that were developed for particular types of exotic heritage properties. The degree of applicability may not always reap positive results. Here I argue that the conservation of Great Zimbabwe and other similar archaeological heritage sites should not only be influenced by international frameworks, instead indigenous knowledge system need to be taken on board.

TRADITIONAL STONEMASONRY AT GREAT ZIMBABWE

Stonemasonry is an expansive term that encompasses a wide range of techniques that include quarrying, construction and repair of stone-built structures[25]. To become a stonemason, one has to spend a considerable period as an apprentice, mastering the hands-on skills and techniques of the work that McGibbon[26] described as 'not possible to teach from a book'. Great Zimbabwe is surrounded by four local communities falling under the jurisdiction of Nemanwa, Mugabe, Murinye and Charumbira chiefdoms. Since the colonial to the present, these communities, in particular that of Mugabe (Duma), have been the main source of skilled and experienced stonemasons to work at Great Zimbabwe. This observation is concurred by Ashton Sinamai, an archaeologist who grew up among one of the Great Zimbabwe local communities (Charumbira) and later worked at the site from 1994 to 1998, who noted that;
Amongst the population living around Great Zimbabwe, there is a crop of very skilled traditional stonemasons most of whom come from the Duma (Mugabe) clan, who were the traditional custodians and lived within the landscape. People from other clans have been trained by members of this same clan[27].
Thus, the most skilled and experienced stonemasons to have worked at Great Zimbabwe are those from the clan considered to have a long known tradition of dry-stone masonry.

The dry stonemasonry workmanship is central to Great Zimbabwe's restoration and conservation initiatives and programmes. Following recommendations of Hamo Sasson and other UNESCO consultants, stonemasons have always been part of the conservation team at Great Zimbabwe[28]. In 1982, Ken Mufuka the first 'black' director at the site reported that:

«The preservation of the walls of the Great Zimbabwe was highlighted by the visit of a United Nations expert on preservation. While we await further action from the international organisation on this score, we have appointed a small team of the Vengai (also known as Mugabe) brothers, Edward and Leonard to work under the direction of [...] in a full-time basis. The late Mr Vengai Mugabe (Edward and Leonard's father), worked with Mr Wallace, the curator who first thought of preservation and rebuilding the walls on a grand scale in 1930. The name Mugabe has been associated with dry-stone building at Great Zimbabwe for the last fifty years»[29].

In the post-colonial conservation of Great Zimbabwe, Leonard Mugabe became one of the famous and skilled traditional stonemason, who led in the major restoration work not only at Great Zimbabwe but other similar sites, such as Khami, Matendera, Tsindi, Naletale among others (fig. 2). His younger brother Henry Mugabe has been the head stonemason at Great Zimbabwe until his recent retirement in June 2019. Currently, Daniel Mugabe, from the same clan is one of the Great Zimbabwe's most experienced stonemasons. This trend vividly depicts the hereditary nature of stonemasonry with reference to Great Zimbabwe.
However, in the past, NMMZ, with the assistance from donor organisations, has attempted to enhance the knowledge, skills and practices of traditional stonemasonry through training and workshops. At one point, in the mid-1990s, French consultants were engaged to work with the traditional stonemasons in carrying out major restoration work at Great Zimbabwe. This initiative was however condemned by the local communities as captured in a letter to the editor published in one of the national daily newspapers, *The Herald*, he wrote: «We are very concerned at the state of affairs at Great Zimbabwe. The decision by the government to engage the French to rebuild the ruins is stupid and ill-advised. They should have consulted the elders of the area but we were treated like outsiders. I understand that one wall which they built with cement collapsed showing the supernatural powers of the spirits [...]. We must follow our tradition if we want to prevent the walls collapse [Signed 'Very Concerned']»[30].
Sentiments such as the one expressed above, resonates with the ever increasing ideas that the knowledge, skills and practices of restoring dry-stone walls at Great Zimbabwe should be appropriate to the cultural context to which the site belongs[31].
Among the local communities and many other Zimbabweans, Great Zimbabwe is a sacred place. However, for the state and its agencies, the site is a monument. These different attitudes are exemplified by Webber Ndoro's book title; *The Preservation of Great Zimbabwe: Your monument, Our Shrine* published in 2005.

[25] Dube 1991; McGibbon 2013; Gutu 2016.
[26] McGibbon 2018, p. 10.
[27] Sinamai 2013, p. 106.
[28] Sasson 1982.
[29] NMMZ 1982, p. 23.
[30] Letters to the Editor, The Herald, 24.06.1994, p. 6.
[31] Dube 1991; Chikwanda 2006; Ndoro 2001.

While traditional stonemasons have contributed immensely towards the conservation of dry-stone walls at Great Zimbabwe and other similar archaeological sites in southern Africa, their knowledge, skills and practices is not being recognised in the ever expanding academic conservations literature. Instead, western or scientifically acquired knowledge, skills and practices continue to dominate in guiding the restoration work at Great Zimbabwe and the related sites[32]. There is no clear succession planning to pass the skill from generation to generation. Although around the mid-1990s a stonemason training course was held at Great Zimbabwe. The aim was not to formalise the qualification but to create shared knowledge and establish common ground. In 1999 specialist on traditional techniques of conservation from CRATerre–EAG (France) proposed to train the traditional stonemasons employed by NMMZ on key aspects of the workmanship. The proposal was rejected as it was felt that it was top-down rather than bilateral[33]. NMMZ argued that in fact the Zimbabwe stonemasons had skills to impart to the heritage community rather than the other way round. The inspiration provided by Great Zimbabwe is an organic process. Besides NMMZ and occasional whims of wealth individuals, there is no demand for the skill in the building industry. There is no framework for sharing experience and professional development. In any case Zimbabwe, unlike the neighbouring country of South Africa, for example, does not have a policy for Indigenous Knowledge Systems.

CONSERVING DRY-STONE WALLS USING INDIGENOUS KNOWLEDGE, SKILLS AND PRACTICES

The contribution of indigenous knowledge and practices has mainly been discussed in the context of the conservation of natural resources[34] and less for cultural heritage conservation[35]. Simply put, indigenous knowledge refers to the unique local knowledge gained from past experiences or events which holds cultural practices and tradition of a community[36]. The indigenous knowledge, skills and practices are often stored in the bearers' memories and largely transmitted orally. In Zimbabwe, stonemasonry is a skill and a profession that is embedded in the indigenous knowledge system. There are no formal institutions that train dry stonemasons. In fact, this skill has been inherited from the ancestral builders of the ancient dry-stone built settlements[37]. As such, the development of the skill can be traced back to the 11th century at the time when prototype Zimbabwe tradition walls began to make an appearance. Evidence abounds of ancient quarrying, careful selection of stone blocks, trimming (dressing), construction and repair of walls.

From 2015 to the present, I have been interviewing and interacting with serving, and retired stonemasons who have worked at Great Zimbabwe as well as elders from the local communities. My interest has been to understand indigenous knowledge, skills and practices of conserving the dry-stone walls. Spirituality emerged as one of the philosophies underlying the conservation of dry-stone walls at Great Zimbabwe. My informants from the local communities argued that the spiritual worldview can impact negatively or positively on the material remains of the past. As highlighted by one elder from the Nemanwa local community, walls do not just collapse and when they do, something will not be right within the ancestral spiritual world[38]. *Sekuru* Makasva highlighted that during the time of Vengai Haruzivishe (the traditional stonemason who worked with Curator Wallace) whenever Great Zimbabwe experienced major collapses, consultations were made to the ancestral spirits. In resolving the conservation problem certain rituals and traditional practices were conducted at the site. According to the elders I have spoken to, few of the early European curators at Great Zimbabwe, were respectful of such practices to an extent that during such ceremonies they would remove their shoes, hats and even drinking millet (traditionally brewed) beer. With the intensification and adoption of scientific or western conservation approaches from the 1960s, such indigenous conservation approaches began to fade away.

In addition, the ancestral spirits can convey certain messages through physical signs on dry-stone walls causing collapses or other signs so as to draw attention of the keepers of the site. From the indigenous perspective, Great Zimbabwe is not only about stone walling, in fact it is a shrine amongst the local communities, as already mentioned[39]. There are certain cases when collapsed walls should not be restored. If there is need for that, procedures and process to be presided by rituals and cleansing. Though such approach to conservation is well supported by the locals, within the modern and scientific conservation philosophy such practices are dismissed as baseless theories which do not add value to the conservation of dry stone walling heritage[40]. In fact, when elders advocate for such ideas to be fused in the current conservation of Great Zimbabwe and other similar sites, they are quickly labelled 'trouble makers' with unending demands by the educated curators (personal observation).

The spirituality of dry-stone architecture at Great Zimbabwe

[32] Gutu 2016; Mukwende 2011; Mupira 2011; Gurira *et al.* 2017.
[33] Matenga 2015, *pers.comm.*
[34] Lingard *et al.* 2003; Mapara 2009; Sasaki *et al.* 2010.
[35] *Traditional conservation practices* 2005.
[36] Nkwanyama 2018.
[37] Sinamai 2013.
[38] Makasva 2016; *pers.comm.*
[39] Ndoro 2001; 2005; Fontein 2006; Chirikure, Pwiti 2008.
[40] Fontein 2006; Pwiti 1996.

was well captured by Kundishora Tungamirai Chipunza, (current NMMZ's chief curator) when making a presentation during the stakeholders' meeting that was meant to discuss the management plan of the site in 2011. Chipunza, who worked at Great Zimbabwe in the early 1990s, highlighted that during his time at the site when there was peace, harmony and unity in the country, the conservation team would rarely encounter wall collapses within the monument. But the moment when there will be unrest, economic or political upheavals, numerous wall collapses would occur during that period. This was an observation that was made through time, even the current stonemasons were testifying the same in the discussions and interviews that I had with them during my fieldwork. This then shows that an appreciation and understanding of indigenous knowledge system is important in conserving Great Zimbabwe.

With retirement, death and other unforeseen consequences, Great Zimbabwe and the nation at large continue to loose skilled and knowledgeable stone masonry practitioners. In the absence of regional, national and even local skills transfer and developmental infrastructures, there is danger that the knowledge and skills critical in the restoration and conservation of dry-stone built archaeological sites may fast disappear. Against this background, there is need to engage the current stonemasonry practitioners, state heritage agency and other stakeholders in finding sustainable means of preserving and promoting indigenous knowledge, skills and practices of conserving dry-stone built architectural heritage.

CONCLUSION

Conservators and heritage managers of dry-stone walled monuments in southern Africa have so much to gain from recognising and in cooperating in their work with indigenous knowledge, skills and practices of the traditional stonemasons. The traditional stonemasons need not only to be regarded as 'labourers' but as intellectual partners in the conservation of Great Zimbabwe and other similar monuments dotted around the country and the neighbouring countries of South Africa, Mozambique and Botswana. I have argued in this article that in the academia, traditional stonemasons have not yet received the same degree of status afforded to the western conservation knowledge bearers. Some conservators have questioned the extent to which indigenous knowledge, skills and practices should be permitted to exert authority over scientific conservation practices[41].

[41] Bruchac 2014.

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Basing on the findings of this study, I conclude that the educated curators, surveyors and intellectuals have pounder and imposed their voices on traditional 'uneducated' stonemasons. The silent voices of stonemasons in the conservation academic literature of Great Zimbabwe revolve around power differentials between curators and stonemasons. It is power politics of the people who are formally educated and those that have traditional knowledge. Conservation is about making choices and solving problems – making correct decisions which timely solve problems. The future conservation of Great Zimbabwe requires active participation of the traditional stonemason from the planning, implementation as well as dissemination of conservation information. This article is not advocating for the confining of the conservation of Great Zimbabwe to the traditional masons, instead it is calling for the inclusion of their narratives in the conservation literature of the dry-stone built heritage.

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DIGITAL TECHNOLOGIES FOR AN OPEN CULTURAL HERITAGE

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INTRODUCTION

The contribution aims to discuss the use of digital technologies within the field of conservation for improving knowledge sharing (of ideas, projects, data, etc.) and connection towards innovation, dissemination, and transparency. It also explores conservation theory and practice in the context of a technocratic paradigm shift in our "Digital Era", which is sharpened through this current pandemic and marked by changes to the profession increasingly relying upon remote working – especially in time of physical distancing. Digital and information technologies enable countless opportunities of sharing and connecting – ideas, projects, data, information, etc. – and several processes benefit from these opportunities in terms of dissemination and openness. We believe that also conservation might adopt a digital perspective, catching the opportunities it provides in terms of accessibility, knowledge sharing and public engagement. Starting from the consideration of the current instrumental use of technology in the conservation field, we propose to drive the attention on the implication of using it to enhance public engagement and participation in the phase of identification of

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cultural objects' value and in the decision-making process about how, when and why to conserve it.
In line with the Faro Convention (signed in 2005, ratified in Italy in 2013), we believe that conservation is firstly a matter of care that should be as shared and collective as possible[1].
Digital technology can be a unique tool for listening to people's needs, creating connection between their opinions, and aggregate them in communities of interests, which can then be transformed in communities of care for cultural heritage.

DIGITAL TOOLS FOR HERITAGE CONSERVATION: THE STATE OF ART

Cultural Heritage – and its conservation – is a crucial asset for societies' growth (Faro Convention, 2005). The relationship people may establish with cultural objects plays a very important role in building the identity of a community and strengthening its sense of belonging to a place. The issue of conservation should be acknowledged and taken over by a wider public, to improve people's contribution in defining the objects' values for and within communities[2]. In order to perceive and preserve the interrelation between cultural heritage care and communities, nowadays conservators and restorers are required to have social skills, not only technical competences[3],since they should engage public in a socially and financially sustainable approach to heritage protection and preservation.
In the last years, accessibility to cultural heritage and related issues have been supported by various EU projects in the framework of 2020 Horizon program, with the aim of discussing and refining the concept of Digital Cultural Heritage connected to public engagement. Part of results and ongoing projects were presented in 2018, during the European Year of Cultural Heritage. The annual event has been an important moment for debating about what cultural heritage is and how to handle technological issues in its respect. Digital innovation for Cultural Heritage has been a key concern in 2018 for researchers, stakeholders and non-professionals who gathered to talk about cultural heritage and cutting-edge technology[4].
The concept of digital heritage has been increasingly explored in recent years, especially with regard to techniques of documentation and audience fruition[5]. Along the past years, museums have been transformed in places of interaction[6] employing a number of digital technology tools in order to tell stories about museum contents and their biography, offering interaction with objects and enhance the visitor's personal experience[7]. Moreover, by transferring the collections on the web, in the form of virtual tours or digital open archives, cultural institutions tried to adapt the current mode of fruition to digital transformation, bringing the visit out of the museum. Nowadays visitors can view digitized artworks and explore reconstructed museums' environments directly from their smartphone at home or anywhere else. We can count on a lot of experimentations and applications of technology in digital heritage fruition. Scholars and specialists have investigated number of case-studies about technical topics, mostly addressed at the practical considerations on the use of technology[8].
As well as talking about digital heritage, it is time to set out a discussion on tools and methods for digital heritage conservation, so to avoid the risk of compromising the value of our cultural heritage. Conservators and restores must translate their operational processes in digital terms and therefore also modify its main goals. They should define a theoretical framework to improve documental workflows, as a prior step for opening the conservative process out of the traditional laboratory and putting into practice the concepts of sharing and openness that characterize the "Digital Era".

AN INNOVATIVE THEORETICAL WORKFLOW TO ENGAGE PUBLIC IN THE CONSERVATION PROCESS

The practical responsibility of conservators is clearly evident in the current state of cultural heritage: they are still poorly attuned to the need of adopting digital tools to improve their work. Nowadays, conservators and restorers must learn to use digital methods and focus on opportunities that ICTs can offer in terms of outreach and public engagement. We know that conservation should build, preserve and transmit the identity of a Country. In the last decades, it also assumed the crucial task of transforming cultural identity in a valuable asset for countries' social and economic growth. Conservation discipline may adapt to the paradigm shift sparked by digital technologies, by reshaping its ethics and practice and including in its goals that of enabling the process of sharing and connecting different cultural identities, at a micro and macro level. In practical terms, a review of the traditional workflow is required aiming at the improvement of public engagement in some phases of the conservation process. The conservative process starts long before the practical restoration intervention. Analyzing each phase before and after the physical restoration, we can outline five sequential steps:

1. Fundraising / Financial phase: each restoration project needs to be funded and most organisations need to find sufficient money to start

[1] Art.1.b – *Convention on the Value of Cultural Heritage for Society*, 2005.
[2] Saunders 2014.
[3] Jones 2019.
[4] Lykourentzou, Antoniou 2019.
[5] See the proceedings of three international conferences on Digital Heritage: Marseille, 2013; Granada, 2015; San Francisco, 2018.
[6] Lo Turco, Calvano 2018.
[7] Greco 2019.
[8] Santana Quintero *et al.* 2019.

the work. In many cases, this phase is the real spark for the process to start. Funds can be raised from many sources by using different methods, not only public funding.
2. Project / Design phase: it is the first operative phase, during which restorers should use their knowledge and experience. The project is usually a written sequence of technical operations.
3. Restoration / Operative phase: the core event, during which the restoration takes place. This is a very technical phase, characterized by a number of practical operations and different kind of technical applications.
4. Maintenance / Conservation management phase: for restorers, it is the last step of process, in which they design a specific technical project for environmental conservation and suggest some practical routines.
5. Fruition and use: audience fruition can be thought of as part of the conservative process, because it is not only the final goal but also the first step for people to reappropriate of a piece of their cultural identity. It is crucial for raising awareness of an object's value for a community and for society at large.

Today, the actors of each mentioned phases can be both private and public. In Italy, for instance, we have some Foundations, Associations and Museums which are trying to open out one or more stages of conservative process. In particular, we can point out two crowdfunding platforms, totally targeted at art conservation: pArt and loveitaly.org. These can be taken as models, because they involve people in the first step of the workflow, i.e. the financial one. They are based on a typical e-commerce mechanism that allows an easy fundraising campaign for restoration projects, calling on the active participation of all Italian art lovers.
Also for the last step of the analyzed workflow there are examples of public engagement via technological tools. Just think of digital museums or virtual setting of exhibition: these are all endeavours of involving the audience in the visit, as already explained before.
But that's not enough. To adopt an innovative approach to digitalization it would be important to open each step to the public, so to connect people to cultural heritage and its care[9]. We start from opening the documenting process by adopting innovative technological tools, so to set the stage for an open digital, shared and collaborative care of cultural heritage. By picking up this challenge, we may develop a "conservation in action"[10], enabled by the use of digital tools which, in turn, enables connection, sharing and collective participation. Ezio Manzini, a design theorist committed in social innovation, suggests that what he calls *hybrid local communities* can mark out a road towards the use of «the net to do something together even in the real world»[11], enabling people to catch the opportunities for connecting with places they belong to and taking care of them. Cultural heritage is interlaced with communities and places, and as such it can be involved in this digital transition if we are able to establish a healthy and well-balanced relationship with digital technologies also in this mostly traditional and analogic field[12].
Thanks to digital technologies, conservators can easily interface with the public at any moment. Through a systematic and scientific documentation, he/she can narrate his work, explaining each decision about how, when and why intervening or not. The results of a documental process can be told as a story, a narrative to be shared within a community, that generates social cohesion around a common interest. This could mean benefiting from the possibilities – enabled by digital technologies – of improving open decision making processes, listening to people's opinion and integrating them, engaging public all along the different steps of conserving cultural heritage, from the beginning to life-long actions of care[13].

CONCLUSIONS

Public engagement and collaborative practices in cultural heritage conservation has the double effect of strengthening the sense of belonging and sharing the built of the identity of a community of people interested in taking care of it[14]. Digital technologies are leading a transition in almost every field. Technology can be used to aggregate people, instead of isolating them. As Viola and Idone Cassone say: «Digital technologies and web led us from a concept of collective as mass to an idea of collective as a network»[15].
Interestingly, Ezio Manzini, reflecting upon the cultural transformations brought by the pandemic and the spreading of online activities, writes: «a large number of people have been forced to overcome the threshold of practical and psychological difficulties in the use of digital technologies in fields previously not practiced. As a result, once the initial practical and/or psychological difficulties are overcome, many are discovering that these online activities can be easy, efficient and sometimes fun. [...] The result is that, if nothing else happens, in the name of this convenience (that is, in the name of the search for a frictionless and effortless daily life), society will continue its march towards self-dissolution in a myriad of individuals, so connected how lonely. A society of more isolated people (less relationships between them, that is, more individualization), more detached from the places where

[9] Konsa, 2015.
[10] Brooks, 2013.
[11] Manzini, 2020.
[12] Art. 14 – *Convention on the Value of Cultural Heritage for Society*, 2005.
[13] K. Cook, G. Hill, 2019.
[14] Baratin *et al.* 2017; Art. 8 – *Convention on the Value of Cultural Heritage for Society*, 2005.
[15] Viola, Idone Cassone 2017.

they live (less relationships between people and places, that is, more virtualization) »[16].
All of this can be said also as respect to cultural heritage conservation, acknowledging the importance of sharing interests and connecting people towards collaborative actions of care[17]. This contribution tries to point out a line of research about the increasingly important topic of ICT for conservation, providing a critical perspective on how to use digital technologies in phases of the conservation process where they are not usually adopted. We are still in a developmental phase. We can't still speak about a method, though we can do some approaching steps to follow the evolution of the available tools for conservators and use them to improve our results.
Finally, we are convinced that a future research perspective should face the challenge of rethinking the traditional conservator's role as the one who can bridge the gap between the physical and virtual worlds, where involving and engaging non-experts, e.g. in the process of documentation, will become increasingly important in setting the stage for an 'open digital heritage'. If the "Digital Era" has changed our attitude to the material and physical aspects and we are more knee to virtual experiences, we still need an offline relationship with things. Conservators, with their highly specialistic manual and material competences, can bridge the gap between physicality and virtuality.

[16] Manzini 2020.
[17] Szmelter 2013.

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CONSERVATION OF DEVOTIONAL HERITAGE IN THE GREATER MEXICO CITY AREA

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Since 2016, Claudia Alejandra Garza and Naitzá Santiago, who both graduated from the National School of Conservation of Mexico, have led projects to conserve the religious heritage of several churches on the outskirts of Mexico City. These works have been part of the Conservation Plan of the Archdiocese of Tlalnepantla, a Catholic administrative unit of six municipalities in greater Mexico City. The territory of these six municipalities covers 682km^2 and has 4 million inhabitants.
The Archdiocese of Tlalnepantla was founded in 1964; before this year, the whole territory came under the Archdiocese of Mexico. Due to population growth it was necessary to split the territory and found a new Catholic diocese. The administration of Mons. Carlos Aguiar Retes, archbishop from 2009 to 2018, sought to include laypeople committed to pastoral work and from more specific fields, to make the most of professionals and specialists who could serve the archdiocese. Consequently, for everything related to sacred art and its conservation, it was decided to grant a conservator an official position. This position then gave the person authority over the priests when it came to the care and conservation of the cultural heritage.

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The archdiocese already used the Prospective Methodology applied to pastoral care; therefore, it was decided to apply this to the field of cultural heritage too. The strategy was to translate this archdiocese-led pastoral methodology into global cultural heritage guidelines, in order to speak the same language with the priests. The plan included: identification and analysis of the situation model, assessment of the conservative condition of each artwork, definition of the ideal situation to be reached by envisaging the condition that the heritage item should have, development of a diagnostic and analytical protocol aimed at detecting the main problem, and preparation of an operative plan to reach an ideal condition.

The situation model from which we began was that forty out of the 203 churches within the archdiocese were built during the viceregal period and housed artworks belonging to the cultural heritage to be preserved. Within these forty, fourteen were built in the 16th century, while the remainder date back to the 17th and 18th centuries. These buildings house numerous artworks, including: easel paintings, polychrome wooden sculptures, altarpieces, liturgical vestments and sacred vases (fig. 1).

We began our analysis of the artworks' condition from an inventory compiled some years earlier.

All the actions of the operative plan were aimed at achieving an ideal model which entailed visualizing the goals we wished to achieve. This approach to the conservation of the archdiocesan cultural heritage could only be realized by instilling a new culture of conservation among the professionals, clerics, and members of the general public who frequent these sites, including bishops, priests, church workers and communities.

Considering the distance between the starting point – the situation model – and the goal we wished to achieve – the ideal model – we focused on the need to carry out a diagnostic campaign, a conscientious analysis protocol which would help us in two ways: to detect the obstacles, namely the fundamental problems which could prevent us from achieving our ideal model, and to identify which artworks were in a grave state of repair.

The diagnostic model then indicated the essential actions and individual steps to be carried out. This was our 'operating model' and involved the planning of specific actions needed to answer the questions of *how*, *when*, *where* and *why* we should achieve our ideal model.

From this diagnosis, we understood that the main problems were inadequate previous interventions carried out by people without a Degree in Conservation. We know that this not only happens in Mexico, but is also an international problem which ought to be

1. Interior of Tlalnepantla Cathedral

fig. 1

2. Half face of the sculpture cleaned

fig. 2

3. Madonna after treatment

fig. 3

regulated, as shown by such well-known international examples as that in Spain with the *Ecce Homo* in Borja, the *Saint George* in Estella, and more recently what happened with the copy of a work by Murillo in Valencia.

The operative model covered actions carried out to overcome the fundamental problem, so that, even if the main problem might not be wholly eradicated, useful actions could slow it down or delay inadequate interventions. The first step was preventive and included a plan to increase historical, artistic and technical knowledge among new groups of seminarians, with the long-term goal of educating future priests about the history, preservation and conservation of sacred art.

Other activities included the execution of professional conservation projects for artworks in a dire state. The priests who look after the artworks were the ones who requested their restoration. So far, we have restored forty-seven cultural assets, consisting of: twenty-two easel paintings, three gilded altarpieces, and twenty-two polychrome wood sculptures, all of them located in parish churches and with important devotional functions for the archdiocese and the communities. We have also taken steps to inform the public of the importance of the conservation works carried out: we have given conferences and talks to the communities and shared posters, among other things.

In this paper, I want to discuss how we were aided by the archdiocese's methodology in conservation of the cultural heritage kept by the Catholic Church. I will also go deeper into the appraisal and conservation of two polychrome sculptures with an important devotional value, both of them having undergone earlier inadequate interventions. These sculptures are a Crucifix crafted in the 16th century from corn cane and *Our Lady of Los Remedios* which is a sculptural group formed by the Virgin and the Child Jesus, and is an image which arrived in Mexico along with Hernan Cortes' soldiers in 1519, being the first sculpture of the Virgin Mary in the newly discovered continent.

The first case study was *Our Lady of Los Remedios*: this sculpture had been completely transformed by a series of interventions which concealed part of the polychromy, as well as by degradation phenomena visible as surface lacunae and abrasions arising from uneven deterioration, largely generated by the work's three-dimensionality, but also its historical vicissitudes. At a first glance, two types of interventions could be identified: overpainting and retouches which covered particular areas of deterioration (fig. 2).

4. Crucifix after the restoration

fig. 4

From the oral tradition – since no reports exist – and historical photographic records, it is known that the sculpture saw interventions on two occasions, however, it cannot be ruled out that it has seen even more interventions, due to the important devotion which the *Madonna of Los Remedios* has enjoyed since the 16th century[1].

The first recorded intervention, which coincided with the 400th anniversary of the possible discovery of the Virgin, dates to somewhere around the 1940s; what operations were carried out is unknown, however it is clear that the sculpture received various layers of paint, especially on the flesh parts. Considering the epoch of the intervention and the appearance of the surface in the photographs, use of an oil-based paint is highly likely. The face of the Virgin appears with softer features and smoother skin tones. Given that this is an image of some importance, it is likely that good quality materials similar to the originals were used, however, it is not possible to define the selection criteria because of the overlapping of paint layers belonging to the subsequent intervention, carried out in the first decade of the 21st century.

In the last intervention executed, the piece received new layers of paint: the appearance of the flesh of both the Child and the Virgin was modified yet again, changing the features, volumes and texture. This intervention created a waterproof plastic film which inhibits the passage of moisture but also the natural movements of the sculpture's organic support, causing even more damage due to the accumulation of paint layers of such different kinds.

Both interventions covered over the original polychromy and modified the general appearance of the work, hiding the aesthetic and historical values of the Virgin and causing a sense of perplexity among those who knew her before.

In addition to the pictorial additions, this artwork has undergone modifications of the volumes, such as the hands and face whose form has become misshapen.

The purpose of our project was to carry out a material investigation and restoration of *Our Lady of Los Remedios.* The various steps grew out of the material analysis and the historical links, while the intervention was guided by the ethical guidelines of the professional conservation of cultural heritage[2]. The restoration was made possible thanks to the sum of efforts of the various entities involved (fig. 3).

The second case study is a lightweight sculpture made around 1590, representing The Crucifixion; it is made from corn cane, coral tree wood, amate paper and linen. The sculpture had areas of deterioration which affected both its aesthetic value and stability[3]. The sculpture presented overpainting which had entirely covered the original polychrome, pastes, and other interventions on the support. These retouches had affected its stability since they did not allow the constituent materials to breathe adequately give that they are hygroscopic. They also hid the original layers and completely modified the original colours, form and surface texture of the Christ.

Moreover, the right arm was completely detached and the left one was close to falling off. These examples of deterioration stopped the Christ figure from taking his original position on the Cross, leaving him in a different position from the one he'd had in the 16th century as a crucifix. The aforementioned defects were caused by a modification which the Christ figure suffered in the late 20th century: the shoulders were cut off and cedar joints, later covered with leather, were added. These joints modified the original image of the Christ and also affected the earliest stratigraphy, revealing evidence of past biological attack by both insects and microorganisms.

The project to conserve the Christ figure focused on restoring the sculpture's stability and the correct legibility. In addition to structural stabilization, the aesthetic part was addressed by eliminating the overpainting which had completely modified the visual value of the sculpture. Likewise, considering that the cross was considered no longer adequate in terms of material, size or shape, a new cross was made with the aim of allowing a better preservation of the Christ figure (fig. 4).

Thanks to these conservation projects, we have strengthened our relations with several stakeholders, including civil and religious authorities: from the National Institute of Anthropology and History in its role as state protector of cultural heritage to parish priests as custodians of these works, and the communities involved with the works. We have also strengthened our relations with several professionals in the field, including historians, art historians, chemists, biologists and radiologists.

I would like to insist on the importance of sharing knowledge and experiences in forums like this one which allow us to share experiences and learn from other conservators from around the world. These activities have enriched us not only as individuals but also as a guild.

[1] For more information about *Our Lady of Los Remedios*: see Granados 2012.
[2] *The COREMANS Project* 2017, p. 30.
[3] These kinds of sculpture have been studied in depth by Dr. Pablo Amador: Amador Marrero, 2012.

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CONSERVATION PRACTICES BETWEEN PAST AND PRESENT

AN INTEGRATED APPROACH ABOUT CONSERVATION DECISION-MAKING CHALLENGES

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The research spotlight on how changes in time, resources, and institutional practices reflect on the way we approach objects in conservation. Objects and their materials change over time, and conservators have to understand and identify the significance of changes on objects and practices. Conservators' roles are to try to understand mechanisms of changes that occur on objects and how these changes can be slowed down or minimized. Conservation treatments cover change for the object, and conservators have to consider the long-term implications of their treatments. Development of conservation practices and changes of methodologies over time have to consider which can improve decision-making in determination of the future of objects.
The research discusses the previous intervention and present conservation of collections discovered in the tomb of King Tutankhamun during 93 years, as it relates to conservation decision-making. The role of previous intervention, display and storage in preserving objects is one of the research points. Chosen case studies from the tomb of Tutankhamun, these cases give clear information about an object's life after first intervention, and also in display and storage since its time of discovery in 1922 until now, which can cover many changes in object's life, the reasons for these changes, and how conservation treatments approached these changes. Alfred Lucas was the first one to deal with the conservation of objects from the tomb of Tutankhamun, and it was important to read about these previous interventions before considering any future treatment. Lucas wrote notes about his work, which was done on some of the objects from the tomb of Tutankhamun. The Grand Egyptian Museum GEM will host Tutankhamun collections for permanent display.
The research make a comparative study between the scientific methodology and the practical application of treatment and conservation processes by comparing the practices of Lucas and Carter to the collections discovered in the tomb of King Tutankhamun in 1922 and the recent practices that are currently taking place within the Grand Egyptian Museum-conservation center GEM-CC applied to some organic objects. Based on an extensive research of past intervention made by Alfred Lucas in the time of discovery of Tutankhamun's tomb 1922 and how this intervention considered now a part of objects history and lead the present methodology of conservation to think more about it as not just a previous intervention.
Although the aim of conservation is always the same to preserve the objects the methodology of conservation can vary according to time period, institution, conditions, and materials. Conservation methods and materials might also differ according to what we need to preserve from the collection and why. Some reasons can limit the intervention, such as the condition of the objects, materials' availability, museum budget, previous intervention and also the experience of conservators. It is impossible to separate past methods of treatment and conservation applied on an object from modern procedures and practices, because previous interventions have a cumulative effect, meaning they are affected by the same factors surrounding the impact of the objects and may increase or decrease the object's vulnerability to damages.
Study of the previous intervention work on the objects is of one of the most important steps that will help to better understand the future conservation methodology as well as assess the success of these practices. Reading about previous intervention applied on objects refers to the importance of documentation of conservation work that is applied on objects. The decision in conservation must be based on scientific and technical

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information such as examination, analysis and previous historical studies. These means may not be available and the decision of conservation may be based on the condition of objects that require quick intervention in order to stabilize their condition first. The conditions and conservation practices can differ from museum to another, as some museums support minimum intervention ethics and other support advanced treatment.

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THE RESTORATION OF THREE CONTEMPORARY PLASTIC MASKS

STUDY, PROTECTION AND ENHANCEMENT

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INTRODUCTION

An event held at the Museum of Civilization[1] in Rome afforded an opportunity to identify, in the repositories of the "Lamberto Loria" Museum of Folk Arts and Traditions (MATP), three plastic carnival masks which needed restoring (fig. 1).
The three objects of this study entered the collection in the 1970s, as bearers of demo-ethno-anthropological (DEA) interest, passing from mere objects of everyday life to witnesses of cultural values. Their origin, related to serial production, is linked to their use in popular carnival celebrations and to the socio-cultural changes which they evidence.

USE AND DEGRADATION

Documents kept at the museum and the Central Institute of Demo-Ethno-Anthropology (including a volume of inventories, documents on the donation of the masks, a publication by Prof. Rossi on the rituals of the popular carnival in Campania)[2] and the discovery of the production catalogue of the masks dated 1975, helped attribute the three masks examined to the 1970s. Through research in the modern photographic archive and

[1] The Museum of Civilization was established in September 2016 following a reorganization of the MiBACT by the Minister Dario Franceschini. Currently, the Museum of Civilization is directed by Filippo Maria Gambari. The Museum's conservators are Maria Francesca Quarato (responsible for the Conservation and Restoration Laboratory), Alessandra Montedoro, and Serena Francone.
[2] Rossi, De Simone 1977.

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fig. 1

1. The Ox (inv. no. 88637); Old Woman (inv. no. 88638); Clown (inv. no. 88639): general photos before the restoration work (© Museum of Civilization).

contacts with some collaborators of Annabella Rossi, the masks were traced to the Avellino town area.
The anthropologists analysed the rites of the popular carnival in Campania during that period, discovering that masks were used without any particular care being taken: the masks in question were extremely cheap, bought from a stationery shop, and worn tied to the face. The fixing system was made in the coarsest of ways, with string or elastic knotted or fixed with staples or adhesive tape, which had been used again when the masks broke or tore (fig. 2). The present forms of degradation were then analysed, discerning three main causes of damage, related to use, improper storage, and the natural ageing of plastics manufactured to have a limited lifespan.

GUIDELINES FOR CONSERVATION TREATMENTS

The conservation focused on ethical reflections about quality and methods, considering many aspects, including the historical and geographical origins of the case study.
In fact, restoration of DEA objects usually requires a critical evaluation of certain ethical choices related to their rituality, history and purpose. A study of best practices represents a further point of view from which these assets can be observed and studied, which justifies even more the essential importance of regular interdisciplinary discussions with all varieties of museum professionals.
The material of these objects is linked to a specific historical period and involved serial production using low-cost synthetic materials which have been researched and analysed. The ethical

fig. 2

2. In the red circle, the adhesive tape used to stick the hair to the plastic. Modern photographic archive of the ICDe. Photo inv. no. 81961. Photo by A. Rossi, 03.03.1974, Montemarano (AV). Publication authorized by the Central Institute for Intangible Heritage – MiBACT.

approach was based on painstaking research into the historical and cultural meanings and studies of the behaviour of the constituent materials.
The composition of the plastic material was analysed using chemical investigation (FTIR) and the manufacturing technique was reconstructed through interviews with the producers and by consulting original catalogues. Evaluation of the state of repair allowed planning of a conservation intervention which could improve the structural properties of the whole object along with preservation of the signs related to the usage of which these objects are bearers. Beyond the established intervention methodologies, which respect criteria and guidelines that are valid for all artistic artefacts, this particular collection required a deep evaluation of the forms of deterioration, since certain signs need to be left as bearers of further meanings. Such a selection can prove difficult, considering that every sign and cultural meaning is closely linked to an object's history and therefore any selection becomes highly case-dependent. Specific evaluations become indispensable to recognize these and to establish conservation methodologies according to their historical or anthropological nature. For this reason, the conservation of the three masks began by analysing each form of degradation and questioning its intrinsic value (tab. 1). To plan a conservation project, distinguishing the forms of degradation is a useful way to highlight intervention priorities: deterioration related to structural problems takes precedence over that affecting the aesthetic value only. Certain formal aspects were sacrificed and not treated in order to respect their significance, while the structural integrity needed remedying to physically preserve the objects. The origin of the damage was considered, analysing the various causes which might have provoked the degradation such as: usage, the fragility of the constituent material, and musealization with incorrect handling and storage.
This first schematization, related to the nature of the present deterioration, allowed a more critical view of these plus the compiling of a summary assessment rating regarding their maintenance or recovery. The surface abrasions and scratches can be attributed both to the original usage and to their museum life, while the traces of adhesive tape were normally related to repairs during usage: in any case, all of these had resulted in a modification of the aesthetic reading of the artifact, without compromising the structural integrity. On the contrary, the deformations, lacerations and lacunae represented phenomena linked to the stability of a plastic support: from

3. Traces of adhesive tape.

fig. 3

the perspective of conserving these objects they marked high-risk areas. In fact, considering the thinness and stiffness of the constituent material, the slightest bending of these objects can cause a breakage, something particularly critical for routine maintenance and when handling in the repository or display areas.

	Aesthetic value	Structural value
Lacerations		X
Shortcomings		X
Deformations		X
Abrasions	X	
Scratches	X	
Traces of duct tape	X	

Table 1. Deterioration forms and values

From this initial analysis, an intervention was deemed necessary for the lacerations, lacunae and folds; instead, the choice was deemed not obligatory for the abrasions and scratches, nor for the traces of adhesive tape: appraisal of whether to intervene or not was based on an interpretation of the causes of the deterioration.
With reference to these, among the aesthetic damage, the traces of adhesive tape (fig. 3) were the only one considered a clear sign of usage and, if preserved, would not constitute a future problem for conservation[3] of the objects. Those forms of degradation representing a high risk to the structural integrity of the objects, such as lacerations and lacunae, were remedied; the methodological approach was designed according to the cardinal principles of

[3] From studies by Antonio Mirabile within the European NanoRestART project: 2018 workshop training course on pressure-sensitive tape removal.

4. Rendering of the museum layout for the three masks.

fig. 4

Restoration Theory (reversibility, recognition, stability, minimum intervention) and, above all, allowing future reversibility.
Localized treatment of the small areas of deformation, using spatulas heated to 100°C, was successfully carried out on the objects' surfaces, after positive results from preliminary tests. All operations were tested beforehand on a newly produced PVC mask used as a control. For the largest areas, the same kind of damage was left untouched because of the high risk of the intervention.
On the mask of the *Ox,* the abrasions and scratches of the polychrome surface required deeper analyses and reflections: since the scratches and abrasions had an aesthetic value only, it was possible not to intervene on this problem. Moreover, the uncertain causes of this deterioration led to some evaluations of the various intervention choices.
An analysis of typical carnival rituals, documented with great thoroughness by the anthropologists, did not reveal such signs as significant traces of their usage. On the contrary, the many years of incorrect storage could explain the formation of abrasions in the mask of the *Ox* because of its almost imperceptible, extremely fragile layer of printing ink. Given that they were visually disturbing, the abrasions were treated in the retouching phase. In fact, these objects are material evidence of an immaterial asset, rather than ritual objects which present signs of propitiatory gestures. No special magical-ritual acts had been performed on the masks nor had they been used in a particular way. The abrasions were not related to rituals; the masks could be used as new or damaged without distinction. Finally, an additional motivation was provided by the aesthetic features of the mask of the *Ox* which were particularly remote from the other two.

The factors which helped to define suitable treatments for the abrasions and scratches were:
· Lack of certainty over the causes of the degradation;
· No evidence of significant ritual signs;
· The purely aesthetic nature of the abrasions and the scratches (not related to structural changes);
· A discrepancy between the conservative conditions of the *Ox*, with its polychrome finish compromised by abrasion, and the other two, the *Clown* and the *Old Woman,* where the coloured film was perfectly preserved, probably thanks to its greater thickness.

DISPLAY AND ENHANCEMENT

Knowledge of the immaterial context to which the masks belong was vital in organizing an appropriate conservation project and ensuring optimal fruition. Documentary research geared to demonstrating cultural value becomes a fundamental, indispensable step to enhancing knowledge and comprehension of DEA objects, otherwise their inner values can easily be underrated. The three plastic carnival masks documented by Annabella Rossi are significant examples of the importance played by an appraisal of values related to an immaterial context within a conservation project. Various gestural, sonority, geographic and urban contexts constituted key issues of the preliminary study, useful to design and enhance the eventual fruition of the objects.
The Tarantella dance of Montemarano (Avellino) represents just one example of a methodology of research in archive documentation: from among all the documents found, the gestural descriptions and musical transcriptions collected by the anthropologist Prof. Rossi were extrapolated as examples. The information collected allowed a definition of the fundamental dance movements and the sounds which lie at the basis of the rhythm that always accompanies this performance. The musical peculiarity, in terms of its underlying structure, is the rhythm played by the drum, characterized by an alternation of binary and ternary groupings, and a third feature known as syncopation. This type of study is very important given that popular rituals are characterized by their peculiar intrinsic variability and it therefore becomes fundamental to discover the underlying structure of the music (which never changes), but which on the contrary is naturally subject to continuous variations at each repetition of the rite. Out of demological interest, a study of the museum's layout became a significant phase since DEA objects cannot be appreciated merely for their artistic value but also for the experiences they have witnessed. In the case of the three plastic masks, these experiences were linked to Carnival celebrations in Campania (Southern Italy), whose particular ceremonial rites have been extensively studied and documented. Consequently, the conservation project envisaged both 'material' and 'immaterial' approaches. The former referring to the different phases of the conservative intervention, combined with a definition of preventive procedures for maintenance and handling, suggesting the use of alternative forms to handle, move and store the delicate masks, and the realization of a more suitable lighting system within a controlled environment (RH = 30%-50%, T = 15°-20°, storage away from light sources). Enhancement of the masks' immaterial value was realized through the design of interactive touchscreens, and posters with photographs and captions explaining the sounds and gestures, as well as texts transcribed by Annabella Rossi.
It was decided to represent these dualities in the museum layout: in the final display, the three masks will be accompanied by archive photographs of the fundamental ritual phases, by original sound recordings (made during the 1970s by the anthropologist) and by a video showing the legacy of current rituality (fig. 4). Direct observation of the three masks will be supported by an information panel with the results of historical and cultural research, with specific geographical references tagged on an adjacent map of the Campania region.

CONCLUSIONS

The three plastic masks from the popular Carnival of Campania represented a significant case study to enhance knowledge of DEA objects, as yet not fully explored. Difficulties related to the constituent materials and conservation problems proved to be significant criteria in evaluating the most suitable approach to their conservation/restoration, storage and handling. During this work it was possible to confirm that an effective conservation project not only consists of direct actions on the artefact, but must also include measures oriented to the fruition, disclosure and enhancement of the object in question.

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THE SHEKHAWATI PROJECT

UNDERSTANDING CULTURAL HERITAGE THROUGH DIFFERENT CONCEPTS AND CHALLENGES IN RAJASTHAN (INDIA)

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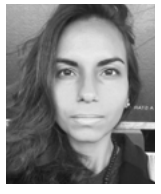
SHEKHAWATI: HISTORY

The Shekhawati region, in North Rajasthan, India, has a unique heritage of painted architecture from 19th and 20th century (fig. 1). The name Shekhawati derives from Rao Shekha, a baron of the Kachhwaha family, born in late 15th century as a *Rajput* (warrior caste), who had ruled Amber and Jaipur for centuries. Rao Shekha had to pay tributes to Amber state, but in 1471, he declared sovereignty over his own principality. From then on, his heirs were known as Shekhawats and the lands they held as Shekhawati.
The region is home of Marwari *bania* (merchants and traders' caste), which shaped the local economic development. In the 18th century, the caravan trade shifted to Shekhawati (demanding low tax) favouring a flourishing trade controlled by Marwari. A great diversity of products (spices, precious wood, indigo, wool, cotton and opium) was passing through Shekhawati connecting India to Middle East and China. However, in the late 18th century the British Empire competed with Marwari demanding lower taxes to the caravan trade, damaging the prosperity of the region and shifting the trades towards Bombay and Calcutta. So, the Marwari migrated their business to these trade centres. Rich and powerful, they kept sending money to their families living in Shekhawati, which showed their wealth by erecting painted buildings: impressive family mansions (*haveli*), monuments for the ancestors (*chattri*), temples (*mandir*) and step-wells (*baoli*). Between 1840 and 1930, over 2000 painted edifices were built. After India's independence in 1947, the Marwari bought different British companies, contributing to the post-independence economy development. Today, a big portion of the Indian economy is owned by these rich Marwari, many of whom belong to Shekhawati.



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THE SHEKHAWATI REGION: HERITAGE

Havelis are well fortified Marwari houses built following the Mughal architecture mixed with Hindu style. The structure is composed by two inner courtyards: Men's courtyard called *mardana*, used only by men for business meetings and visitors related to work; Women's courtyard *zenana*, with kitchen and bedrooms used by women for their daily life. These houses are living spaces, used for different activities and conceived to face the extreme heat of the local climate. *Havelis* are a complex unicum of different materials belonging to distant cultures elaborated in local style, where external and internal walls are painted in Italian "Fresco" technique; doors and windows are highly elaborated in relief in wood from Myanmar; and the most visible part of the façade or the entrance enriched with decorations in glass from Belgium (fig. 2). These buildings have a unique iconography depicting mythological and religious scenes (Gods Ganesh, Shiva, Krishna, Hanuman from *Ramayana*) combined with domestic life (life in the court, dances, local festivals like *Dandiya*), as well as scenes showing regional history (British presence) and modern inventions (cars, trains, telephone). The local fauna (elephants, horses, camels, peacocks, cows, monkeys, birds, donkeys) is a very important presence not only on the wall paintings, but also in the sculptures (wooden and metallic).
The unlimited creativity of a few artists has produced some unique depictions showing Hindu Gods driving a modern British car with wings, the portrait of Frida Kahlo etc. Most of the buildings present a similar spatial distribution of the decorations (3 registers: lower, central and upper), with similar iconography changed according to the place, artists and budget.

THE UNIQUENESS OF THE TECHNIQUE

The local technique is called "arayish". Associable to the Italian "fresco lustro", it's a mixed media technique involving fresco and a secco. From literature and observations, above the support (local sandstone or limestone), there are 3-4 layers of lime plaster with sand (>0.2mm),

fig. 1

fig. 2

2. A scene on Hindu mythology and its polymateriality: wall painting, glass, gold leaf, paper, stone; Fatehpur, Rajasthan-India, 2020. (photo courtesy: Harpreet Tanday).

brick powder (0.1-0.5mm) and *jaggery* (sugar cane juice) mixed with water. Jaggery acts as an additive to improve the working property (miscibility) and performance criteria (adhesiveness and cohesion of the aggregates). The 1st layer (1.5-2cm) is rough; the 2nd and 3rd layers (0.5-1cm) have fine particles and are incised (crossed lines or dots) to favour the adhesion of the last layer called *Arayish*. Generally white (0.1-0.2mm), it is a mixture of lime, marble powder, curd (adhesive like *jaggery*) and water. Seashell powder was also a component as it leads to a greater shine effect. The preparatory drawing is outlined in the still wet plaster, through direct incisions, compass and cord dipped in pigment; followed by the application of the pigments diluted in water. Once the plaster starts to set, all the surface is polished with Agate stone until a glossy finish, comparable to an oil painting, is achieved. This mechanical action, combined with the carbonization process, aims to reduce the porosity of the plaster matrix to the external environment. The highlights are done a "secco" by using Arabic gum as binder. According to the literature the pigments used were both organic and inorganic (red/green-ochres, yellow-mango leaves, blue-Indigo); while the 2019 X-ray Fluorescence elemental analysis suggests the use of blue ultramarine (artificial?), emerald green, green earth, litharge/minium?, red ochre and black carbon as part of original materials.

STATE OF CONSERVATION: CONCERN AND CHALLENGES

According to the literature, there were more than 2000 painted havelis, but the migration of the merchants in the 19th century marked their decline. Due to disuse, careless maintenance, neglect and a harsh climate, just half stand today and in a worrying condition. The lack of urban drainage and waste management programs are one of the main reasons behind the ruin of the havelis, especially during the monsoon season (happening in July-August), when the water is also polluted with sewer water. This is a common problem, both for the local population and wall paintings, which are regularly subjected to the rising damp, containing a wide range of soluble salts as well as human-derived secretion bacteria. Sometimes water can reach the height of 1m causing plaster detachment in most of the havelis. In response to this situation, local treatments have been performed with cement based plaster, which lead to further conservation issues at the expense of the original material. Cement is widely available and cheaper than lime (difficult to source and purchase); acrylic paint is also available, cheap and easy to use. Indeed, façades and courtyards are often repainted by means of restoration (fig. 3). But over the years, it has been seen that the cement repairs cause detachment and loss of the original plaster in adjacent areas within a few years, while the repainting in acrylic last even less, exposed to the extreme climate and monsoon season. But the beauty of this region, rich in wall painting although some in disastrous condition, attracts considerable number of tourists. The owner of one of these havelis has shown the interest in conservation following a different approach and that's how *The Shekhawati Project* was born.

"THE SHEKHAWATI PROJECT": ETHICS AND GOALS

The Shekhawati Project was born in 2016 at Nadine Le Prince Haveli in Fatehpur, a town of Shekhawati. A French painting conservator

3. An example of restoration: repainting with acrylic media over the original wall painting from 19th century, Fatehpur, Rajasthan-India, 2019 (photo courtesy: Harpreet Tanday).

fig. 3

brought together an interdisciplinary and international team (conservators, art historians and heritage consultants) from Europe and Australia to restore the wall paintings and raise awareness on their historical, architectural, artistic, social and scientific value. The project aims to establish a treatment protocol which follows both modern conservation method and the traditional ones respecting the original materials and the social context. This approach attracts an increasing interest, but the communication with the communities has been often challenging as we find ourselves in a living heritage, where the aesthetic instance plays an important role as mentioned in INTACH's Charter «In consonance with traditional ideals, replication can be accepted as an appropriate strategy not only to conserve unprotected historic buildings, but especially if such replication encourages historic ways of building».
This leads sometimes to repainting with incompatible materials (fig. 3). One of our biggest challenges is to find the limit where both the approaches can meet. We also raise awareness on: the importance of traditional skills and technique; promote the concepts of compatibility, retreatability, preventive conservation approach, better waste management and sustainable reuse of heritage. We approach local schools and Universities from Rajasthan (Mody University) and Delhi (Indira Gandhi National Centre of the Arts), international institutes (ICOMOS, AICCM, ICOM-CC), give public presentations of the project in Indian conservation symposium (Le Corbusier Centre, Chandigarh) and to private owners.

fig. 4

4. The team at work during workshop 2020, Nadine Le Prince Haveli, Fatehpur, Rajasthan-India (photo courtesy: Harpreet Tanday).

WORKSHOPS: INTERNATIONAL COLLABORATION

One of the major goals of the Project is to share and transmit knowledge to the young generation through international and interdisciplinary workshop with Indian, European and Australian students from conservation or architecture fields.
There, both students and professionals gain practical experience on the paintings (fig. 4), learn different concepts of authenticity across continents, discuss Indian and European approach, share their experience, discuss about conservation treatments (consolidation, cleaning and in-painting) and perform condition assessment documentation considering the impact of the climate and human decision making. The participants work as a team and learn to see the site work not only as a single object, but rather part of a more global Heritage panorama, which defines its value. Where possible, alongside the modern conservation materials, the local materials and skilled artisan are also involved (to recreate large missing parts), in line with INTACH's charter «The objective of conservation should be to sustain the building and/or the traditional skill and knowledge system of building" and "Conservation strategy must focus on the potential for employing local raj mistris, labour and materials because this will prolong the economic viability of traditional ways of building»
. Site visits to the neighbouring town, observing the artisans at work, talking to the local experts, interaction with the local restorers are moments of great importance, which benefit the whole team. *The Project* is also encouraging the participation of young professional Indian women (architects, conservators, urbanists, cultural heritage consultants), integrating different conservation aspects, which is promising for the future.

SESSION 2

DIAGNOSTICS AND TECHNOLOGIES APPLIED TO CONSERVATION

Lorenzo Apollonia
Costanza Miliani

When discussing heritage conservation it seems clear that the degree of degradation of our patrimony is closely linked to the long-term behaviour of the materials that compose it. The state of repair of a heritage object is the consequence of the behaviour of its materials and the latter's response to external factors, whether natural or anthropic.
Consequently, an understanding of the state of repair is an effort which requires the collaboration of experts from different disciplines. It is evident that conservation science draws on contributions from chemistry, physics, biology, geology and other disciplines in a non-stop dialogue with restorers and conservators. These play a role not only in characterizing the heritage materials and their alterations, but also in optimizing and improving conservation procedures, i.e., envisaging new materials and methods and testing their potential and limitations.
In a holistic vision, to obtain results of value and bring innovation as well as impact to the field, it is very important to foster collaborative approaches involving both conservation scientists and end-users. Maintaining a strong link between research and practice is key to generate effective, sustainable solutions. An interdisciplinary, intersectoral approach can positively support the different steps involved in conservation projects, such as determining sustainable protocols for decision-making, implementing effective monitoring systems, and providing a sound basis to develop preventive conservation schemes.
The YPF is a crucible for this participatory approach to research which encourages young professionals and researchers to commit to interdisciplinary as well as intersectoral collaboration between different players within the world of cultural heritage conservation.

Lorenzo Apollonia, Costanza Miliani

ADHESION INTERVENTIONS ON PAINT LAYERS

CORRELATING VISCOSITY AND SURFACE TENSION TO ADHESIVE PENETRATION AND DEPOSITION

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INTRODUCTION

Failure of adhesion, leading to flaking of paint layers, is a recurring problem in the conservation of decorated surfaces. Lack of adhesion between paint and the underlying support is commonly addressed by treatment with an adhesive material. In order to ensure the success of the intervention, adhesives must be deposited at the interface between the lifted paint and underlying support, providing adequate contact and reinstating the lost bond. Penetration and deposition of the adhesives is critical and important to assess[1].

A number of factors will determine how a solution will travel through porous substrates and where it will ultimately deposit, including rheological properties, surface tension and environmental conditions in which it is applied. Traditionally, conservators rely on practical experience to determine the success of adhesion of paint flakes, based on empirical assessment, and making adjustments to the adhesive and method of application.

This paper examines the relationship between the viscosity and surface tension of a proteinaceous and a polysaccharide adhesive at different concentrations. Deposition of the adhesives between paint and plaster flake mock-ups is assessed through fluorochrome tagging. Real-time penetration was observed using dynamic unilateral nuclear magnetic resonance (NMR). Results show a direct correlation between adhesive concentration, viscosity and gel point and deposition in the substrates. Unilateral NMR was successfully employed to track the adhesive's migration and evaporation of the carrier.

[1] Soppa *et al.* 2011

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WINNER OF THE SESSION 2

MATERIALS AND METHODS

Two organic adhesives commonly used in conservation practice, type B 250 g Bloom gelatine and Jun Funori®, a purified polysaccharide extracted from the red algae genus Gloiopeltis Furcata were assessed. To allow direct comparison, the adhesives were evaluated on flake mock-ups consisting of a plaster wafer (1:3 lime and sand) of approximately 3 mm thickness onto which a paint layer containing iron oxide and chalk bound in egg yolk was applied. For each sample the paint was left unbound from the plaster on an area of approximately 6.5 cm² in the central part of the wafer (fig. 1). The samples were naturally aged at ambient conditions for nine months before treatment. The adhesives were applied dissolved in deionised water at 1%, 3% and 5% and 0.5% and 1% for the gelatine and Jun Funori® respectively. The materials were applied by injecting 0.1 mL of adhesive solution at 26°C behind the lifted paint layer. To encourage adhesion after application of the adhesive, the paint was gently pressed back with a cotton ball wrapped in non-woven tissue (9 g/ m²) through another layer of tissue, acting as a release layer.

1. Diagram and image of a flake mock-up.

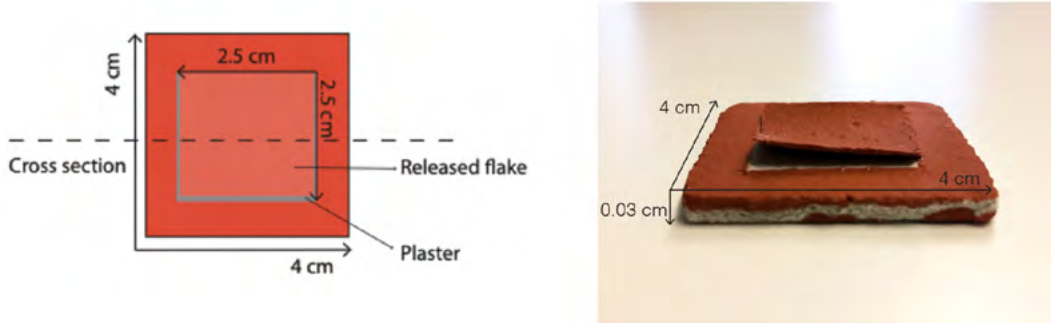


fig. 1

RHEOLOGY AND SURFACE TENSION

Viscosity and gel point of the adhesives were measured at different temperatures. Although Jun Funori® solutions form viscous liquids, due to their molecular structure they do not develop semi-rigid gels. The polysaccharide solutions were therefore characterised exclusively for their viscosity. Given the different rheological properties of the adhesives considered, viscosity of gelatine solutions was measured at 30°C, below and above their gel point, and the Jun Funori® at 30°C, 20°C and 10°C. Gel point of the gelatine solutions was observed at the three concentrations used. The viscoelastic behaviour was observed as a function of temperature, ranging from 30°C to 20°C. Temperature was increased by one degree per minute, while angular frequency was kept constant. Gel point can be observed by determining the point where the storage modulus (G'), describing the elastic behaviour crosses over the loss modulus (G"), measuring the viscous behaviour[2].
Rheological measurements were carried out with an Anton Parr MCR 302 rheometer fitted with a Peltier plate P-PTD 200/air with a pre shear of 60 seconds at temperature. Two geometries were used, to observe viscosity and gel point respectively:
· Viscosity - Stainless steel cone plate 50 mm Æ, 1° angle, truncation gap 0.099 mm
· Gel point - Stainless steel sand blasted parallel plate 50 mm Æ
Surface tension was analysed with a Krüss DSA100 drop shape analyser using the pendant drop method. Solutions were loaded in 1 mL syringe at 33°C. The 5% gelatine solutions reached their gel point by the time measurements were taken. To prevent gelling to take place in the experiment timeframe, the solutions were loaded in the syringe at 35°C. The drop shape analysis was carried out with 16G needle, with a diameter of 1.63 mm and a drop volume of 30 µL. The interfacial tension (IFT) between the solution and air was calculated by the equipment software with the Young Laplace method[3]. For each solution at least four measurements were carried out, the results presented show the average of the measurements acquired.

FLUOROCHROME TAGGING

Tagging protocols follow methods described in published studies in conservation and
bioconjugation fields[4] and are described elsewhere[5]. Gelatine was labelled with 5- (6-) Carboxyfluorescein Succinimidyl Ester (5- (6-) FAM SE) with a wavelength of excitation maximum at 494 nm an emission maximum at 518 nm, exhibiting a green colour[6]. Due to its higher reactivity to hydroxyl groups, 5- (4,6-) Dichlorotriazinyl Aminofluorescein (5- DTAF), was used for Jun Funori®. 5- DTAF is characterised by an absorption maximum at 492 nm and emission maximum at 516 nm. Successful grafting of the fluorophore on the polymers and therefore the absence of unreacted dye was assessed through thin layer chromatography[7].
Adhered samples were embedded in polyester resin, obtaining two cross-sections and one thin section for each sample. Cross-sections were imaged with a Nikon D800 camera fitted with a Sigma 105mm F2.8 macro lens and a band-pass visible filter XNiteBP525. The samples were illuminated with a Qflash T5d-R with a UV/IR Wave Reflector QF80 with band pass filters XNite 330C and CC1 to block visible and IR radiation. Thin sections were imaged with a Leica-Zeiss microscope fitted with a bandpass filter Q505lp.

UNILATERAL NMR

Unilateral NMR experiments were carried out with a PM-5 Profile ^{1}H NMR Mobile Universal Surface Explorer (NMR-MOUSE) (Magritek, Aachen, Germany), with a field strength of approximately 0.5 T and 19 MHz proton frequency, coupled with a Kea2 spectrometer (Magritek). The magnet is installed on a precision lift enabling the sensitive slice to move through the sample from approximately 5000 µm above the instrument's surface with a lateral sampling area of 13 mm^2. For each excitation slice the decay of the traverse magnetisation was recorded by CPMG echo radiofrequency pulse sequence, used to obtain spin echoes at different depths throughout the substrate. Following characterisation of individual materials, parameters were optimised to observe the movement of the dissolved adhesives in the stratigraphy. Signal to noise ratio was taken into account as well as experiment time.
Dynamic experiments were carried out on flake mock-ups and consisted of a three-phase experiment (parameters shown in tab. 1):
Before - depth profiling of the flake mock-ups before adhesion with 32 scans and 32 echoes and 64 scans and 128 echoes and CPMG of maximum amplitude slice;
Dynamic - depth profiling after injection of the adhesive run as 10 consecutive profiles over 80 minutes with 32 scans and 32 echoes;

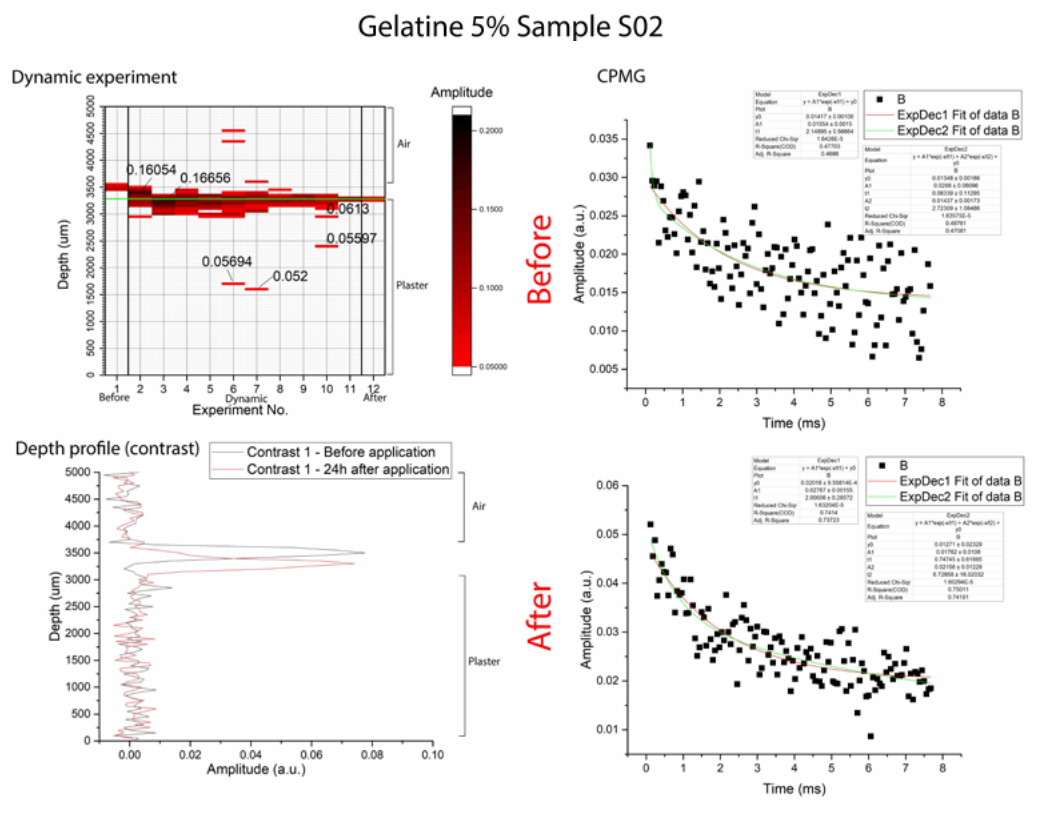
[2] Mortimer *et al.* 2001; Tung and Dynes 1982.
[3] Bagalkot *et al.* 2018.
[4] Soppa *et al.* 2011; Hummert *et al.* 2013; Hermanson 2010.
[5] Rava *et al.* 2019.
[6] Hermanson 2010; *The Molecular Probes Handbook* 2010.
[7] Rava *et al.* 2019.

After - Depth profiling of the adhered flake mock-ups 24 hours after injection with 32 scans and 32 echoes and 64 scans and 128 echoes and CPMG of maximum amplitude slice.

Table 1 - Analytical parameters set up for the NMR-MOUSE experiments carried out for each sample.

Experiment	Depth Profile	CPMG	t_R (ms)	n_S	n_E	t_E (µs)	t_{acq} (ms)	t_P (µs)	Step size (µm)	Experiment time (min)	No. Experiments
Before	**X**		600	64	128	54.25	0.024	6.75	50	64	1
	X		150	32	32	54.25	0.024	6.75	50	8	1
Dynamic	**X**		150	32	32	54.25	0.024	6.75	50	80	10
After	**X**		600	64	128	54.25	0.024	6.75	50	64	1
	X		150	32	32	54.25	0.024	6.75	50	8	1
CPMG (before and after)		**X**	600	2048	128	60	0.008	6.75	N/A	20.48	1

tab. 1



In the opposite page 2. NMR-MOUSE three phase experiment: dynamic analysis, depth profile (before and after) and CPMG (before and after) for sample 02, treated with 5% gelatine.

[8] Baby 2020.protein, peptidic, colloidal, surfactant, or lipid origin. Hydrogels are a mainstay in the food and pharmaceutical industries but are also increasingly finding applications in areas such as biosensing, microfluidics, drug delivery, and tissue engineering. Rheology is an appropriate method for characterizing hydrogel mechanical properties since it is quick, sensitive, requires small sample sizes, and is revealing of differences in architecture such as degree of cross-linking, proximity of the glass transition, structural homogeneity/heterogeneity and molecular weight. In this chapter we are discussing various aspects of rheology of hydrogels.","container-title":"Rheology of Polymer Blends and Nanocomposites","ISBN":"978-0-12-816957-5","language":"en","note":"DOI: 10.1016/B978-0-12-816957-5.00009-4","page":"193-204","publisher":"Elsevier","source":"DOI.org (Crossref

[9] Abouzeid 2016; Johnston and Peard 1925; Sato 1980.

[10] Harrold and Wyszomirska-Noga 2017; Swider and Smith 2005; Timar-Balazsy 2000.

[11] Osorio *et al.* 2007; Michon *et al.* 1993; Leuenberger 1991.gel strength (Bloom

[12] Haug and Draget 2009.

[13] Leuenberger 1991; Wulansari *et al.* 1998; Yunoki *et al.* 2019.gelation temperature and gelation process. The measurement of these parameters is exemplified on several mammalian gelatins and is used to investigate the differences between mammalian and fish gelatins in solution. Hydrodynamic radii have been determined in addition by photon correlation spectroscopy. A series of mammalian gelatins of different Bloom numbers (from hydrolyzed to Bloom 300 gelatins

[14] Korson *et al.* 1968.

Data acquired with Prospa software (Magritek Aachen, Germany) was processed with OriginPro 2016 software. Depth profiles are presented as 2D contrast plots (echoes 1-16) with the x-axis showing amplitude intensity and the y-axis the sampling depth. CPMGs of individual slices are presented as xy scatter graph, where the signal amplitude is plotted on the y-axis and the decay echo train is plotted on the x-axis as a function of time. For the dynamic experiments the maximum amplitude echo for each experiment, corresponding to the maximum amplitude column from each profile, is plotted against experiment number / time on the x-axis. This allowed the movement of the signal to be observed through the stratigraphy over time. Experiment 1 corresponds to the maximum amplitude echo before adhesive injection, experiments 2-11 to maximum amplitude echoes of the dynamic set over 80 minutes, experiment 12 corresponds to the maximum amplitude echo of the profile captured 24h after application (fig. 2 and fig. 6). The full relaxation train is only presented in CPMGs. Spin-spin relaxation or T_{2eff} is analysed as a single exponential decay of CPMG plots. The software function used was ExpDec1 with an iterative fit until converged function.

RESULTS AND DISCUSSION

Viscosity and surface tension

Gelatine and Jun Funori® are natural thickeners, highly hydrophilic and can change the flow properties of solution by forming thermoplastic physical net-like structures, able to entrap large amounts of water[8]. The surface tension lowering effect of gelatine in water is well known and reported in the literature[9] as are lowering tension properties for funori in water[10].

Results showed how gelatine's gel point temperature increases with increase in concentration (tab. 1). Similar gel point values are reported in the literature[11]. Differences in gel point could be due to variations in bloom number, pH, or molecular weight and distribution[12].

All gelatine solutions showed a Newtonian behaviour when analysed at 30°C, where the viscosity is independent of shear rate, and shear stress is directly proportional to shear rate. This behaviour is expected and reported in the literature[13]. Considering that the viscosity of water at 20°C is equal to 1mPas[14], all gelatine solutions showed a more viscous behaviour with viscosities not exceeding 10 mPas, increasing with concentration (tab. 2). At temperatures just below their gel point, gelatine solutions lose their Newtonian behaviour, with viscosity becoming affected by shear rate (fig. 3).

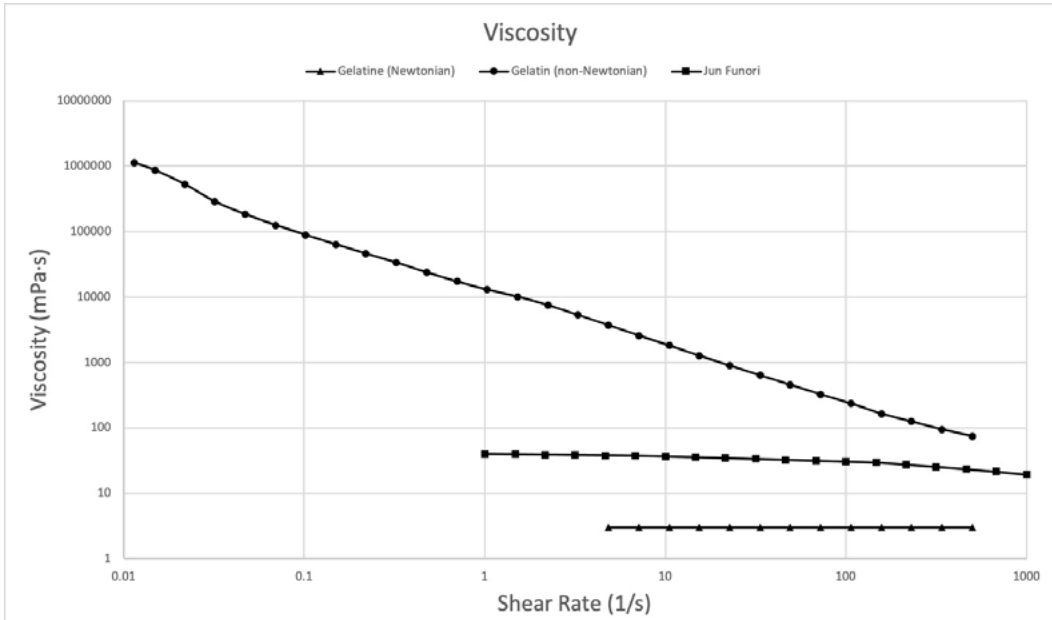


fig. 3

3. Newtonian and non-Newtonian viscosities (actual data not shown).

All concentrations showed a drop in viscosity with increasing shear rate, characteristic of pseudoplastic or shear thinning fluids. The same non-Newtonian behaviour is observed for the solutions analysed at temperatures below their gel-point (data not shown). Viscosities are generally higher in the 3% and 5% solutions that showed very similar properties; however, the lower concentration presented a higher viscosity at shear rates above 1.52/s when solutions were analysed at temperatures just below their gel point.

As most polysaccharides, Jun Funori® has a high density of hydroxyl functions, responsible for its hydrophilic character and ability to establish hydrogen bond networks[15]. Although more similar in their molecular structure to agars, funorans belong to a hybrid family between agars and carrageenans[16]. They are sulphated galactans belonging to the agar family due to their lambda configuration but contain more ester sulphate groups, characteristic of carrageenans[17]. Due to the high sulphate content these materials do not form semi-rigid gels but form viscous liquids at low concentrations[18].

Results showed how Jun Funori® solutions have higher viscosities than gelatine at the same concentration, temperature and shear rate. Both solutions analysed showed a decrease in viscosity with increase in temperature. A slight decrease in viscosity was observed with increase in shear rate for all concentrations at all temperatures measured. This can be interpreted as a shear thinning behaviour, in line with reports in the literature[19]. The pseudoplastic character observed here was slight, and comparable to that shown by Fenoradosoa et al. who determined the behaviour of the solutions under study up to 1% concentration as «quite similar to a Newtonian fluid»[20].

When compared to water, most adhesive solutions show a decrease in surface tension (tab. 2), this characteristic enhances their wetting and spreading ability, ensuring good contact and resulting in good adhesion. Generally, increase in concentration results in lowering surface tension, with the exception of the 3% gelatine solution.

Table 2 – Gel point, viscosity and IFT of the adhesive solutions analysed.

Adhesive	Concentration (%)	Gel point (°C)	Viscosity at shear rate of 100/s (mPas) at 30 °C	IFT average (mN/m)
Jun Funori®	0.5	-	12	69.30 ±0.8
	1	-	30	67.52 ±0.39
Gelatine	1	18	1.5	60.74 ±1.31
	3	22	3	75.20 ±1.95
	5	26	8	49.09 ±4.30
Water	-	-	1	72.97 ±0.36

tab. 2

Deposition

Fluorochrome tagging, allowed clear visualisation of the deposition of both adhesives in the stratigraphy (figg. 4-5). Although sections showed only a discreet slice in each of the three mock-ups analysed, it is immediately evident how concentration and changes in material characteristics affects deposition. Samples treated with 1% tagged gelatine solution show a distinct green fluorescence through the stratigraphy, in areas reaching through the full 3 mm of the plaster. The deposition is not uniform and small amounts of material are left at the interface between paint and plaster. Two of the three samples treated with 3% tagged gelatine show the adhesive deposited below the paint layer, however gelatine is present through the plaster of the third sample, penetrating the full 3 mm in two locations. Samples treated with 5% tagged gelatine are consistent, showing deposition between plaster and paint; thin sections showing glue lines and bridging between the substrates.

Samples treated with tagged Jun Funori® showed less intense fluorescence, due to the smaller amount of adhesive deposited, especially when applied at 0.5% concentration. The material is identifiable in all samples at the interface between the paint

[15] Pierre *et al.* 2014.
[16] *Ivi.*
[17] Geiger and Michel 2005; Izumi 1971; Swider and Smith 2005; Takano *et al.* 1995.
[18] *Handbook of Hydrocolloids* 2000; Usov 2011.
[19] *Handbook of Hydrocolloids* 2000.
[20] Fenoradosoa *et al.* 2012.

and plaster layers with samples treated with 1% showing glue lines and bridging.
Deposition can be directly correlated with changes in the rheological properties of the materials. Materials showing higher viscosities resulted in less penetration, with adhesives deposited at the interface between plaster and paint.
No clear differences were observed in material conformance resulting from wetting; however, it can be assumed all materials have good wetting properties due to their lowering surface tension effects.
Temperature and relative humidity were recorded at the time of adhesive application and did not show clear correlation with differences in deposition (tab. 3; fig. 4 and fig. 5).

Table 3 – Environmental conditions at time of application of adhesive solutions analysed and penetration depth.

Adhesive	Concentration (%)	Sample #	Environmental conditions at time of application		Penetration depth
			Temperature (°C)	RH (%)	
Jun Funori®	0.5	01	25	42	Interface
		02	25	49	Interface
		03	25	49	Interface
	1	01	24	42	Interface
		02	24	39	Interface
		03	25	46	Interface
Gelatine	1	01	26	43	Full stratigraphy
		02	26	41	Full stratigraphy
		03	26	40	Unclear
	3	01	26	32	Full stratigraphy
		02	26	31	Interface
		03	26	38	Interface
	5	01	26	45	Interface
		02	26	31	Interface
		03	24	43	Interface

tab. 3

In the opposite page
4. Cross-sections showing gelatine deposition visible thanks to the distinctive green fluorescence. Thin section of samples 03 treated with gelatine 5% show glue lines and bridging between the substrates.

5. Cross-sections showing Jun Funori deposition visible thanks to the distinctive green fluorescence. Thin section of samples 02 treated with Jun Funori 1% show glue lines and bridging between the substrates.

fig. 4

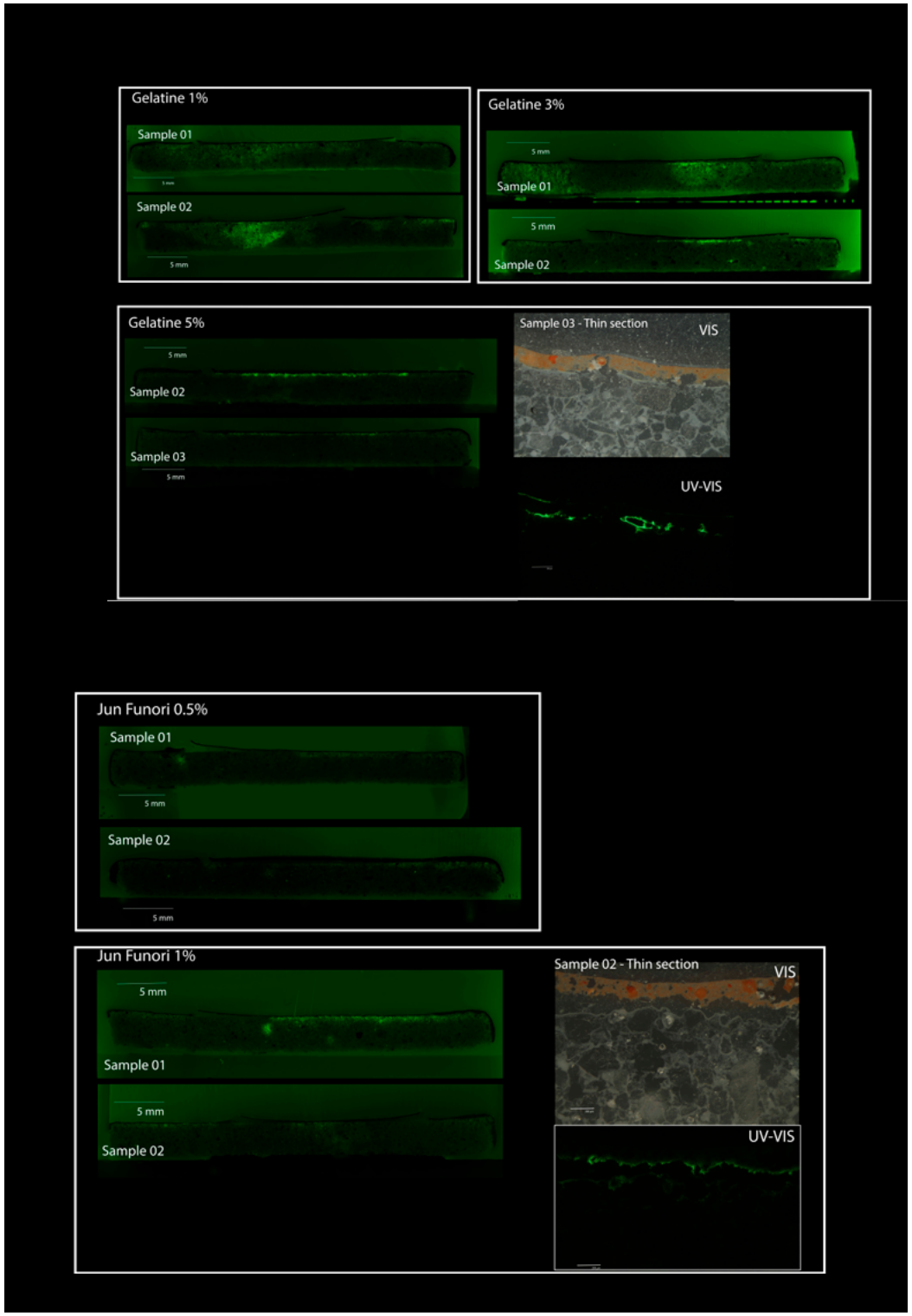


fig. 5

PENETRATION

Unilateral NMR allowed observation of the migration of adhesive solutions between the paint and plaster mock-flakes (fig. 2 and fig. 6). The adhesive solutions were readily detected; increase in concentration resulted in a signal increase, with the 5% gelatine showing highest amplitude. All adhesives displayed reverse migration and tendency to dry from the upper surface (data not shown). Moisture migration in the paint appears in most sample sets, however paint swelling occurred only for gelatine solutions, becoming more pronounced with increase in concentration. Two instances of paint swelling were observed for the adhesive at 1% concentration, three instances at 3% and on all 5 samples at 5%. This may be related to the change in rheological properties of the gelatine, acting as a moisture reservoir upon thickening and gelling. No paint swelling was observed for the Jun Funori®. Instrument limitations and low signal precluded precise measurement of the depth of penetration, however all adhesives had lost their volatile component 24 hours after injection. Most samples showed reduced signal area after adhesion, ascribing to the flattening of the paint layer. Peak shift towards the plaster was consistent only for the higher gelatine concentration. This can be interpreted as the adhesive providing better adhesion and conformance to the plaster substrate.

6. NMR-MOUSE three phase experiment: dynamic analysis, depth profile (before and after) and CPMG (before and after) for sample 03, treated with 1% Jun Funori®.

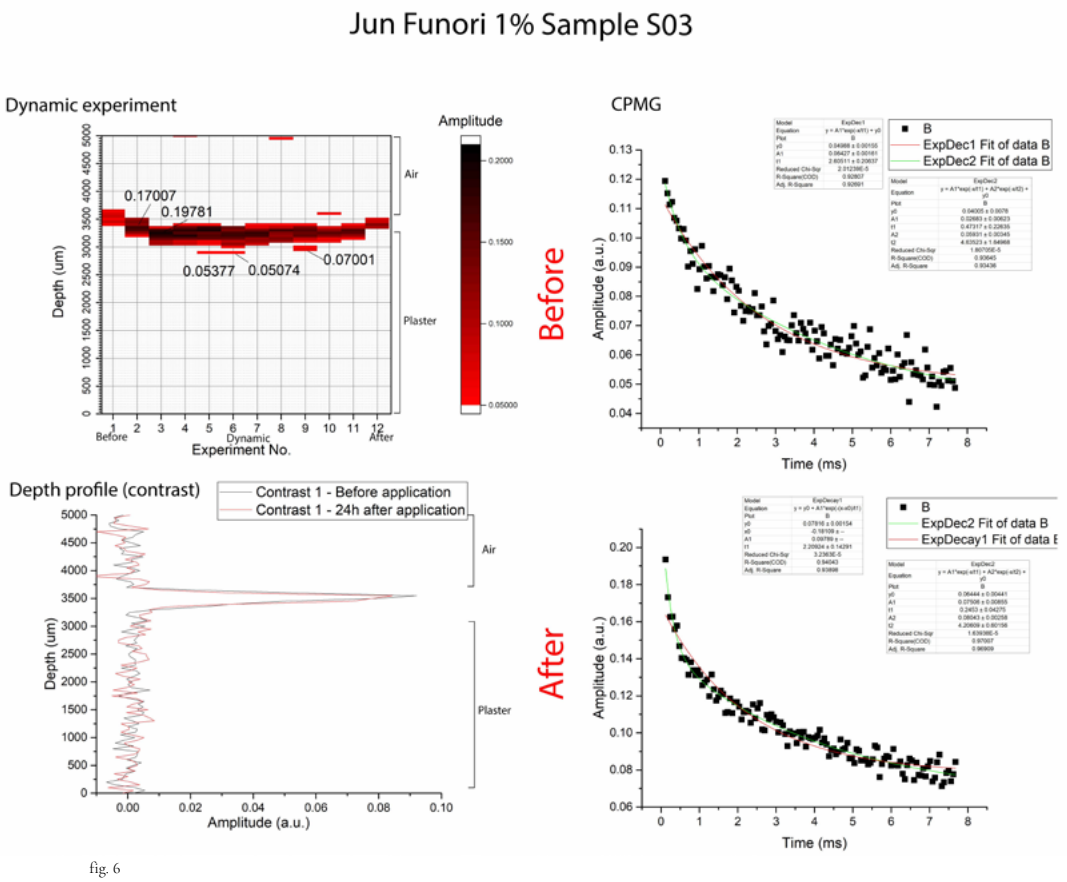


fig. 6

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CONCLUSION

The results of this study allowed correlation of the rheological properties of the adhesives solutions to their penetration and deposition. Generally, adhesives showed decrease in surface tension when compared to water, suggesting their ability to conform well to the substrates and provide good adhesion. Lower viscosities, characteristic of lower concentrations penetrate and deposit further in the stratigraphy. Gelling properties limit penetration, but can provide a moisture reservoir, leading to swelling of the paint layers. Paint layers are consistently flattened onto the plaster support when adhered with gelatine solutions at 5% concentration. As shown, rheological behaviour, affecting penetration and deposition of adhesives can be manipulated through changes in concentration and temperature. The study aims to provide guidance for the practical conservator to determine appropriate application parameters suited to the specific problems to be addressed.

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TOWARDS AN INNOVATIVE ANTI-CORROSION COATING

FOR METAL ARTWORKS BY COUPLING NANOTECHNOLOGY AND GREEN CHEMISTRY

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INTRODUCTION

In Heritage Science, the application of materials scientists' expertise to conservation has proved a highly successful way to integrate science and the humanities. The preservation of metal artefacts is analogous to the protection of industrial metals, both needing an all-out battle against corrosion. The interfacial nature of corrosion can be exploited for protection purposes by controlling the environmental conditions (*Preventive Conservation*), or by altering the metal surface with a specific treatment (*Interventive Conservation*)[1].
The interventive approach is usually discouraged since the ethics of conservation prescribe minimizing interaction with an object but, sometimes, this is inevitable for reasons which can vary from cost-containment to visitor accessibility. In these cases, coatings come in handy to physically insulate the metal surface and prevent any interaction with the external environment[2].
An eligible conservation coating must fulfil several requirements: it must not alter the appearance of the artefact; it must not modify the material nature of the artefact, neither the original one nor the alterations which contain information about its history (such as

[1] Watkinson 2010.
[2] Cano, Lafuente 2013.

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patinas); it must be reversible; it should present low or zero toxicity; it should feature high durability and require low maintenance[3].
In practice, the products currently used by conservators have shown certain significant limitations. The preferred organic coatings Paraloid B-72 and Incralac have displayed limited effectiveness over time, occasionally degrading into irreversible coloured films or even causing specific alterations[4]. Not least, they are often applied by means of toxic solvents. A serious health hazard is also associated with benzotriazole (BTA), a corrosion inhibitor for copper-based alloys widely employed on its own or as an additive. Investing in new ways of protecting metals thus appears mandatory.

PROJECT

The project described below addressed the lack of an adequate interventive treatment for bronze surfaces by bringing to conservation practice some recent advances in materials science. Looking for greater safeness and sustainability, scientists have spent much effort on making their way of working 'greener'. This has led to the formulation of various principles which can guide the selection of materials. For example, compounds made from food waste are considered of great value since they curb waste production, are biobased, often cost-effective, and also follow the circular economy guidelines. But rather than merely representing restrictions, *Green Chemistry* principles[5] can also be exploited in a functional way.
This is what we wish to demonstrate, and to do so we are stressing their non-toxic and biodegradable features. While a biodegradable protective coating may sound like an oxymoron, perfectly balancing overall lifespan and degradation dynamics can lead to a highly-controlled system, easily reversible, but still reasonably durable.
To this end, for our coating we chose to test chitosan as a polymer matrix, and Thymus vulgaris essential oil (TEO) or Pecan nut-shell extract (NSE) as corrosion inhibitor additives. All three are biodegradable, made from production waste and are definitely non-toxic for humans and the environment. Chitosan, a polysaccharide derived from the extremely abundant natural polymer chitin, has already been reported in literature as a suitable matrix for conservation coatings[6] and its antimicrobial activity can further help to prevent dangerous biofilm formation. Some research has documented the inhibitive action of TEO on copper surfaces[7], while the properties of NSE are less familiar. Along with TEO, NSE shows a strong antioxidant activity and similar nut extracts have been successfully tested for anticorrosion purposes; as a result, expecting some inhibition activity from it seems reasonable.

[3] *Ibidem*; Caple 2000.
[4] Degrigny 2008.
[5] Anastas, Warner 1998, p. 30.
[6] Giuliani *et al.* 2018.
[7] Fouda *et al.* 2014.

1. Depiction of the proposed system, highlighting its main features: the Chitosan matrix and the PLGA capsules loaded with a green inhibitor.

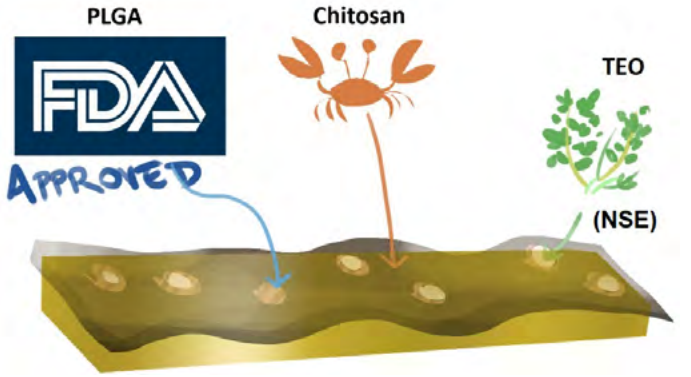

fig. 1

Nanotechnology is yet another field which has been widely explored of late, leading to some extraordinary research outcomes such as the possibility of using nanostructured systems for protecting, transporting and eventually releasing a guest phase. We selected poly(lactic-co-glycolic acid) nanocapsules (PLGA NCs) to englobe the inhibitive agent. PLGA NCs are biocompatible, biodegradable nanosystems which release their guest phase gradually over time as a result of their own decomposition[8]. Our aim is to protect the inhibitor from a potential leach-out while maintaining its concentration inside the coating constant over the entire coating lifespan.
In this way, the resulting system would be a nanocomposite coating constituted only by non-toxic, biodegradable compounds (fig. 1).
The expected system lifespan is ~1 year, a limited span balanced by the easy and complete reversibility of the treatment, given that the coating itself can be removed with a mildly acidic solvent or will simply dissolve at the end of its service life, leaving behind only harmless, easy-to-wipe-away by-products.
An additional reason to encapsulate the inhibitor is that this enables the use of advanced laser techniques in the presence of volatile compounds like TEO and NSE. In conservation practice, protective coatings are usually applied by means of solvent-casting methods such as brushing and immersion. These two are the simplest but also the poorest-quality options. However, there are a number of higher-quality, more complex alternatives. Among these, Matrix-Assisted Pulsed Laser Evaporation (MAPLE) looks promising for our purposes. MAPLE is a laser-based technology for solvent-free deposition of thin organic films[9], a scenario where standard Pulsed Laser Deposition fails. The difference lies in the different type of target adopted. In PLD it is the bulk material that is directly hit by the radiation, while MAPLE uses a frozen solution in which the solute is the organic phase to be deposited and the solvent is a highly volatile optical absorber. In MAPLE, it is the solvent matrix

[8] Kapoor *et al.* 2015.
[9] Piqué 2011.

that absorbs the laser radiation, thereby protecting the organic component. Because of the laser excitation, the frozen matrix breaks away in clusters containing the solute, but does not land on the receiving surface thanks to its high volatility and the ultra-high vacuum conditions typical of MAPLE systems. The object will thus be covered by a thin solvent-free organic film created by the solute particles which strongly but gently adhere physically to the receiving surface thanks to kinetic energy from the matrix explosion. MAPLE technology enables deposition of films without the drawbacks of standard solvating techniques, i.e. high residual porosity and inhomogeneity. The lower the porosity, the higher the barrier efficiency of the coating. A higher barrier performance allows a reduction in coating thickness, enhancing transparency and the overall aesthetic impact of the treatment. Moreover, the whole process can take place without any direct interaction between the operator or the laser radiation and the object, apart from the necessary operations of movement. However, the need for a vacuum chamber and the slow deposition rate restrict the scope of the application to small objects such as coins or pieces of jewellery.

SUMMARY OF EARLY EXPERIMENTS

The first operations involved the preparation and deposition of PLGA NCs loaded using NSE. Prior to this, MAPLE had been tested on azobenzene-based light-responsive NCs, proving the success of this technique in preserving even the most delicate chemical functionalities[10]. The fabrication of NSE-loaded NCs was accomplished using a double emulsion method[11]. The hardened particles were observed via Scanning Electron Microscopy (SEM), showing a highly regular spherical form (fig. 2a). A mean capsule diameter of 400 ±300nm resulted from a comparison of SEM micrographs and Dynamic Light Scattering analyses (fig. 2b). The encapsulation efficiency (EE) was calculated as the difference between the prescription concentration in the initial batch and the residual concentration in the supernatant solution after centrifuging, weighed against the initial concentration. Residual concentration was determined using UV-VIS spectroscopy. The resulting EE was 27 ±5%.

[10] Marturano *et al.* 2020.
[11] Yang *et al.* 2019.

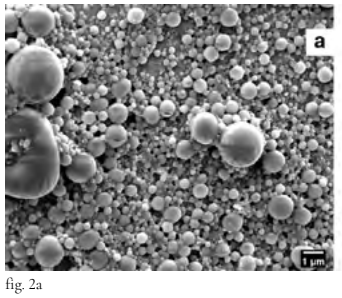

fig. 2a

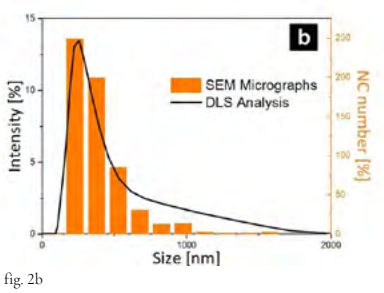

fig. 2b

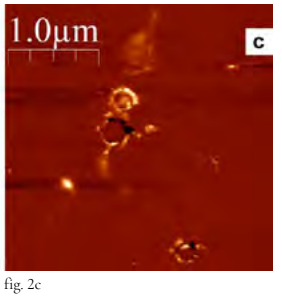

fig. 2c

In the opposite page 2a. SEM image of NSE-loaded capsules as obtained from a double emulsion oil-in-water-in-oil method. b. Dimensional distribution of the same capsules, SEM image analysis vs DLS analysis. c. AFM image of the coated substrate (mica) after a first attempt to MAPLE-depositing the capsules.

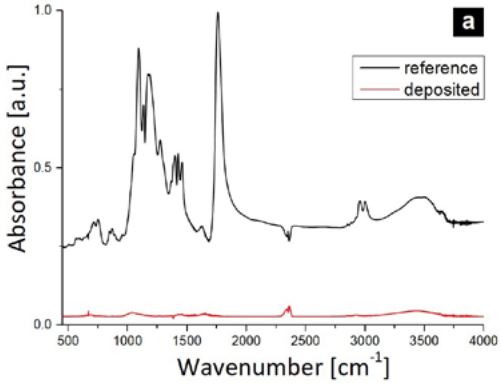

fig. 3a

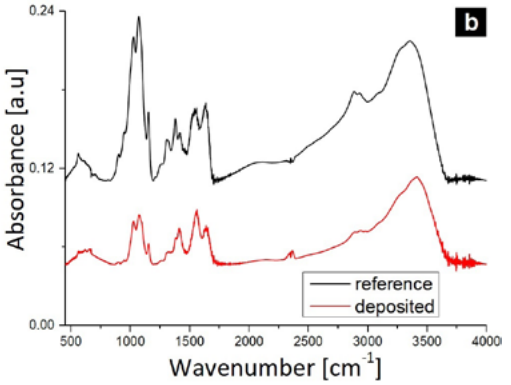

fig. 3b

3a. FT-IR transmission spectra of a coated KBr substrate after trying to MAPLE-depositing the capsules with a lower laser fluence (red) vs the same capsules as produced and englobed in a KBr disk (black). b. FT-IR transmission spectra of Chitosan as prepared and englobed in a KBr disk (black) vs MAPLE-deposited on KBr (red).

The first attempts to MAPLE-deposit water-dispersed PLGA NCs were unsuccessful, regardless of the fluence set. In fact, a higher fluence caused the capsules to explode upon contact with the receiving surface, as evidenced via Atomic Force Microscopy (fig. 2c). At the same time, a lower fluence produced no target ablation at all, as revealed by the FT-IR transmission spectrum of the coated sample (fig. 3a). Instead, using water-dispersed PLGA NCs loaded with F_3O_4 nanoparticles led to good results with similar deposition parameters, suggesting that the key for a successful deposition lies in tuning the normally medium-to-scarce optical absorbance of water to the laser wavelength adopted (1064nm). An attempt to deposit a chitosan film via MAPLE was also made, with positive results including retention of the chitosan's chemical integrity (fig. 3b).

CONCLUSIONS

The project described here clearly shows the enormous potential inherent to a collaboration between advanced science and conservation science. By taking advantage of green chemistry and nanotechnology, we propose a coating system for copper-based artefacts that could overcome the limits of reversibility, toxicity, and transparency of standard treatments, while extending durability. Furthermore, we propose the adoption of an advanced deposition technology which enables a series of such important benefits as better anticorrosive and aesthetic performance, while limiting interaction with the object as much as possible. However, such a technology requires specialized equipment and dedicated personnel, and is principally suitable for small

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objects, two factors which restrict the scope of application of the treatment when compared to traditional methods.
The initial experimental attempts delivered mixed results.
The fabrication method adopted for PLGA NCs proved somewhat unsatisfactory. The EE was too low, while a smaller dimensionality is needed for the capsules to be efficiently englobed within the chitosan matrix.
It was not possible to directly deposit purely water-dispersed PLGA NCs using MAPLE. Other tests with F_3O_4-loaded capsules and further examples of water-based targets from the literature[12] suggest that to successfully deposit NSE-loaded PLGA NCs it should be sufficient to optimize the target's optical absorption by addition of a suitable optical absorber. Instead, chitosan proved highly suitable as a target material for this kind of technique.
The next steps will involve optimization of the capsule preparation, a complete characterization of the nanocomposite coating obtained via MAPLE co-deposition and, finally, an evaluation of its anti-corrosion efficiency and key properties: transparency, reversibility, and low toxicity.

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WATERCOLORS WASHING WITH PARAPRINT OL60 WASHING: ANALYTICAL STUDY

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Cleaning is one of the most delicate treatments in the field of restoration as it is completely irreversible. In the case of watercolors, several types of cleaning have been used: blotter, flotation, immersion, among others.
Nevertheless, due to the soluble nature of its components such as Arabic gum used as a binder, a washing can induce: loss of the color saturation, paint drag and/or loss of paint adhesion, these alterations could affect the aesthetics and material stability of the watercolors.
An aqueous treatment can be beneficial for watercolors for several reasons: it can remove accumulated dirt between the fibers of the paper, harmful substances that are found inside the substrate, the acids produced by the same degradation of the paper and/or those produced by some classes of fungi and bacteria, or those that are related to pollution. For these reasons, this type of treatment allows to chemically stabilize the paper for a period.
In addition, an aqueous washing prepares the paper objects for later procedures. For example, lining, tears repairing and color reintegration.

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WASHING BY PARAPRINT OL60

According to the sources consulted and reviewed on the subject, there is a cleaning alternative that does not damage the watercolors, named Washing by Paraprint OL60. It consists of: The artwork on paper or the document is collocated on a layer of a Paraprint OL60 a synthetic fabric, owing to the capillarity phenomenon the water permeates the textile. One side of the fabric absorbs water from a container, the water travels up a slope, and at the other end, the dirty water drips down out of the material. The water is transported continually from one end of the material to the other. Solutes that migrate from the paper into the Paraprint OL60 are dropped out of the system.
This washing has been applied in several countries but the information generated on its effectiveness and employment was minimal and a study that included the evaluation with analytical techniques was not reflected.

EXPERIMENT

For this reason, this research aimed to assess the scope, limitations and effectiveness of Paraprint Washing in watercolors, through an experimental investigation in different kind of samples. it contemplated the comparison of the before and after results of the washing, through the use of analytical tools. The presented data in the next part was referenced of the theses *"Limpieza de acuarelas por Paraprint OL60 o lavado por sifón"*.

SAMPLE 0 ELABORATION

Sample 0 was made with the purpose of determining how long the washing will delay in drag soluble substances in a paper of specific measures. The sample was made with *Fabriano*® paper of 300 gr/m² composed of a mixture of cotton (25%) and cellulose free of lignin (75%), free of acidic substances, whose measurements were 24.0x12.0cm. The paper was dyed with *Cochineal* Red A o *Ponceau* 4R (*Lebensmittelfarbe flüssig E124: Städter*), this kind of dye has been used in several experiments to know if a washing is successful. This dye contains acidic substances that can simulate those that are generated by the oxidation of lignin, as well as others that may have been transmitted by having been in contact with an acidic surface. The paper was immersed in a solution of 250 ml of fresh water with

1. Watercolors of Group I

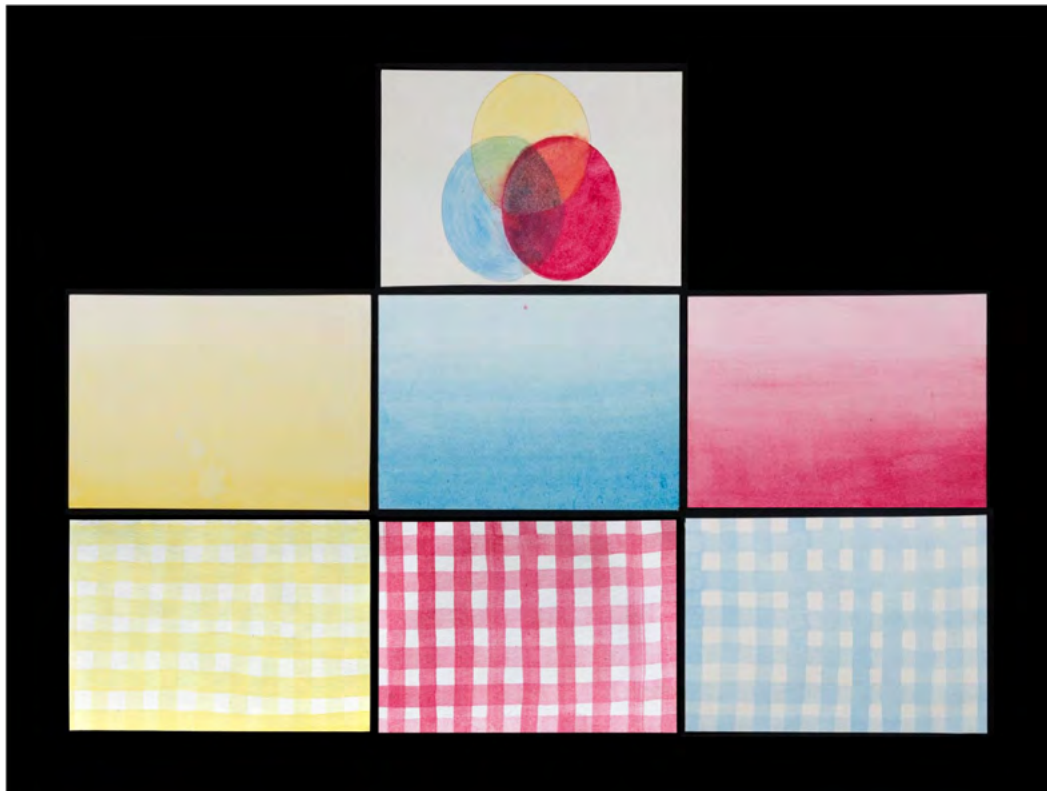

fig. 1

13 drops of colorant, the paper was left immersed for 50 hours to ensure that the colorant completely impregnated the paper fibers. The sample was subsequently hung and air dried for a day.

GROUP I ELABORATION

Group I was made with the objective of evaluating the behavior of the pictorial layer before the cleaning treatment in a systematic way. With the analysis of 3 kind of samples, it was possible to cover the basic techniques for making a watercolor painting: drawing lines, applying glazes, overlapping colors, applying saturated colors and reserves.
Group I was composed of 7 samples made with the same paper and measures that the Sample 0 and professional watercolors of Winsor & Newton® were used to paint them, the 3 basic colors were employed to generate different mixtures of colors: magenta (carmine), cyan (cadmium yellow) and blue (cerulean blue), the

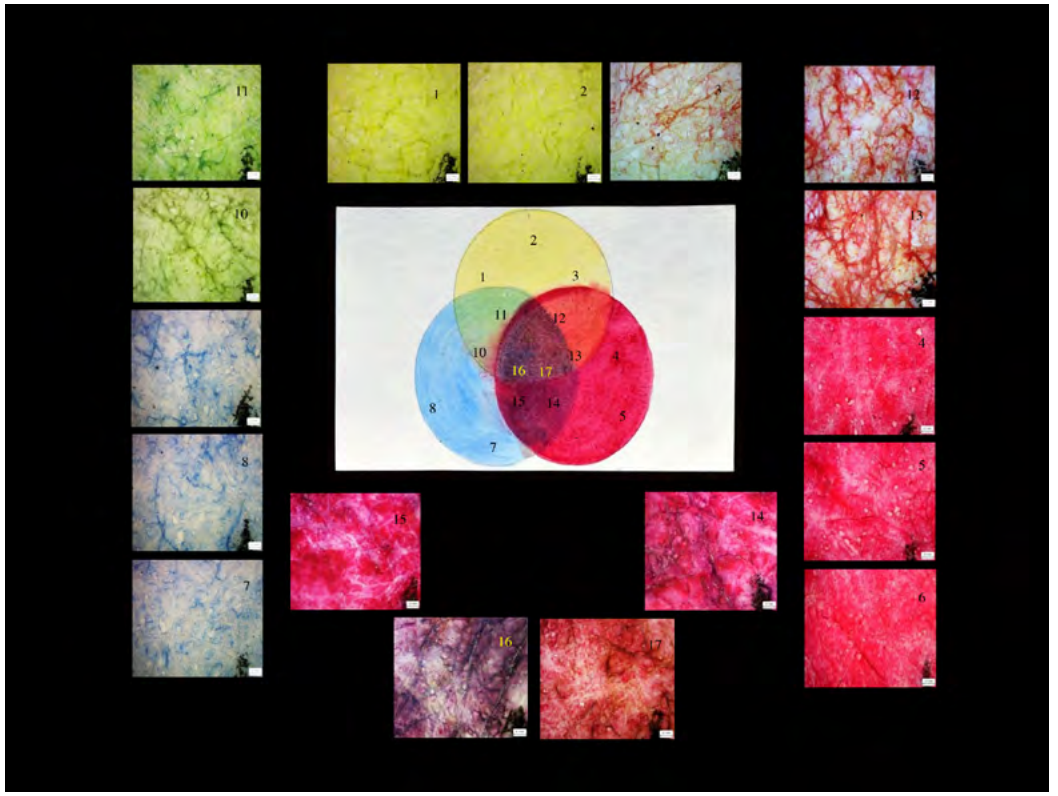

fig. 2

2. Microscopic photographs that were taken of the chromatic circle of the Group I

selection were chosen because with this it is possible to generated an extended palette.
The samples were made with the paper humid using fresh water, the paper was tensed in a wood tablet with kraft tape. The watercolor was mixed with water and applied with brushes.
The Group I (fig. 1) was constituted of seven samples: 3 checkered paintings one of each color, 3 gradient paintings of each color and 1 with three circles of the 3 colors, the shapes were juxtaposed and formed 3 secondary colors and 1 third color at the center.

ANALYTIC ANALYSIS

In order to evaluate the cleaning efficiency, qualitative and quantitative tools were used, before and after washing:
Photographic record with Color Checker Passport Photo® by the bran X-Rite photo & video® and a professional reflex camera of *Nikon*® D5100 with the following setting; bulb shutter exposure, ISO 100, white balance for incandescent light (photos was taken with incandescent lights), with a focal lens of 35m, aperture of f/11 and RAW format image. A photograph was taken to each sample before and after the washing to record any possible change.
Observation and photographic record with coded upright microscope from Zeiss® brand, Primotech model with; Integrated rotating stage, with 3 W 5000 K (stable light temperature) transmitted and reflected LED illumination, with multiphase analysis, extended depth of field, with 5x-100x objectives, built-in 5 megapixel live broadcast HD camera , Matscope iPad APP software, magnification reading, 2D measurements, designed specifically for the study of materials, such as biological and petrographic materials. This was selected with reflected light and a 10x magnification.
Depending on the kind of sample the number of microscopic photos was taken. In the case of gradients, 3 points were recorded for each one, in the transition areas; in checkered, 8 were taken for each one, 2 in some of the centers of the grid, 2 in some of the areas where the lines overlapped and 2 in the vertices; in trichromy (fig. 2), 17 points were taken, 3 were in yellow area, 3 in red zone, 3 in blue the part, 2 in green fragment, 2 in the orange portion, 2 in the purple segment and 2 in the center "black". The location of these points was signed with a line of pencil. In the sample 0 were taken 5 photos in different areas before and after the washing.

The colorimetry was done with a Colorimetric equipment by Konica Minolta brand, Spectrophotometer, CM-2500d, the specular component including SCI (diffuse/specular) and SCE (diffuse excluded/diffuse), with an illuminant of 65 and an observer 10°, the measurement area was 1cm², the calibration was carried out with a white standard. Two programs were used to process the data, at the start was used Spectra Magic NX and then to process and analyze the data, with Microsoft Excel Workbook 2016.
As in the previous analysis according to the type of sample the number of measures were taken. In the gradient samples, for each one, 9 shots were taken, these were located in the most marked areas of the color transition. In the checkered the exact points that were taken depended on each of each sample since they had small differences between them, which meant that there were different areas for recording, as is the case of those where the color was more saturated or the brush was marked, or where the edges were fuzzy etc., 9 different points were taken from each one; 3 white centers, 3 of the lines and 3 where the lines overlapped. In this way it was possible to see if the lines were extended or not and if the color saturation was maintained.
In the chromatic circle 17 points were taken: 3 from yellow, 3 from

3. Washing procedure of one of the gradient samples

fig. 3

blue, 3 from red, 2 from green, 2 from orange, 2 from purple and 2 from "black". The application of this study in this type of samples allowed us to see if there was a drag of any of the mixtures as well as to see if the characteristics of the color were maintained. In the Sample 0 were measured 5 points in different areas.

PARAPRINT OL60 WASHING APPLICATION

The Sample 0 was the first washed. Before the start of the process it was slightly moistened with a Dahlia Pressure Sprayer®, after that it was collocated in the system, it was washing until the water stopped to drag red dye and the water was completely colorless, the procedure lasted 4 hours, after that the sample was air dried on a blotter paper. This parameter indicated the time that the other samples would be left in the system since they were of the same size.
Each sample of the Group I was washed one by one (fig. 3), before to start with the process the samples were slightly moistened with an ultrasonic humidifier to avoid any damage in the painting, after that they were placed in the middle of the system, each sample kept washing for 4 hours. While washing it was noticed that the water did not drag pigment and the paint kept stable. After that the samples were air dried on a blotter paper too.

4. Values a and b* after and before the washing of the three checkered paintings (blue, red and yellow), in the graph it is possible to appreciate tha the numbers kept stable*

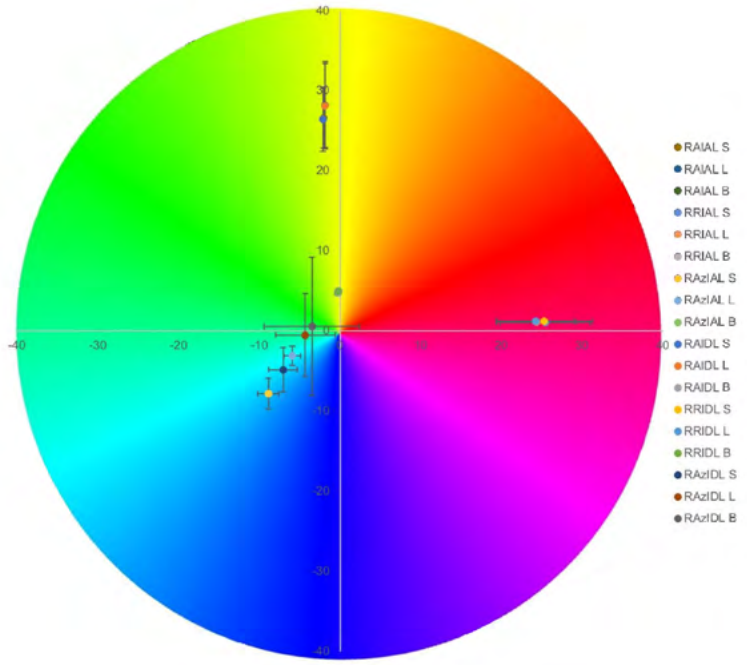

fig. 4

RESULTS

Sample 0

After moistening, the sample was placed in the washing system, immediately the red dye was dragging by the water into the empty container, in addition, the paraprint turned slightly red. Every thirty minutes it was observed that the color of the sample discolored until it became a light pink tone, the sample was in the wash until the water stopped dragging dye.
With the general photos, micro photos and the colorimetry it was possible to confirm that the red color decreased almost by 25%.

Group I

By comparing the photographs before and after the washing it was feasible to identify that in the 7 samples the paint remained in place, every single detail was the same, inclusively the borders of the watercolors were exactly identical, the gradients had the same color transition and the mixture of the color in chromatic circle remained without changes. The data of the colorimetry (fig. 4) confirmed the photographs results owing to the color properties continued in the same range, which allowed us to know that the measures of hue and chroma remained the same as at the start. Finally, the microscopic photographs showed that the color particles stayed in the same location between the paper fibers.

ANALYSIS OF RESULTS

Sample 0

The drag of the red dye, which simulates the substances that are generated over time, including some acids contained in a paper substrate, was evident from the application of the washing. The dye was notable during the process. After the washing, thanks to the photographic record, it was possible to see that the red coloration decreased, although it did not completely return to the original white color of the paper. This indicates a moderate cleaning, which allows it to maintain a level that is not excessive. The changes in red saturation were also visible in the microscopic shot, since the dye between the fibers decreased markedly, so that the macroscopic observations coincide with the microscopic ones. Optical spectroscopy revealed that in all points there was a decrease in red color and an increase in luminosity, proof of color extraction. Taken together, the analysis indicate that the cleaning is effective in removing water-soluble substances.

Group I

During the washing of the sample, it was observed that the water and the paraprint remained colorless. This was the first obvious indication that no damage had been done to the watercolor.
Subsequently, from the comparison of the before and after photographs, it was conceivable to see that the three basic colors and mixtures behaved in the same way when washed, since all without exception remained stable, none of them presented migrations, bleeding, which suggests that this method can be used with watercolors composed of a diverse color palette and similar formulations to those used in this research.
In the same way, it allowed us to verify, regardless of the type of pictorial resource (sutured colors, lines or gradients), that the paint was maintained, leaving both the linear and blurred edges in the same way. It was also observed that those areas with certain details remained the same. This indicates that the method can be applied to watercolors with more complex compositions and with a wide range of pictorial resources
Owing to the edges kept stable, which are the most vulnerable areas, it is possible to know that there would not be problems when cleaning a watercolor where the pictorial layer completely occupies the paper, without risk of having alterations.
As mentioned above in the macroscopic observations, no alterations were recorded, these coincide with the microscopic ones, where in the same way, regardless of the color or type of sample, no changes were observed in the distribution of the pigment conglomerates or in the pattern. This shows even more precisely that there was not movement of the paint due to the good condition of the binder.
On the other hand, optical spectroscopy showed quantitatively that the color properties of the watercolors were maintained in the same way before and after washing.

CONCLUSIONS

Since they did not show alterations caused by the washing process, it is possible to affirm that the washing does not cause damage in recent made watercolors. This is a good indicator, because contemporary watercolors are much less stable to cleaning than aged ones. The results also indicate that the method is applicable to watercolors with an extensive pictorial range, with a complex technique and composition without damaging them. The results also showed that the method drags soluble substances contained in the support without causing any alteration in pictorial layers.
This type of cleaning allows the washing of work arts that with other washes is not viable, such as pieces with structural damage that make difficult its manipulation or paper objects with media susceptible to water, since this method requires little movement of the work and does not directly affect the surface of the piece.
According to the bibliography, the cleaning methods mentioned above cause damage to the pictorial layer of the work with media that are susceptible to water, compared to paraprint washing, which are a slow and controlled cleaned.
The presented results in this research are an invitation to continue investigating and experimenting about the use of this method, and it would even dare to suggest its application to other pictorial techniques in paper. Since this method is a viable solution for cleaning paper works with media susceptible to water such as gouache, soluble inks, tempers, among others, and /or objects of paper with structural problems, such as highly friable documents or with tears, folds and deformations, to name a few.

FROM MATERIALITY TO IMMATERIALITY

ADOPTING TANGIBLE CULTURAL HERITAGE DOCUMENTATION TECHNIQUES TO INTANGIBLE CULTURAL HERITAGE

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With the threats of pandemic, modernity, globalization, migration and other socio-economic challenges, it becomes crucial to document and safeguard intangible cultural heritage (ICH). The evolving and dynamic characteristics of ICH can be a challenge in ensuring that it is safeguarded however, the initial step for understanding its complexity is through documentation. By identifying and understanding its vital features and factors, possible documentation tools and methodology can be adopted from tangible heritage documentation techniques and applied to each ICH domain: oral expressions and traditions, performing arts, rituals and social practices, knowledge concerning nature and the universe and traditional craftsmanship.

Through the process of documentation, significant information can be collected, stored and produced as audiovisual materials, texts, graphics, audio, images and replicas. Some of the basic steps in the process of documentation enumerated by ICCROM for tangible heritage can be adopted for intangible cultural heritage: (1) preparatory work; (2) fieldwork; (3) laboratory investigations; (4) overall evaluation of results; (5) supplementary assessments.

The following are the objectives of the research: (a.) To analyze the attributes of ICH in order to find suitable techniques for documentations (b.) To identify documentation tools, techniques, methods and strategies of tangible heritage that will be suited for each ICH domain (c.) To consider cultural diversity and sensitivity within the framework of the ICH documentation while also taking into account the ICH's domain. Thirty-one (31) country cases from different parts of the world were collected through the process of random selection online. Comparative-causal analysis was the methodology used for analyzing the extracted data from the case studies.

The data from the 31 case studies were compared and contrasted using the following attributes: domain (oral traditions and expressions/performing arts/ rituals and social practices/knowledge concerning nature and the universe/traditional craftsmanship), country classification (developing/developed), approach(bottom-up/top-down), documentation tool (audiovisual/image/sound/ replica/graphics), status(inscribed/not inscribed to the UNESCO Representative List) social structure(indigenous group/local inhabitants), vulnerability(at risk/safeguarded), ratification of the 2003 Convention for the Safeguarding of Intangible Cultural Heritage (state party/non-state party). From the comparative and contrast analysis, significant patterns were observed and determined. Five (5) case studies exhibiting the significant patterns were selected (from the 31 country cases) for causal analysis using the attributes and factors derived from the nature of ICH. The attributes and factors determined the documentation types and processes exhibited by the case studies. The following attributes and factors were used for the causal analysis of the five selected case studies representing each ICH domain: organization, history, materials, social actors, transmission, function, symbolism, space, vulnerability and embedded implication. The following are the five (5) case studies representing each ICH domain: 1. Oral traditions and expressions – Hudhud chants, 2. Performing Arts – Fado: Urban Popular Song of Portugal, 3. Rituals and Social Practices – Program of cultivating ludodiversity: safeguarding traditional games in Flanders, 4. Knowledge concerning nature and the universe – Traditional Wayfinding and Canoe Building in Polynesia, 5. Craftsmanship – Tinian Marble Craftsmanship.

From the analysis of the data, documentation tools for the selected cases were identified and classified according to the advantages, disadvantages and the features of each tool in terms of interaction with respondents, collection, management (cataloguing), analysis, storage (archiving) and dissemination.

Furthermore, the research attempted to concretize the complexity of ICH by identifying its significant features and factors influential to its evolving characteristic. The study can also can be a take-off point and reference for those who will embark on extensive and systematic ICH documentation and safeguarding.

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STUDY OF POSSIBLE SOURCES OF VEGETABLE FIBERS IN CUBA

FOR THE HANDMADE ELABORATION OF USEFUL AND NECESSARY PAPER FOR RESTORATION

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The restoration of documents includes those actions aimed at returning to a document, of whatever type, its meaning or function when these have been lost due to alteration or deterioration.
The complete and definitive definition of the Conservation and Restoration of documents took place in 1970 with the appearance of the first specialized manuals on the discipline and the formulation of international regulations and standards, which established its functions, objectives and methods.
Among the actions dictated by the conservation manuals, aimed at achieving the integrity of a piece in paper, is the lamination, which aims to correct the fragility of the document by recovering the consistency and functionality that it has lose and the reintegration, which consist of filling in the lost areas using materials with similar characteristics to the object to be restored. In both cases, the fundamental material used is the commonly called Japanese paper.
This paper is not only used in the restoration of documents but also to fix the pictorial layer in the restoration of easel paintings, murals and polychrome paintings, so its high demand in institutions linked to conservation.

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For the manufacture of Japanese paper or washi, the bast of the plants known as Kozo, Gampi and Mitsumata, very abundant in all the Japanese geography, are traditionally used. This is a paper composed by the superposition of vegetable fibers of different lengths and with numerous micro fissures.
This research will evaluate the potential of alternative sources in Cuba to obtain useful vegetable fibers in the manufacture of paper for restoration. For this purpose, there were identified the species commonly used for the elaboration of paper to restore and there were consulted some previous studies, referred to alternative fibers in order to establish a scheme of characteristics and parameters, which allowed determining the existence of similar species in our country (tab. 1).

Table 1. Traditional and alternative references of fibers used for the manufacture of paper for restoration.

Reference	Scientific Name	Common Name	Family	Fiber length
(González Alberdi, 2004)	*Broussonetia papyrifera*	Kozo	*Moraceae*	10 mm
(González Alberdi, 2004)	*Edgeworthia chrysantha*	Mitsumata	*Thymelaeaceae*	3-5 mm
(González Alberdi, 2004)	*Wikstroemia diplomorpha*	Gampi	*Thymelaeaceae*	3-5 mm
(Taylor, 2011)	*Hibiscus cannabinus*	Kenaf	*Malvaceae*	2-6 mm
(Becerra, 2013)	*Heliocarpus donnellsmithii*	Majagua	*Malvaceae*	1,88 mm
(López, 2003)	*Ficus*	-	*Moraceae*	-

tab. 1

The theoretical studies carried out showed the existence in Cuba of eleven plant species with a potential for the manufacture of paper for restoration. Four of such species were investigated because they were the most abundant. The plants selected for the study were Kenaf (*Hibiscus canabinnus*), Majagua (*Teliparitis elatus*) and *Ficus benjamina* and *Ficus religiosa* (tab. 2).

Kenaf was very abundant in Cuba during the 80s, because its fibers were used for the manufacture of sacks with the objective of replacing the import of this product. Since 1916, there were studied in Cuba the different species of fibrous cultivations appropriate for the manufacture of sacks for agricultural and

Table 2. List of the plants with potential for the manufacture of paper for restoration.

Scientific Name	Common Name	Family
Ficus religiosa	**Poplar tree**	**Moráceas**
Ficus benjamina	**Laurel**	**Moráceas**
Ficus benghalensis	Jagüey	Moráceas
Ficus lyrata	Pandurata	Moráceas
Ficus microcarpa	-	Moráceas
Ficus auriculata	Himalayan Fig	Moráceas
Ficus elástica	Gomero	Moráceas
Hibiscus canabinnus	**Kenaf**	**Malváceas**
Teliparitis elatus	**Majagua**	**Malváceas**
Daphnopsis americana	-	Timeleáceas
Daphnopsis guacacoa	Guacacoa	Timeleáceas

tab. 2

industrial products, being determined that the one with better perspectives under Cuban conditions was the Kenaf.
Ficus are also very common in our country; they were introduced as ornamental plants, thanks to the activity of the Royal Botanical Garden of Havana, created in 1822, mainly destined to the promotion of plants that could support temperate climates. Among the most common in the urban environment are the *Ficus religiosa* and the *Ficus benjamina.*
Another species studied was the majagua (*Teliparitis elatus*) a tree with a height of up to 18 m and a diameter of up to 80 cm. It is naturally distributed in Cuba and Jamaica and has been naturalized in South Florida, Mexico, Peru and Brazil. Its bast provides an excellent fiber for making ropes with which to tie up the packaging of tobacco. This bark is pulled off the young branches, which are reproduced, always preserving the majaguals. It is used in Cuba in reforestation programs.

METHODOLOGY FOR THE STUDY OF THE CHARACTERISTICS AND PROPERTIES OF THE FIBERS

These four species were analyzed in the laboratory in order to know their morphological properties. For this purpose, the fibrous material was placed in test tubes by adding 20 mL of acetic acid and 20 mL of hydrogen peroxide. It was kept for 48 hours in a distilled water bath at 50ºC, until a whitish color was obtained. The treated material was washed with distilled water and then shaken to achieve the dissociation of the elements.
The fibers were lightly dyed with aqueous safranin (aqueous dye solution), washed and then introduced in phenol glycerin (20 mL of melted phenol, 40 mL of glycerin and 40 mL of water)[1].
The material obtained was then placed on sheets, dispersed with water and placed on a heating plate at 60ºC to evaporate the water. It was covered with a coverslip and the sheets were mounted on a microscope.
The morphological characteristics of the fibers are those that basically serve as orientation criteria to elucidate the paper value of a given plant species[2]. These characteristics involve the length of the fiber, the diameter, the thickness of the wall and the diameter of the lumen (interior cavity of the fiber).
Table No.3 reflects the comparison of the values of length and width of the fiber, width of the lumen and of the walls of the fiber of the species selected for this study with respect to the fibers used as reference (tab. 3).

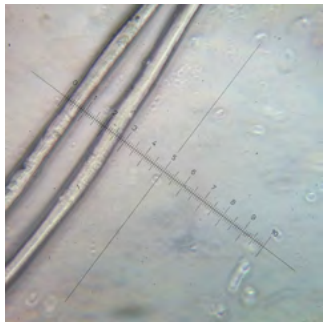

fig. 1

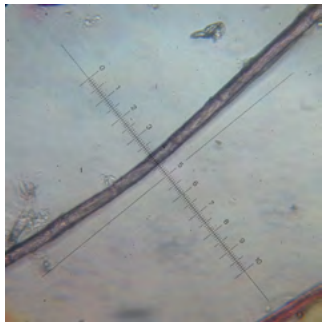

fig. 2

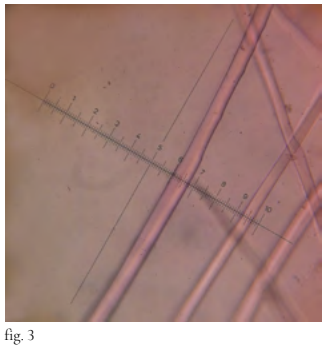

fig. 3

1. Microscopic view of the fibres of Ficus benjamina

2. Microscopic view of the fibres of Ficus religiosa

3. Microscopic view of the fibres of Teliparitis elatus

[1] Becerra 2013.
[2] García 1988.

Table 3. Average fiber dimensions (N=30)

Species	L (mm)	D (µm)	W (µm)	l (µm)
Ficus benjamina	6.5	25	7.5	10
Ficus religiosa	2.5	13	4	5
*Hibiscus canabinnus**	5	22.1	4.3	12.7
Teliparitis elatus	2.7	13	3	7
*Broussonetia papyrifera***	10	30	10	10
*Edgeworthia chrysantha***	3	12	4	4
*Wikstroemia diplomorpha***	3	12	4	4

tab. 3

*Values obtained for this species by Sanjuán (1997)
**Values taken from Taylor (2011)

The best results in terms of fiber length, as observed, are presented by the species *Ficus benjamina* and *Hibiscus canabinnus*, which can be considered as long fibers. As mentioned before, fiber length plays an important role in paper properties, especially in its resistance to tearing and bending, parameters that will increase the bigger the fiber dimensions are (fig. 1, fig. 2 and fig. 3).

In the case of *Ficus religiosa* and *Teliparitis elatus* the length value is not as high as in the other species studied, but it can be considered within the moderately long fibers and it is not discarded as a possible source of raw material for paper production.
The width or diameter of the fiber and the lumen influence the flexibility index of the paper. The wider the fiber, the higher the quality of the pulp produced. In this case *Ficus benjamina* has the most similar values to Kozo, with a fiber width of 25 µm and lumen of 10 µm.
There is a direct relationship between wall thickness and pulp quality, where the lower the thickness, the better the quality.
The results of the wall thickness measurement of the selected fibers generally showed low values, close to or equal to the values obtained for Mitsumata and Gampi. The highest value is presented by *Ficus benjamina* with an average of 7.5 µm, although it is below the value of the wall thickness obtained for Kozo.

CALCULATION OF MORPHOLOGICAL INDICES

Once the values of length, width and diameter of the fiber, as well as the diameter of the lumen were obtained, the morphological indexes were calculated (stiffness index, flexibility index, and felting index), all this allows to predict the quality of the paper that will be obtained using the proposed fibers (tab. 4).

Table 4. Quality indexes of the studied fibers and those traditionally used in the elaboration of paper for restoration

Species	I.R	I.F	I.A
Ficus benjamina	0.6	0.4	260
Ficus religiosa	0.6	0.38	192.3
Hibiscus canabinnus	0.4	0.57	226.2
Teliparitis elatus	0.5	0.54	207.7
Broussonetia papyrifera	0.6	0.3	333.3
Edgeworthia chrysantha	0.6	0.33	250
Wikstroemia diplomorpha	0.6	0.33	250

tab. 4

Rigidity index results indicate that all species analyzed, both those studied in this research and those traditionally used to make paper useful in restoration, except *Hibiscus canabinnus* (0.4 = medium rigidity) present high rigidity**.** We can say then that the paper made with these fibers will present greater resistance to tearing than the one made with *Hibiscus canabinnus*. In spite of this we are talking about a paper with very particular characteristics and properties that are not similar to those of common printing papers, the comparison, therefore, of the species studied with the Japanese species leads us to affirm that these species can be used in the manufacture of paper for restoration.
The fibers of the four species studied, were extremely faithful, close in values to Mitsumata and Gampi, especially *Ficus benjamina*, this indicates that all will have a high tendency to interlock so you can expect to obtain a highly resistant paper.

With regard to flexibility, the two species of Ficus were not very flexible as the Japanese plants and *Hibiscus canabinnus* and *Teliparitis elatus* can be classified as flexible according to the parameters studied, so, the latter will have greater potential for union between them and therefore be more resistant to stress. However, the Ficus are more similar in their values to the Japanese fibers so we can predict that with these it will be possible to manufacture a useful paper for restoration.

This research theoretically demonstrates that it is possible to produce quality paper for restoration from local raw materials. From this research, other studies are currently being carried out, which examine in depth the sustainability of the cultivation of these raw materials providing plants, the most efficient ways of obtaining the fibers, as well as the quality and resistance of the paper produced from them and the systematization of the manufacturing process for small-scale production, in a first stage, which could then be extended to other countries with flora similar to Cuba's.

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NMR PROTOCOL FOR MULTISCALE CHARACTERIZATION OF ARCHAEOLOGICAL WATERLOGGED WOOD

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Wood is a natural porous material with pores size between 0-400 µm and its structures[1] vary according to the species and to the anatomical direction observed. Wood is also a hygroscopic material in which water molecules diffuse and the diffusion coefficient is vehicle of information about pores dimension and distribution. Aim of this work was to characterize archaeological waterlogged wood by non-destructive nuclear magnetic resonance diffusion, relaxometry, imaging and cryoporometry in order to investigate the samples at different length scales (nanometer, micrometer and sub-millimeter scale). The work is divided in two steps.
In the first step, the molecular diffusion protocol was validated by studying five soaked modern woods (four hardwoods and one softwood) and measuring the diffusion coefficient along x axis (i.e. perpendicular to the main axis of vessels/tracheids) with a 400 MHz Bruker-Avance spectrometer. By introducing data correction to remove the diffusion of water through semi-permeable membranes (cell walls)[2], pores diameter was estimated.
In the second step, the characterization of the porosity and microstructure of a small and archaeological submerged wood excavated in Naples and belonging to the 5th century A.D. was carried out. Relaxation times T_1 and T_2 were quantified and magnetic resonance images were acquired by using a 300 MHz or 400 MHz spectrometer while cryoporometry was performed at 500 MHz using spin-echo and CPMG experiments over the temperature range 180-294 K, increasing temperature in 76 steps of 1.5 K[3]. T_1 and T_2 provided preliminary information about water compartments, wood density and porosity. T_2 and T_1-weighted images with an in-plane resolution of 18 x 18 µm² allowed to observe anatomical and physiological elements under the micrometer and sub-millimeter scale while T_2*-weighted images highlighted the presence of paramagnetic impurities due to the decay. Thanks to the magnetic resonance images it was possible to get a complete and non-destructive virtual histology in the three anatomical sections of wood (fig. 1).
By using the diffusion protocol previously implemented on the five modern woods, two sizes of micrometer pores were calculated: around 27 ± 5 µm associated to earlywood tracheids and around 18 ± 2 µm of latewood tracheids and the associated magnetizations were used to estimate the pores abundance. Through cryoporometry analysis, structures between 10 and 80 nm were identified as the interstices among degraded cellulose fibrils. In conclusion, this work presents an innovative magnetic resonance approach to study nanometer, micrometer and sub-millimeter structures of waterlogged wood and their variation over time. Furthermore, multiparametric high-resolution images provides a powerful tool for assessing wood species and the conservation status of submerged wood in its entirety.

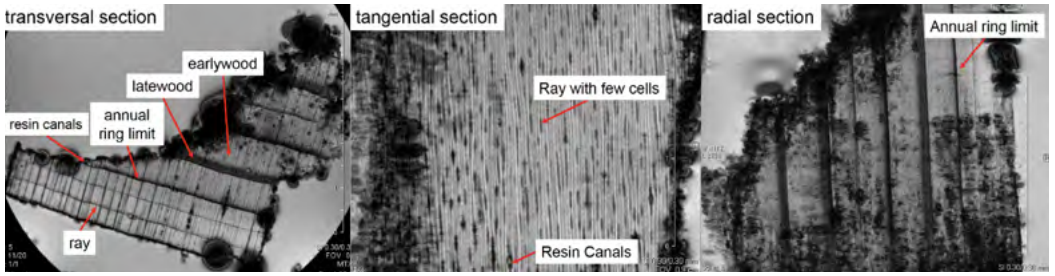
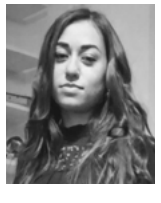


fig. 1

1. Virtual histology in the three sections of wood with its anatomical elements.

[1] Wheeler *et al.* 1989; Richter *et al.* 2004.
[2] Van As 2007.
[3] Mitchell *et al.* 2008.



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SESSION 3

MUSEUM PROFESSIONS

Sara Abram
Alberto Garlandini

First off, we would like to explain why, in conjunction with the scientific committee, we decided to dedicate one of the four sessions of the Forum to museum professions.
Thanks to the growth of their scientific profile, today's conservators have developed a great deal of interdisciplinary skills. In addition to competence in conservation and restoration, they require knowhow and knowledge on the maintenance, exhibition, transport and storage of artworks. Conservation is a knowledge process. During a conservation treatment we collect so much information about an artwork, from historical, technical and scientific points of view, that at the end of the intervention not only do we have a greater understanding of the artefact we have also collected data which can aid communication and educational and promotional initiatives. Consequently, documentation, digitization, and conservation practices must be flexible and adaptive to specific needs.
Starting from conservation we can touch all the aspects related to the life of a work of art. But are museums and institutions aware of this potential? In what ways can they involve young professionals of cultural heritage in their activities?
The experiences and reflections in the contributions to this session have helped us understand how to improve training programmes, so that they match the skills of young professionals to the needs of museums, collections and institutions. To acquire the necessary skills for the conservation of cultural heritage, the training and the profession itself must be integrated. This is one of the guidelines behind the organization of the five-year Master's Degree course in Conservation and Restoration of Cultural Heritage offered by the University of Turin in conjunction with the Conservation and Restoration Centre. At least 50% of the syllabus is devoted to hands-on workshop activities and the thesis is based on lab work at the Centre. Thanks to this type of experience, students have the opportunity to understand work organization, time and space management, the relationship with museums and institutions, and many other important aspects related to budgeting and fundraising.
It was not easy to select the six contributions for this session

because there were so many excellent works of research. We gave priority to those contributions which showed an interdisciplinary approach, networking skills, and methodological consistency.
The contributions which follow stand out for the scientific rigour of their museological research and for their interdisciplinary approach and attitude. The young professionals whom we selected have an open mind and are capable of working within an international scenario. We particularly appreciated:
1. the ability to react and take action in the face of emergencies, such as the impact on museums of the Covid pandemic, and to involve a large group of professionals in producing technical and social guidelines to face critical situations;
2. the interest in research and activities requiring experimentation and development of new paradigms, such as the conservation of contemporary art works and plastic materials;
3. the skills to produce guidelines not only for documentation and conservation, but also for a better promotion of specific works of art, including digitization, which is indispensable for the development of online resources;
4. the ability to work in a globalized world and in interdisciplinary working teams, to combine traditional and local heritage with international conservation challenges;
5. the willingness to transfer knowledge and technical information obtained during conservation activities to training initiatives for museum operators.

Museums are facing global challenges in managing their collections and attracting visitors and we would like to underscore that people working in and for museums are their best resource. Which is why we emphasize the importance of museum professionals. Museums without professionals cannot fulfil their roles for society and its development.
We are greatly worried about the impact of the COVID-19 emergency on museum employment. We know that outsourced services and freelance professionals such as education staff have been particularly affected. These professionals are often motivated, committed, competent young colleagues. Losing their professional skills and personal commitment is going to be catastrophic for both museums and society itself.

Sara Abram, Alberto Garlandini

ICOM BRAZIL RECOMMENDATION IN FRONT OF TO COVID-19

THE IMPORTANCE OF INTERDISCIPLINARY COLLECTIVE ACTION BETWEEN INSTITUTIONS FOR THE PROTECTION OF HERITAGE DURING THE PANDEMIC IN BRAZIL

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INTRODUCTION

The COVID-19 pandemic brought severe consequences for the world population by affecting the general quality of life, forcing changes in habits and reducing the flow of people and goods. Additionally, it also brought to a high number of deaths and a significant impact on the local and global economy.
A total of 29,679,284 cases occurred worldwide with a total of 936,521 deaths and, a total of 4,383,264 cases of the disease and 133,119 deaths in Brazil alone till 27th September 2020[1].
Such facts directly affected the cultural economy in March 2020, leading to the shutdown of 94.7% of museums worldwide and forcing the vast majority of employees of 84% of museums to work remotely from their homes[2]. By determination of the Brazilian government, the 3880 Brazilian museums[3] had to close its doors from March 15 2020, roughly 18 days after the first confirmation of the disease in the national territory[4].
The Museu de Arte Moderna do Rio de Janeiro (MAM Rio) closed its doors to the public for more than five months since

[1] WHO 2020.
[2] ICOM 2020, p. 2.
[3] IBRAM 2020.
[4] Ministério da Saúde 2020.

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WINNER OF THE SESSION 3

the state's determination, and much of its staff began working remotely three days later. For the first time in the museum's 72 years of existence, the team had to be physically absent from the collection. This unprecedented situation was the initial motivation for collaborative action among professionals from various Brazilian cultural institutions that resulted in a document with guidelines on the conservation of collections and security of heritage professionals during the period of social isolation: *The ICOM Brasil Recommendation in front of COVID-19*[5]. ICOM Brasil (Brazilian Committee of the International Council of Museums - UNESCO) was responsible for organising and disseminating these recommendations later translated to the English and Spanish languages.

THE WRITTEN PROCESS

Faced with the impossibility to be physically present by the MAM Rio's collection, the professionals of the museology department began to worry about how the security of the collections and the handling of its professional's health during the pandemic (the MAM Rio's museology department was later renamed Acervo e Conservação (Collection and Conservation) since august). Still, back in March, a search for specific guidelines on how to deal with the situation was conducted but ended up without results. From then on, museology and conservation professionals from different institutions both in Brazil and abroad started to informally connect themselves based on the professional conduct suggested in article 8.11 of the ICOM Code of Ethics.

Professional Consultation

It is a professional responsibility to consult other colleagues within or out-side the museum when the expertise available in the museum is insufficient to ensure good decision-making[6].

In the first moment, the communication went through telephone and email in order to understand how each institution was proceeding concerning the conservation of collections in few aspects: how often professionals went to the museums to check collection conditions, what measures should be considerate regarding loans, what were the choices of equipment and individual security measures, whether any more teams in the eventual tasks were involved, and whether such decisions were discussed and supported by the board of directors.

Even though the initial objective was to find guidelines of instructing the museology department of MAM Rio to apply conservation methodologies in this period, this initiative made evident how enormous were the gaps on how other institutions were treating their collections and professionals. It was then that, together with the conservation team of the Museu de Arte de São Paulo (MASP) and the board of directors of ICOM Brasil, the representants invited all other organisations for an online meeting with multiple Brazilian cultural institutions that took place at the end of March of the same year.

The first online meeting had the attendance of 70 professionals of different functions, such as museologists, conservators, restorers, producers, researchers, historians, directors and registrars from 33 Brazilian cultural institutions, including art, history, ethnographic, technology museums, public heritage institutes, heritage management companies, cultural centers, universities, archives and libraries.

Initially, each representative described how their institution was organising itself regarding the conservation of its collection during the period in order to exchange information and create a network for support.

The following questionnaire was sent out in advance so that each testimony could follow an orderly pattern:

How often do the responsible professionals go to the institution for a check-up in the works and museum spaces?

Is there a staff rotation in this routine? If so, which teams are involved?

What are the criteria for choosing employees who should go to the institution?

Does everyone have access to the technical reserve?

Is there a team (such as security, cleaning and maintenance) that keeps going to the institution daily? If so, which ones?

Was there a reduction in personnel?

If the previous answer was yes, do these teams have any function related to the conservation of the works (such as emptying the dehumidifier trays, for example)?

Was this routine discussed by the entire team and management or only by the conservation/collection/museology department?

Which personal security measures must the employees take and which ones have the institutions guaranteed?

The answers were very varied, which denoted a substantial heterogeneity in how each institution treated the collections and their professionals in the face of social isolation. About 40% of them had no plan on how to proceed with conservation in this period, either due to lack of resources, specialized staff, planning or parameters.

About only 63% of the institutions that answered the questionnaire during the meeting did provide security equipment for individual use for its employees who needed to be on site. Others, however, had developed defined action plans on conservation, but about 47% of

[5] ICOM Brasil 2020.
[6] ICOM 2006, p. 12.

them had not even discussed with the management or had support from other teams.
Following suggestions, the research group proceeded to create a collaborative recommendation document written by all the participants aiming at the urgency of the situation and suitable to the different realities of museums in Brazil.
An online document was filled out over a week by participants with observations, suggestions and bibliographies as the only available guidelines at that time related to the heritage and COVID-19 were the recommendations of ANVISA (Brazilian National Health Surveillance Agency) and WHO, which served as parameters for this writing process.
A smaller task force composed of Camila Pinho (MAM Rio), Erick Santos (MASP), Marilia Bonas (ICOM Brasil) and Yacy-Ara Froner (LAICOR-EBA/UFMG) met once again remotely to organize the ideas and to structure the documents into recommendations. This document, in turn, was made available to the original group for further comments and approval. The ICOM Brasil Recommendation in front of COVID-19 was written and disseminated over 15 days, and launched in early April 2020.

OBJECTIVES

Countless initiatives focused on plans for museums related to digital actions, such as workshops, lives, online exhibitions and seminars observed since the beginning of the pandemic. In the document that is the object of this work, these actions were not discarded but had as a central focus action that would guarantee the conservation of the institutions' physical collection and the safety of the professionals involved.
At first, the online gathering between professionals from Brazilian cultural institutions had the objective of understanding which procedures could be adopted aimed at the safety of the collection and professionals during the period of social isolation based on practical experience. Soon, the common understanding was that the content of this meeting could generate a document with recommendations to homogenizing the way of providing continuity to the heritage conservation and also guaranteeing the safety of museum professionals, following the rigid criteria of national and international health agencies and the museological parameters.
The applicability of such a document in a country of continental dimensions such as Brazil with diverse realities of cultural institutions of complex and heterogeneous natures are the central object of study of this article.

THE DOCUMENT

The ICOM Brazil Recommendation in front of to COVID-19 is divided into 18 general recommendations that revolve around the teams involved in conservation practices of the collections during the pandemic, the action and management plans for this period, and the next steps for a return action plan. These are the recommendations:
1. Regarding the coordination of actions
2. Regarding professionals at risk
3. Regarding routine teams
4. Regarding outsourced teams
5. Routine, inspection and work shift planning
6. Internal communication plan
7. Risk management plan and maintenance team procedures: building maintenance
8. Maintenance management plan: air conditioning, dehumidifiers, climate monitoring
9. Risk management plan and procedures in case of fire, flood and natural disasters
10. Risk management plan and theft security protocols
11. Cleaning management plan
12. Management plan and procedures in storage room and custody areas
13. Recommendations for exhibitions: long-term exhibitions; disassembly and assembly of temporary exhibitions
14. Recommendation on works in atelier or laboratory
15. Recommendations on loans, research and returns to home institutions
16. Recommendation on documentation projects
17. Recommendations regarding the public, communication, digital actions, educational actions
18. Activities Return Plan Development

The document begins with an important statement that it is not just about recommendations focused on museums, although it is organized and disseminated by ICOM Brazil. It also deals with cultural institutions in a broader sense, such as archives and libraries because it understands that safeguarding heritage is its main objective, regardless of the structure or definition of the institution in which it is inserted.
Besides, the document recognizes the impact of the crisis caused by COVID-19 on cultural institutions of memory, understands the need to adopt measures and strategies to provide continuity and guarantee the preservation of collections, and affirms the need to protect the professionals involved.

In this article, we will not discuss each topic of the recommendations, but those that deserve highlighting. However, the first topic regarding the coordination of actions is of high importance as it demonstrates the involvement of numerous teams in actions related to the conservation of collections together with outsourced professionals.
In a national context in which most of the teams of memory institutions have no training in the area, this recommendation ensures the continuity of preservation of their collections, even by professionals who do not necessarily act as conservators or museologists.
It is crucial to notice that during the composition of the document, the country was under constraints of a possible lockdown, although it never happened. In case it would happen, managers had to coordinate actions with fire departments and police together with an employee and surveillance professional of the institution.
The second, third and fourth topics focus on the safety and risk prevention of the institution's professionals and outsourced personnel who need to be physically on-site. Following the WHO regulations and a survey conducted by institutions on their staff, this document is categorical about professionals remaining in remote work to avoid unnecessary risks.
It is explicit the importance of preserving lives at this time, and it is the utmost responsibility of managers to assure the health of their employees. However, certain functions as the maintenance of essential services (such as cleaning and surveillance) should remain physically operating inside their spaces. For this, the recommendation is that staff must be rotating in shifts while the institutions must also provide the necessary equipment for individual security. All these proposals apply in the cases of outsourced employees according to the document.
One of the most discussed topics of the online meetings led to the document was regarding routine, inspection and shift planning. While it was understood the importance of the specialized conservation teams to be available to identify eventual problems with the collection, it was not known the safest way to establish a framework of rounds on-site.
Regarding shift planning, the suggestion intended taking into consideration the rotation of the employees and also limiting the amount of personnel on-site while contemplating all areas that contain works within the institution with a description of necessary activities. The cleaning, security and building maintenance teams should undergo proper training to report eventual problems to the conservation team once their activities were not interrupted inside of museums.
Previously on the online meetings, many professionals reported that the boards of institutions were using the time of closure for non-urgent renovations of building suitability, deemed later as not recommended in item 7 to avoid putting workers at risk. The maintenance actions, both building and equipment, are recommended to ensure the collection conservation.
The physical absence of most of the team caused a communication problem within the institutions. Items 9, 10 and 11 suggest plans and protocols in cases of fire, flood and natural disasters, theft and cleaning. These items also suggest quickly applicable actions for institutions that do not have a specialized team in conservation/museology and mostly rely on requesting support from the local community and partners.
Another item extensively discussed in the online meetings was the need to authorize employees who usually do not have access to the storages. It became clear that the different structure and team realities that would give the individualized answer to this question, as suggested by the document in item 12. Also, this item covers several realities of this space that may have numerous devices and technologies involved, depending on the structure of the institution. Generally, the surveillance of equipment and turning off the maximum of lights is widely suggested together with handling the minimal number of the works in this period.
The fragility of the exhibition areas concerning their safety was a highlight of the meetings. Supervising these spaces is essential during the security, building maintenance and cleaning teams. The document also highlights in item 13 that ceasing setups and dismantling of any exhibition and restrict access to long-term exhibition areas. In items 14 and 15 it is foreseen the suspension of the loan activities and inside the restoration laboratories.
A crucial point for the collaborative intention between professionals and institutions is present in item 15 that refers to loans. Trusting the quality of each other's handlings and decisions related to conservation was part not only of the initial listening of the group but also the following recommendations:
- collaborate with and trust the employees of the institutions where the works are on loan, avoiding external inspections and maintaining contact with the employees who are responsible for the loan and custody;
- it is recommended not to send couriers to monitor the works; [...]
- monitor disassembly, reports and packaging by videoconference[7].

The memory preservation, as a primordial aspect in the institutions responsible for safeguarding the heritage and in the professional practice of its employees, was considered in the recommendations. The document suggests that all the actions adopted by the

[7] ICOM Brasil 2020, p. 4.

institution in this period are in reports for future consultation (item 6). Item 16 recommends that documentation projects keep active even though remotely.

CONCLUSION

The scope of these recommendations was only possible thanks to the union of professionals through a strategic of democratic and collaborative elaboration. This fact allowed the document to be feasible and easily applicable to the different realities of Brazillian institutions ready for adoption in diverse structures, including those that do not have teams of conservators and museologists. The team involved in the elaboration of this document had different abilities, which guaranteed an even greater reach in its application.
The recommendations were not only written by an interdisciplinary team but also absorbed the role of safeguarding the collections, all the teams that work in the institutions, whether they are museums or not. In other words, it means that the mission of heritage care must be interdisciplinary.
The confidence in every professional involved on the team was the starting factor for a document that could indicate collaborations between institutions. In such a turbulent period, the congregation was fundamental in so many aspects of daily life, not only in the cultural area to direct actions of conservation.
Professional ethics was present throughout the process, seeking the best solution for practices that focused on safeguarding the heritage and the safety of the professionals involved, even in unbalanced realities within the context of Brazil's heritage institutions.
Despite the inefficiency of public policies to combat COVID-19 and the disinformation, the collective initiative and the speed of action of the professionals involved make evident the strength of the area of heritage conservation in Brazil and the importance of collective actions amid the crisis.
This document has initially been widely disseminated by ICOM Brazil and the IBRAM (Brazilian Institute of Museums) and later translated into English and Spanish, aiming at a broader scope than just the national territory. At present, the document also appears in the bibliography of recommendations of several platforms in Brazil, Latin-America and Europe, and international sites on heritage, such as ICOM International, ICOM-CC and Ibermuseus. The recommendations also serve as a bibliographic source for re-opening protocols of different museums.

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PLASTIC IN OUR CULTURAL HERITAGE
TRASH OR TREASURE?

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Plastics as artworks have played a significant role since the 1920s when Naum Gabo first constructed pieces from cellulose nitrate and acetate[1]. Fifty years later, plastics comprised essential components of groundbreaking technology in the Apollo space program and today everything from 3D printed buildings to medical devices, credit cards and food packaging contains this material. Wide range of different types of plastics, and therefore diversity of physical properties of these materials make them still attractive to artists nowadays[2]. When museums acquire and register artworks or objects, they are legally obliged to preserve them for future generations. Because plastics degrade faster than traditional heritage materials, this raises many ethical questions, problems and challenges for the museums' regulations.
In this paper, I would like to focus on two study cases from different Polish museums. This case studies are the subject of my doctoral thesis[3]. The first one – *The green composition* (1967) by Zdzisław Głowacki – is an example of a work of art, in which the artist used a polyurethane ester foam to create a painted relief (fig. 1). The second one – *Reflective Standard* (1975) by Władysław Hasior – is a composite work, where Saint Anne's aureole was made of nitrocellulose sheet. Both works of art exhibit extensive degradation, especially the nitrocellulose aureole that has crazed and broken irreversibly (fig. 3). Polyurethane ester foam from

[1] Pullen 1999, p. 48.
[2] Shashoua 2008, p. 115.
[3] Anna Andrzejewska, *Synthetic as a matter of contemporary works of art in the process of conservation*, PHD project at The Interdisciplinary PhD School *Academia Copernicana* 2018-2022, Nicolaus Copernicus University in Torun.

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fig. 1

The green composition is crumbling, cracking and breaking (fig. 2). Despite active conservation treatments, the work is unlikely to resemble again its original appearance.
In both cases the artists' intentions did not include destruction of the work of art.
At the time of creation of these pieces of art, the limitations of synthetic materials where unknown. What is more there was a belief that plastics were highly durable and Polish artists were encouraged to use it[4]. The condition of the works invites the following questions: Should we replace some elements? How will replacement impact the authenticity of the work? Is it possible to exhibit such degraded plastic with a proper narrative, using virtual reality to show how these objects changed with time?

[4] First Symposium of Visual and Scientists *Puławy 66* was organized in August 2-23 in 1966. The idea of this meeting was to present modern materials produced by Polish chemical industry and possibilities for their application in creative process to a leading artists that generation. Furthermore, J. Bruzda and K. Dziedzic published in 1973 a book *Tworzywa sztuczne w plastyce* (Synthetic materials in visual arts) with theoretical and practical information regarding to application of synthetic materials in art.

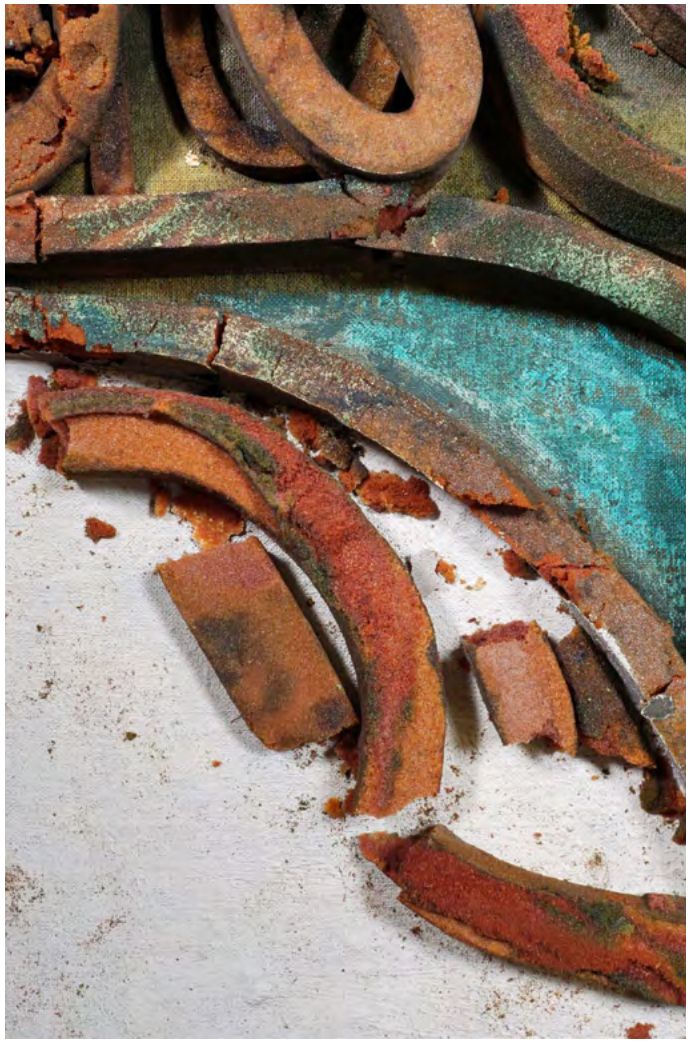

fig. 2

Should we donate these pieces scientists specializing in materials ageing research? Should we think just about the matter or rather try to more broadly understand and reflect upon the artistic idea embedded into it? I would like to answer these questions also taking into consideration the museums' legal regulations. As the problem is very complex, each case requires individual approach. Issues concerning preserving modern art are multidimensional. They involve guidelines relating to saving works of art by conservation which are regulated by documents like for example: Venice Charter (1964), Convention Concerning the Protection of the World Cultural and Natural Heritage (1972), ICOM Code of Ethics for Museum (1986), The Nara Document of Authenticity (1994). These guidelines, along with conferences, literature

fig. 3

and modern philosophical thought present which aspects and values should be paramount in preservation and conservation[5]. Keeping the meaning of the work of art in its tangible and intangible aspects should be the paramount goal of conservation-restoration[6]. At this point problems with conservation of works of art made of plastic emerge. Time and numerous research show that plastic is not a durable material and modern-day conservation methods are insufficient in regard to reversing degradation processes that have already started[7]. Keeping tangible aspects of the work of art becomes problematic. Awareness of the problems concerning plastic degradation, and thus preventive conservation, developed as late as the 90s. Many works of art

[5] Wharton 2005, p. 164.
[6] Jadzińska 2012, p. 209.
[7] Shashoua 2006, p.68.

in Polish museums were stored on the shelves and remained forgotten. They were often stored improperly. Described pieces of art are the prime examples. They can be plainly called museums' trash.

Decision on conservation process depends on the understanding of the character and proper reception of the work of art as well as on judgements about its aesthetic situation, conceptual aspects and assessment of its value. What seems to be helpful here, is the decision-making model for the conservation and restoration of modern and contemporary art[8] developed by a working group of the Foundation for the Conservation of Modern Art. This process should assume cooperation between artists, artist's representatives, owners, art historian, conservator, conservation scientists and technical consultants[9].

The extent of the conservation process depends on recognition of the meaning of the work of art and issues which are closely related to its authenticity. Careful examination and recognition of substances of which the work of art is made is crucial. Once all informations are collected and analyzed, it is advisable to consider different conservation options. When the degradation is so far-reaching and any conservation treatments are not able to restore its original glory, and thereby the idea and authentic artistic message, there are several solutions to adopt. One of these solution is making a copy. From ethical point of view, it seems to be acceptable that the author makes the replica by oneself. However, it may pose a challenge due to the fact that over the years production processes and new additives might make it impossible to find the same substances which do not differ in terms of chemical structure[10]. From ethical point of view, the replacement of degraded elements is acceptable in specific cases and rather used in installation art and with artist's consent. Elements made of polyurethane ester foam in *The green composition* constitute the major part of the composition and in *Reflective Standard* the replacement of the aureole made of nitrocellulose sheet would be also pointless as well as it would influence significantly the integrity of the work of art because other elements of composition are just as much damaged. It is also possible to reconcile oneself to the loss of the work of art and intend it for research purposes[11].

Past solutions were not satisfactory for me. From the point of view of a conservator it is difficult to accept the ephemerality of the substance as well as to accept the fact that often this ephemerality concerns unique works of art, which are significant elements of cultural heritage. Existence and the cultural footprints of these works of art are priceless regarding keeping

[8] *The Decision-making* 2005, pp. 164-172.
[9] Wharton, Altshuler, p.167.
[10] Rodrigo *et al.* 2005, pp. 47-50.
[11] *Ivi*, p.51.

the continuity of perceiving the development of individual artist and changes in Polish art in 60s and 70s. Museums not only preserve cultural inheritance of humanity but also provide cultural and scientific education. What if we display these trash with suitable narration and restore their original glory? Internal museum regulations are highly restrictive with regard to exhibiting, loaning and the transportation of the works of art which are in poor condition and need conservation treatments. First signs of degradation exclude the work of art from exposition and the lack of effective conservation methods often results in restricting oneself to protecting from further damaging and storing it in a museum. In this way, we create a vicious circle, which consign the works of art into oblivion.
In order to give the work of art a second life there is an idea to present the damaged works with proper narration.
For many years latest technologies concerning conservation and restoration of the works of art have been introduced. In the late 90s people started to discover the possibilities of Virtual Reality (VR). Succeeding years brought the significant development of 3D modelling by laser scanning system[12]. This method is widely used in the field of cultural heritage: digitalization of collections, monitoring the state of preservation as well as virtual reconstruction. Along with the development of technology new possibilities arise from the Augmented Reality (AR), which combine VR settings with real physical part[13]. Positioning and orientation of the user is crucial in this technology and provide the possibility of watching spatial works of art from different angles in a real time. By using software we can overlaid artificial information on Real Environment (RE). Until now AR technology was used for architectural monuments for co-locating the reconstructed parts[14] or to re-creation[15] and even to replaced original object during conservation[16]. Considering the development of personal devices, in March 2020 Apple introduced LiDAR (Light Detection and Ranging) Scanner into iPad Pro[17], AR Technology in mobile devices sector will be common and more precise This technology may undoubtedly be useful for interactive exhibitions, during which the viewer, by using application, might see how the work of art looked like before conservation treatment, how it looked like in the time of creation (virtual reconstruction) and at the same time has direct contact with original degraded substance. Certainly, the presentation of degraded objects itself might prove to be risky and it is advisable to take special precautions. Very often deterioration process produces toxic chemical by-products, that is why material investigation at the beginning is highly significant.

[12] Dellepiane *et. al*. 2011, pp. 37-38.
[13] Saggio, Borra 2011, p. 60.
[14] Gîrbacia *et. al*. 2013, pp. 223-231.
[15] Portalés *et. al*. 2009, pp. 316-331.
[16] A. Dajnowski et. al 2015, pp. 65-72.
[17] https://www.apple.com/pl/newsroom/2020/03/apple-unveils-new-ipad-pro-with-lidar-scanner-and-trackpad-support-in-ipados/ (17.09.2020)

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My perspective as a conservator, is that we should do all we can to keep plastic works of art alive. Taking into consideration the technical limitations of conservation treatments, it seems significant to create some solutions that will allow us to retain the vulnerable works of art made of plastic at least in digital form. The digital reconstruction enables imperfect but as close as possible to "real" reception of the object's "content" and artists' messages while not confused by the changing visuality of the "saved" work. The project of preparing interactive exhibition with AR assumes cooperation between curators, conservators, 3D designer and mobile app developer.
The proposed procedure for deteriorated originals will allow future visitors to continue to experience important modern heritage of the 20th and 21st centuries.

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FACING THE BACKLOG
THE *PRINT ROOM ONLINE PROJECT* FROM RIJKSMUSEUM IN AMSTERDAM

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INTRODUCTION

The Rijksmuseum collection consists of c. 1,1 million objects. Due to this volume, collection management has been and still remains a challenging task. Throughout the years, several projects have been started to take the object administration to a higher level. After having imported information from inventories into collection management system AdLib in the late 1990s, it became clear that a more structural approach was indispensable to meet increasing demands from both internal and external parties. These ongoing developments were sparked and accelerated when in 2006 the Erfgoedinspectie, the Dutch state agency in charge of supervising the preservation and management of the national collection, conducted an inspection. The ministerial quality standards for collection management had recently been increased, which made it necessary to check if and to which extent, the newly introduced parameters were respected by the institutions in charge of preserving Dutch cultural heritage. Among others, one particular parameter was used as a decisive benchmark in determining the condition and accessibility of the collection: any object had to be traced within ten minutes, regardless of the research conditions (time, place, and person). When the Rijksmuseum in Amsterdam was inspected in June 2006, it turned out that the required standards could not be met, especially not within the Print Room collection, one of the largest collections in the museum with c. 700,000 objects (prints, photographs and drawings), which was only partly inventoried. As a result, the museum received a negative assessment from the Erfgoedinspectie for the first time.
The inspection not only confirmed the fact that there were considerable backlogs in the registration but also that the method used was insufficient to facilitate access to the collection.

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THE *PRINT ROOM ONLINE PROJECT*: ORIGIN AND BASIC PRINCIPLES

As the museum's board quickly realized, it would have never been possible to incorporate the retrieval of the backlog into the daily workflow. There were too many artworks to deal with and the number of staff members was not sufficient to take care of such a large and heterogeneous number of objects. The best option was to set up an internal project to systematically face the backlog. Learning from the experience of other registration campaigns already underway in Europe, such as The British Museum Collection Online (COL)[1], the museum management decided to pair the opportunity to confront the collection management challenges with this possibility to improve the visibility of the Rijksmuseum by granting online access to the collection and thus bringing it into the new digital era.
At the end of accurate evaluations, a trial period was started in 2007 to assess the possibilities and limitations of such a project. The pilot was successful: the set targets were achieved and overcome. Despite the positive results, the trial also showed some criticalities that could have impacted the project's future production.

GENERAL SCOPE AND ACCESSIBILITY

The main goal of the museum was to communicate effectively that the Rijksmuseum collection in fact belongs to everyone and therefore had to be available for everyone to see. Even though the importance of making the collection accessible online was perceived, structuring the project to pursue this as the main scope would have diverted the attention away from specific needs of the collection. As the Erfgoedinspectie check had underlined, it was indispensable to solve the most urgent criticalities first,

[1] For more information on COL project: Szrajber, 2008.

i.e. the registration of the Print Room collection. The focus was therefore set on cataloguing and digitizing the works on paper. Online publication of the data was considered a secondary scope. Also, the management of other parts of the collection beyond the Print Room, as well as administration linked to collection policy and mobility (such as new acquisitions and loans), was not part of the project and thus appointed to different departments.
At the end of 2012, the museum adopted an open policy approach by making all data, including high-resolution images, freely accessible. Most of the objects belonging to the national collection that are housed in the Rijksmuseum are not subjected to copyright and may therefore be reproduced. The Rijksmuseum decided to make high-resolution images available for free. This atypical approach proved to be successful in the long run. Making the high-resolution images downloadable and (re)usable without costs had discouraged the publication of unofficial images and, at the same time, had made the museum website the main source for images of its collection. A strategy that has paid off in terms of visibility and appreciation from the users[2].

REGISTRATION OF THE OBJECTS

From the beginning, it was clear that estimating, and respecting, a precise processing time per item was challenging due to the heterogeneous character of the collection. On average, to be able to plan and keep the trial results constant, the time window was set to twenty minutes per object. The registration time was affected by the nature of the object. Many artworks in the collection – not the ones that were part of the trial phase – would ideally request more in-depth historical research, and therefore a longer processing time. It would have been hard for cataloguers to always insert precise cataloguing information respecting the scheduled time, especially for the lesser known groups of objects. In order to simplify the entire process, the chosen approach was to make a prioritization within the collection: starting with the so-called highlights (such as prints by Rembrandt and Lucas van Leyden), followed by the Dutch School and in that way, choosing to start by focusing on the objects that could be processed easily and rapidly, and saving the more complex ones for a second phase. In the second phase the targets were adapted to the nature of the collection, e.g. ranging between twenty and forty objects per person on a daily basis.

[2] Verwayen, Arnoldus, Kaufman 2011.

THE *PRINT ROOM ONLINE PROJECT* THROUGH THE YEARS: CHANGES AND DEVELOPMENTS

Over its thirteen years of activity, the *Print Room Online* project has undergone evolutions and changes, mainly aimed at increasing production and making the working process more efficient and productive. There are three periods in which the project is divided: an initial phase between 2007 and 2012; a second phase between 2012 and 2015; and a third period started in 2015, which is still ongoing today (and is expected to end in 2021)[3].

THE FIRST AND SECOND PHASE: 2008-2015

Since the beginning, the workflow was organized in two "steps":
1. Cataloguing: if available, the existing and basic registration information is being verified and adjusted in collection management system AdLib. Afterwards, it is completed with more detailed art historical information, such as descriptions and keywords, which make the collection more accessible. An extensive and detailed manual ensures the information is being catalogued in a consistent way. All cataloguers are trained art historians, book historians or historians.
2. Digitization: mostly performed after the registration has been completed. The guidelines for digitization have been designed following Metamorfoze Preservation Imaging Guidelines standard.[4]

In April 2013, the museum reopened after a renovation that had taken nearly ten years. The project was able to continue despite the challenges that occurred as a result of the relocation of both staff and collection.

PRODUCTION IMPROVEMENTS: 2015-2020

After eight years a large part of the Print Room collection still had to be registered. To speed up the process, an impetus was needed. The objective was ambitious: accelerate from 35,000 items yearly processed in the period 2012-2014 to about 65,000, in order to complete the registration and digitization of the collection within 5-6 years. Achieving this purpose was challenging and to do so a structural change in the workflow was necessary. Although the general work organization was kept, to improve the registration capacity a more structured preparation phase,

[3] The authors of the paper joined the *Print Room Online* project in different moments. Idelette van Leeuwen, as head of the Paper Conservation Department at the Rijksmuseum, since its beginning has followed the project as supervisor for conservation. Manon van der Mullen started working in the *Print Room Online* project in 2012 and since 2019 has become Project Manager. Dafne Diamante has joined the project as paper conservator in 2018.
[4] v. Dormolen 2012.

propaedeutic to registration and digitization, was introduced. A pre-selection phase of the items, carried out by curators and a research coordinator, was added. As already stated, the Print Room collection is an extremely heterogeneous corpus of objects. Besides the clearly defined groups, other agglomerates of materials of the most varied types were stored in the depots. Classifying these items during the registration phase would have been extremely time-consuming. The pre-selection solves this problem, making accessible also these lesser known parts of the collection.
Another important addition to the preparatory phase was the introduction of a conservation team, responsible to mechanically stabilize the objects whose secure handling could not have been guaranteed without.
On top of the mentioned changes, to achieve the aimed target of 65,000 registered and digitized objects per year, important changes in the project structure were applied: more cataloguers were hired and the number of employees thus increased to nearly thirty people. A different hierarchic structure was implemented by introducing an intermediate level, the project coordinators, in charge of leading small teams, performing checks and dealing with daily criticalities, directly reporting to the project manager. In total four project coordinators were provided: two for the cataloging teams, one for the conservation team, and one for the digitization. Furthermore, research assistance was recruited to support the curators.

These improvements effectively transformed the *Print Room Online* project into a strongly oriented and high structured taskforce, almost an organization within the organization. Side activities not related to the final aim were reduced, and the directives from the institution were tightened. To keep homogeneous registration quality level and registration results, several standard protocols were given to the employees, in the form of manuals and guidelines. Also, the aim of the project was slightly updated. From now on making the collection digitally accessible to a large public had become a primary objective. To speed up the digitization process, some collections have been digitized externally.

CONSERVATION PRACTICE AND DIGITIZATION: PAPER CONSERVATION TEAM

As previously mentioned, the conservation condition of the objects belonging to the Print Room was one of the open questions faced through the 2015's reorganization.

[5] Coevert, v. Beek 2015.

Among the items that had not yet been digitized, many presented conservation issues or/and were not stored according to museum conservation standards; a condition that did not ensure their secure handling during the registering and scanning phases. Although the museum has an own paper conservation atelier, it would have never been possible for the conservators to take care of all those objects along with the usual tasks.
Over the years of the *Print Room Online* project, the conservation issue was discussed several times, without finding a final solution for it. In 2015, the will to complete the project led to reconsideration. Given the impossibility of delegating the work to the paper conservation atelier and not wanting to subcontract the project to external conservation companies for internal policy reasons, the chosen strategy was to create an internal team responsible for the conservation. As was already the case for the other teams, a project coordinator was asked to report not only to the project manager but also to the head of the paper conservation atelier.

For conservation, the goal was ambitious too: treat and/or mount approximately 30,000 objects (10,000 photographs and 20,000 prints and drawings). To do so, conservators were asked to focus on treating the object in the most efficient way, privileging low invasive procedures oriented to physically stabilize the objects. Although initially the tasks assigned to the conservation team were purely practical, through the years the conservation team became an indispensable technical support for the other departments involved in the project, especially for the physical management of the collection. The most important example of this collaboration was the design and creation of a mobile book cradle, still used by the photographic department, for the safe handling and digitization of objects.[5]

CONSIDERATION ON CONSERVATION PRACTICE WITHIN A DIGITIZATION PROJECT

From a theoretical point of view, conservation practice within a project like *Print Room Online* can be described as the practical application of the concept of preventive conservation and minimum intervention. In real life, working in such projects puts the conservator in front of several challenges, and, therefore, can be a helpful experience for conservators' professional growth. The uniqueness of the project makes it possible to earn both practical and methodological expertise.

From a practical point of view, working with scheduled rhythms and strict directives improves manual and organizational skills. By operating at high rhythms, the conservator earns confidence in performing treatments and learns more about his capabilities. Moreover, working on larger groups of objects helps the conservator to become able to develop systematic methodologies useful to carry out the work with a constant pace.
On the methodological side, skills in decision making can be earned. To best achieve the objectives, it is crucial to have a good overall view of the work and be able to discern between a necessary operation and a superfluous one. The majority of the objects will probably not be treated again; therefore, in this case, more than in others, the conservation condition chosen by the conservator will be the final one. The same approach applies to the condition report and analysis of the materials. The conservator must be able to discern between information; learning to record and investigate just what could be harmful to the object.

Such systematic work practice raises ethical questions about conservation practice related to digitization. Once the object is digitally available, its use becomes "passive"; namely it can be consulted without physical manipulation. While keeping intact the documentary and artistic value, the artwork is no longer the physical means through which a concept is expressed. Consequently, from a conservative point of view, the primary objective is no longer to completely restore the object's integrity. It becomes, instead, the long-term conservation. To adopt minimal invasive conservative practices and limit the more invasive ones, is the best way to achieve this objective.
The reduction of conservation impact on objects is, currently, more and more carried out, both in private practice and in public institutions. It is a common habit to avoid those treatments which could produce a modification of the object, e.g. the practice of washing in paper conservation. Within the context of digitalization, this concept is further extended, and conservators are asked to minimize physical intervention on the artworks. From an academic point of view, this does not mean that conservators should not be prepared and educated to face the most complex conservation problems.
On the contrary, it is fundamental to train conservators properly. They have to be able to intervene, also in most complex cases, by applying the less invasive conservative methods - which often coincide with innovative and avant-garde restoration techniques - and to develop low impact and high-performance conservation procedures.

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CONCLUSION

Despite the temporary stop due to the corona crisis, the *Print Room Online* project is still ongoing, and it is a vital part of the Rijksmuseum, thanks to the support of the management and the curators, which has been essential. Even with reduced working pace, the project has known more visibility recently. The inability to physically visit museums has prompted many people to use digital channels. In the months of lockdown virtual tours, social media activities, and especially digital collections increased their success. The Rijksmuseum, thanks to the far-sighted strategies adopted in the past years, has been one of the institutions touched by this new trend, receiving widespread recognition at an international level.
Last months' experience has shown us, one more time and with a stronger voice, the importance of digitization aimed at the preservation and sharing of art. A practice that all collections all over the world are asked to adopt. This great success has been the worthy recognition for all the years of effort and work and constitutes a further push and motivation for the conclusion of the *Print Room Online* project. It is with this mindset that the project, one of the largest and most structured digitization projects in the artistic field, is moving towards its conclusion.

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THE BIRTH OF A MUSEUM: THE CONSERVATOR'S POINT OF VIEW

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THE PROJECT

This paper describes the ongoing experience of the two authors, both conservators, in a project concerning the creation of a museum in Oman – the *Oman Across Ages Museum* or *OAAM*. We discuss our roles in and contributions to the project in the hope that this will be a useful starting point for other young professionals who in the future may encounter, even partially, the same situation[1].

The OAAM project has developed since 2014 and is envisaged as the last great gift of the former Sultan Qaboos Bin Said Al-Said to the Omani people, along the lines of the Sultan Qaboos Grand Mosque and the Royal Opera House, completed respectively in 2001 and in 2011.

The museum will act as a landmark in the landscape and as a cultural and educational tool for the region and the entire country, as well as a vehicle for developing the practice of conservation, which the country began to address a few years ago. The opening of the museum to the public was planned to coincide with the 50th anniversary of the Sultan's reign and with his 80th birthday. Unfortunately, his death and the Covid-19–related emergency shutdown of the country have made the opening date uncertain[2].

[1] The collaboration with Royal Court Affairs, the branch of government under which the museum project falls, was made possible by the coordination and under the oversight of Bruna Mariani, an Italian conservator who unfortunately passed away prematurely on 17 August. We take the opportunity of this small space to remember her and the contribution she made.

[2] Since the project is still ongoing and no images have been published yet, it is not possible for us to provide images from the collection or even of the museum building.

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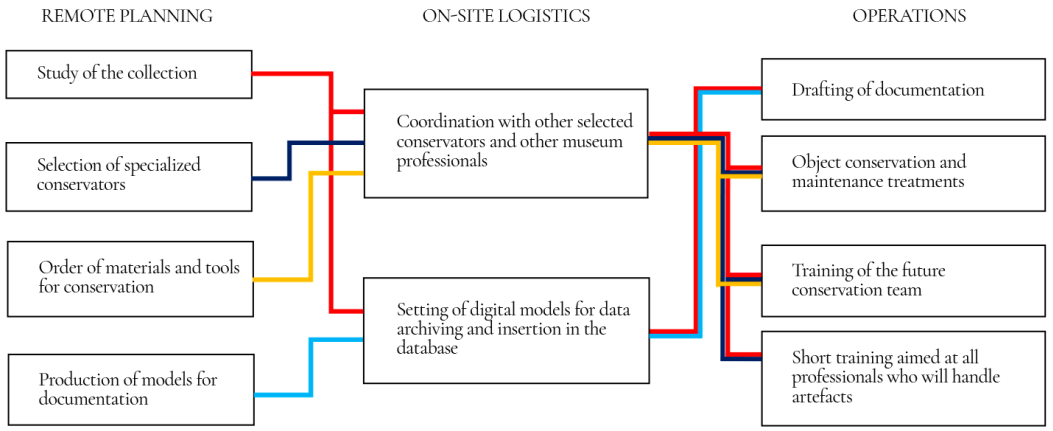
THE COLLECTION

The ever-expanding collection includes a large amount of material of the most disparate types over a range of historical periods.
Visitors to the museum will be guided along a narration of the history of the country, starting with a short section dedicated to the geological formations of the country and moving on to the human presence: from the story of the first settlements dating back to prehistoric times to the first commercial and cultural exchanges with other peoples and then focusing on the Islamic period, and on the Bedouin and mercantile cultures before arriving at the succession of historical events of the modern age.
Great importance will be given to the Renaissance of Oman, which occurred after 1970, when Sultan Qaboos took power. The Sultan embraced enlightened policies and used the geopolitical situation of Oman both regionally with the other Gulf states and internationally to good effect. The Sultan also introduced forward-looking policies for the exploitation of the country's mineral wealth. The proceeds generated by this sector were intelligently invested in the construction of a modern infrastructure system to ensure all citizens a good level of free education and health, among other things, which projected the country towards modernity.
In addition to displays of the artefacts created in each period, audio-visual and multimedia supports are planned that will allow the museum to be considered as an archive of the historical memory of the country.

THE FREELANCE CONSERVATOR

The decision of the museum to rely on a team of foreign conservators, on the one hand arising from the desire to employ a highly-specialised staff, on the other hand was made necessary by the lack of such professionals on site. When we think of a museum, we imagine an already well-organised concern, with a pyramidal structure that also works on a transversal level, but, especially in the initial stages of the project, everything is in progress. As Oman is a young country from the point of view of heritage conservation, it does not have museum professionals. The advantage for young Omanis of taking an active part in the birth of a project of this size is that it offers participants, at all levels, the opportunity to learn from professionals from all over the world.
As freelance conservators we followed a two-phased programme, embarking on a project design phase from abroad, followed by a second phase, the logistics and operational phase, on site. The first

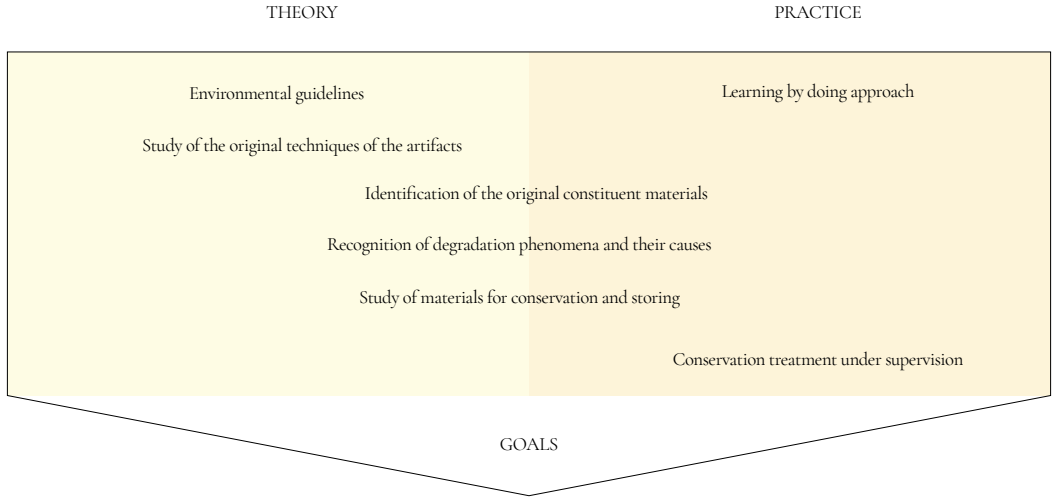


scheme 1

1. Project design and operative phases.

phase took the form of a preliminary study of the collection acquired up to that point, with the aim of identifying the different classes of materials present and preparing an operational plan that would be useful for the selection of specialist conservators for the various objects. An aspect that should not be underestimated, although apparently trivial, concerns the supply of conservation material. The lack of availability of a product, even if considered commonly used and easy to find, can delay operations by even months (especially if importing the product presents customs clearance difficulties)[3].
Pending the completion of the building of the museum and, in particular, the finalisation of the conservation laboratories, the storage rooms and the plant engineering necessary to store the collection and run the conservation programme, the second phase took place within specially adapted spaces in the capital city. This period mainly saw the coordination of other specialised conservators, the restoration of the collection and the training of three local museum staff who will form the conservation team. All of this took place in coordination and in cooperation with other museum professionals.
In addition to the authors, who were present for the duration of both phases and who applied their specialisation in the conservation of natural and artificial stone materials and wall paintings, four other professionals with different specialisations were selected for the restoration of and training related to different parts of the collection[4].
The arrival and stay of these four conservators were organised according to the number and difficulty of the objects related to their specialisation and the needs of the other people working on the project. In addition to contributing to the training of the local conservation team, these conservators held short handling courses for some classes of objects, such as the slides and photographs that the museum photographers were acquiring digitally (scheme 1)[5].

[3] Sometimes one cannot compromise on the quality of a product, even if the search for unconventional solutions that involve the use of local material might be considered preferable from an ethical point of view – and very interesting from a professional point of view. The alternative product may have the potential to harm the conservation of objects (particularly in museums and regarding storage materials).
[4] These specializations were: ceramic, glass and metal materials; textile and leather materials; artifacts carved in wood and wooden structures; book and archival material; paper and parchment artifacts; and photographic, cinematographic and digital material.
[5] At this time, it was not possible to support a conservator in all phases of material handling.



scheme 2

2. Training highlights.

TRAINING

The training of the local conservation team is probably one of the matters on which the most energy has been spent. The need to complete the conservation of the objects for display at the opening of the museum in accordance with the deadlines set did not allow, in the initial stage, for time to be set aside for a short theoretical training course.
At the same time, it was considered vitally important from the outset to make future conservators aware of the context in which they work (the museum), the area to which they belong (conservation) and the multidisciplinary nature of their professional work[6].
During the object documentation and treatment phases, the different issues were dealt with on a case-by-case basis, with relevant insights. This made it necessary to use a "learn-by-doing" approach, which proved to be advantageous. In addition to facilitating the internal bond of the team, thanks to teamwork, this approach had the benefit of promoting the spontaneous absorption of knowledge and technical skills and an understanding of the need for dialogue with other professional figures.

[6] The roles and interactions between the different museum professionals are clearly summarized on the ICOM-CC website: http://www.icom-cc.org/330/about-icom-cc/what-is-conservation/conservation:-who,-what-amp;-why/#.X2RnKGgzZPb
[7] Among others https://icom.museum/en/; https://www.iccrom.org/; https://www.canada.ca/en/conservation-institute.html; https://www.getty.edu/conservation; https://aiccm.org.au/

After the objects to be exhibited had been restored, around ten months of mostly practical work, it was possible to organise theoretical training sessions. At this stage an understanding of the crucial themes was facilitated by a partially developed sensitivity towards cultural heritage in general, and conservation in particular, as well as the methodological criteria adopted with respect to the artefacts and the collection throughout the training course (scheme 2). Of great help in overcoming language and terminology barriers was the material made available online by prominent international associations and museum institutions concerning museum ethics codes and the different classes of materials, their degradation, manipulation and other related issues[7].
An essential part of the training was to instil in the trainees an awareness of the limits within which they can intervene with the skills acquired through the training. In fact, although the results obtained from the training course conducted were good, this path cannot and should not replace full training (and the necessary experience) but needs to be considered as a solid starting point to be expanded on with subsequent training and/or internships according to individual predispositions.

CONCLUSIONS

This experience teaches once again how valid the figure of conservator can be in this context: where sensitivity to cultural heritage and its preservation has not yet taken root, an understanding of the need to use considerable energy (economic expenses, long training courses, cutting-edge technologies and complex techniques) to preserve objects that were in common use in previous generations or (even) nowadays cannot be taken for granted. The practice of conservation can offer invaluable help in sparking interest in these communities: often the results of the treatments are, sometimes unfortunately, visibly recognisable and in many cases, arouse a sort of "astonishment effect", which at first awakens a curiosity about the materials and techniques used. Once the precious goal of involvement has been reached, the desire for knowledge can turn towards increasingly complex themes: from the motivations and reasoning behind the choices made, to why maintain a *patina*, up to the central questions: "What is a museum for?" and "What is the point of conservation?". It is important that the community and the public ask themselves these kinds of questions and that the answers are accessible to them.

A NEW DIGITAL APPROACH IN TEXTILES DOCUMENTATION

INVESTIGATING SAFAVID VELVETS IN THE COLLECTION OF THE UNIVERSITY OF PENNSYLVANIA MUSEUM OF ARCHAEOLOGY AND ANTHROPOLOGY [PENN MUSEUM]

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INTRODUCTION

Beginning in Spring 2018, a group of four rare and magnificent Persian Safavid velvet fragments from the University of Pennsylvania Museum of Archaeology and Anthropology's collection are being displayed in rotation in the new Middle East Galleries. In preparation, the textiles became the focus of an in-depth study that combined advances in graphic documentation and computer-aided design diagrams with the presentation of detailed weave structure analysis and technical features of each fragment. Importantly, the collaboration with Dr. Renata Holod, curator of the Near Eastern Section of the Museum, resulted in a detailed historical contextualization of the pieces.
The digital diagrams featuring the velvet's structures, color palettes and patterns analysis are currently being used by the Museum as didactic aids (tab. 1) and have the power to engage the contemporary Museum audience in a dynamic and colorful way, contributing to the extension of our textile collections'

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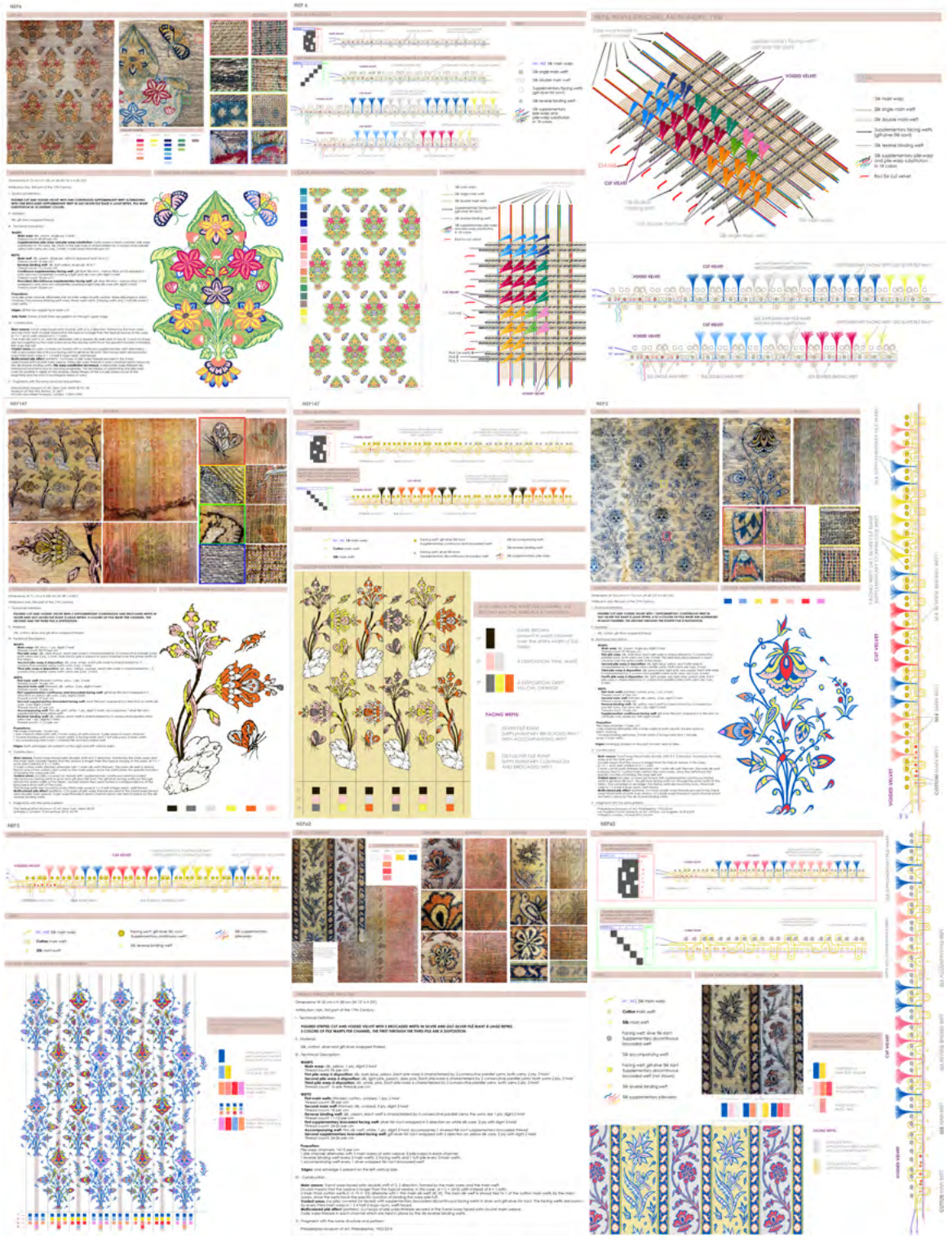

tab. 1

In the opposite page
Table 1. NEP3, NEP6, NEP60 and NEP147 digital rendering of weave structures, color sequence and patterns. A meticulous technical analysis has been carried out for each textile. [Diagram and weave structure analysis credit: Martina Ferrari]

[1] According to the textile vocabulary published by the *Centre International d'Études de Textiles Anciens* [CIETA], depending on the configuration of the pile, velvet can be classified in different ways: *cut* (usually with cut pile of uniform height), *uncut* (looped), a combination of both (called *ciselé* – the cut pile is higher than the uncut pile), or *broderie* (the cut pile is the same height or lower than the uncut pile); *pile on pile* (pile cut to different heights), pile areas on flat ground (*voided*), *plush* (cut velvet with long pile). On velvet weave structure and terminology, see also: Devoti, Romano 1981; Sonday 1987/1988, pp. 57-83; Sonday 1999/2000, pp.101-151; Carboni 2006, pp. 192-203; Bier 1987 and 1995; Monnas 2012; Mackie 2015, Landini 2017; Folsach 1993; Atasoy, Denny *et al.* 2000; De Gennaro, Landini 1987; Jain 2011; Pickett 2018

[2] Among the few extant examples of tailored Safavid velvet clothes, the robe now in the collection of The Royal Armoury - Livrustkammaren in Stockholm, [Accession number: 6195 (3414)] is one of the most celebrated. Entirely made of polychrome silk and metal threads, the robe was most likely woven in Isfahan or Yazd, under Shah 'Abbas the Great's government. For more information on Safavid fashion with a focus on opulent fabrics used for external garments, see: Chardin 1881; Ruhfar 2002, pp. 83-85; Scarce 2002, pp. 72-76; Scarce 2010, pp. 143-57; Scarce 2013, pp. 58-77

[3] One fragment of a parasol is in the collection of The Metropolitan Museum of Art. Accession number: 27.51.2

life, reach and accessibility while laying a sound foundation for additional discoveries, deeper understandings and nuanced interpretations.
Digital documentation and communication of our textile cultural heritage is a critical way to preserve and ultimately enhance the collections themselves.

THE FOUR VELVETS AND THEIR PRODUCTION PROCESS

The Persian Safavid velvets under study (NEP3, NEP6, NEP60 and NEP147, fig. 1) date to the late 16th through the 17th centuries and are among the most flamboyant ever woven. They are characterized by sophisticated designs, an incredibly varied color range of natural dyes now faded drastically over time, complex weave structures and the extravagant use of expensive silks and metal-wrapped threads (in gilt-silver and silver).
The term '*velvet*' generally describes a fabric with supplementary warp-pile, usually silk.[1] During the weaving process the pile-warps are drawn up over thin, grooved-metal rods to make the raised loops, and then cut by the weaver using a small pile-cutting blade (Persian: *tig*) to form individual tufts, thus creating the raised, plush velvet pile. The four velvets in this study alternate flat areas faced with supplementary metal threads, called "voided," with raised polychrome areas of supplementary pile-warps, called "cut", thus creating the design.

Persian velvets would have been suitable for different functions such as:
A. Clothing, in particular, ceremonial robes[2];
B. Furnishings: cushions, bolsters, interior hangings or exterior hangings draped over balconies, balustrade covers, floor spreads, mattresses and canopies;
C. Interior tent panels;
D. Interior linings for umbrellas/parasols[3] (Persian: *shamsiyya*);
E. Animal trappings such as, for example, decorative covers for horse saddles.

While they can be considered as testimonials of Safavid artistic creativity, masterly competences and technological achievement, they are also expressions of power, wealth and taste. They were woven in royal manufacturers by talented silk weavers, but velvet's production involved many more skilled artisans at almost every level of society. Velvet's complex production process would have included the following steps:

fig. 1

1. Fragments of Safavid velvet, Iran, datable 17th c. CE, University of Pennsylvania Museum of Archaeology and Anthropology [Penn Museum, NEP3, NEP6, NEP60, NEP147] Photo credit: Martina Ferrari

[4] The number of pile units depends upon the *découpure* (or pattern step), the step determined by the drawing on grid paper. The smallest step is one, meaning that each square on the grid paper design represents a single pile unit. This is the most refined step and makes for the smoothest curves in designs.

[5] For a description of the drawloom, and particularly the set-up for velvet weaving, see: Pickett 2018; Thompson, Canby 2003, pp. 274-292; Wulff 1966, pp. 205-210. Mackie 2005, pp. 38-40; Jain 1997.

[6] The *naqshband* translated the design into the *naqsha*. The China Silk Museum defines the *naqsha* as "a detachable set of vertical drawcords and horizontal pattern lashes that acts as a template for pattern lifting". At the 2020 Textile Society of America conference, B. Pickett defined the *naqsha* as a "complex mass of cleverly knotted strings which control the fancy pattern design. [...] The naqsha is compressible, portable and lightweight", and C. Bier outlined that "the naqsha is a messy bundle of logic". For more information on the *naqsha* see Pickett 2018.

[7] The weaver controls the position of the warp threads in an up or down position using treadles (floor pedals), creating an opening or shed for the weft to pass through.

[8] The stages prior to weaving are described by Thompson, Canby 2003, p. 275 and Pickett 2018.

[9] CAAM [Center for the Analysis of Archaeological Materials] is located at the Penn Museum. In 2019, we have been able to receive analyses of the nature of the metallic strips, thanks to the director, Marie-Claude Boileau and her research group at CAAM.

1. a drawing executed on paper as a continuous repeat pattern (Persian: *naqsheh*) made by master designers or court artists
2. a schematic drawing on grid paper[4] (or point paper or *mise-en-carte*), which translates the original design into weaving code
3. a woven-thread model made with actual yarn; the model is fundamental as a guide for making the pattern harness for the drawloom
4. dressing the drawloom for weaving

The first three steps would have been prepared in advance, off the loom. Painters were very likely not trained in the technical skills of weaving. Adapting the imagery to the loom was thus the task of the *naqshband*, a term, which translated literally from Persian means a "drawer of threads/weaving". These experts calculated the mathematical sequence determining the exact order of the warp and weft threads necessary to create the selected pattern on a drawloom.

The Persian drawloom for velvet production had the basic loom component and an additional complex mechanism that allowed warp threads to be lifted in a group, as required by the pattern in order to create the design.[5] This additional mechanism is called the 'pattern harness' (Persian: *naqsha*)[6]. It functioned with at least two people: the weaver who controlled the treadles (floor pedals) creating the structure[7], and an assistant, the *drawloom-boy*, who was responsible for lifting and lowering the pattern harness according to the design[8]. The close interaction between the weaver and drawloom-boy would have enabled them to weave fabrics with a good level of consistency.
Velvet is the most material-intensive and labor-intensive fabric that has ever been produced. Since it is characterized by a dense silk pile, it takes about six times as much warp material than is needed to produce any other flat textile. It is also extremely time consuming: a weaver might average a few centimeters per workday.

PHOTOMICROGRAPHY, FIBER IDENTIFICATION AND SURFACE ANALYSIS OF METAL THREAD

Calibrated micro-images of the velvet structures were taken at various magnifications (fig. 2); each metal-wrapped thread was studied at the Center for the Analysis of Archaeological Materials (CAAM).[9] Fiber identification was carried out using a transmitted light microscope with polarizing filters.

fig. 2

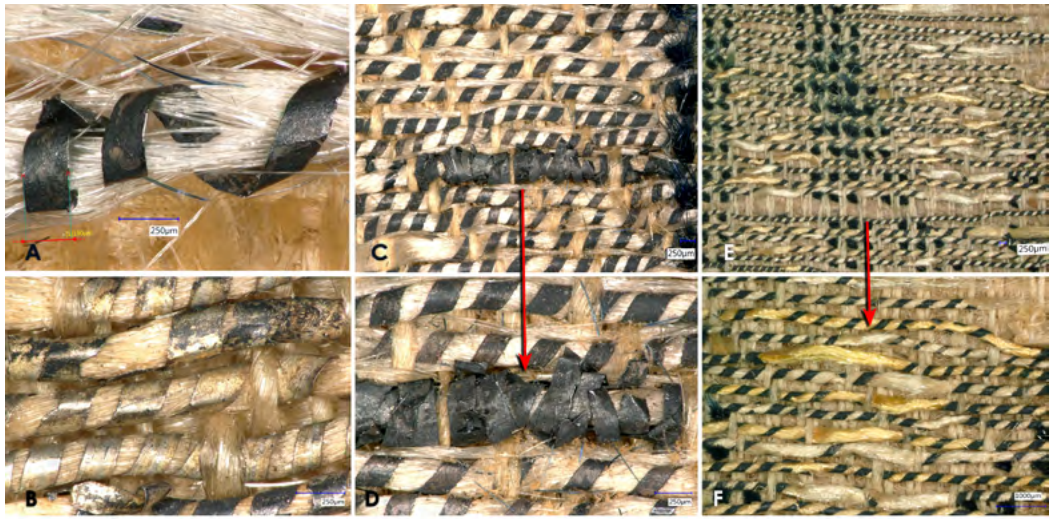

fig. 3

2. Mosaic of different details of the velvet fragments discussed in this study (Photo-macro and -micro documentation) [images: Martina Ferrari]

3. Photomicrography of silver and gilt-silver metal thread wrapping, and not completely covering, white and yellow silk cores (filé riant).

3A. NEP60: The sharp edges of the strips preserve the marks of a cutting tool.

3B. NEP6: The strips are characterized by irregular widths and slightly different thicknesses. Examination of the thread with an optical microscope revealed that the silver metal lamella was one-side coated with gold.

3C-D. NEP60: Two silver strips appear to have been joined by overlapping them as they were wound around the white silk core. Each of the metal wrapped threads are coupled with thin white Z-twisted silk accompanying weft. From the pictures it is clear that both the accompanying and metal wrapped wefts are bound by the vertical yellow silk main warps.

3E-F. NEP3: alternation of metal wrapped threads with white and yellow silk cores. This unusual alternation is limited only on random areas throughout the length of the textile fragment, and not related to the pattern. The alternation is difficult to recognize with the naked eye but clearly visible with a microscope.

[10] The parallel main warps run lengthwise from one end of the textile to another. They are set on the loom before weaving and are the active component during weaving: they withstand the tension and friction associated with repetitive opening and closing of the sheds for the introduction of the wefts. Patterned textiles can have several warps, each of which is named according to its function (for example: Main, Inner, Binding, Pile-warp, Pile-warp substitution). Some of these warps can also be defined as 'supplementary', or rather nonstructural warp added to create pattern.

[11] The horizontal wefts provide filling for textile construction and are inserted during weaving. They interlace warps at right angles. Wefts are named according to their function (for example: Main, Facing, Complementary, *Liseré*, Brocade, *Lancé*, Accompanying, Pattern, Reverse-Binding weft). Some of the wefts can also be generically defined as 'supplementary', if they are not structural to the weaving and added to create the pattern.

[12] For a brief history of the use of metal-wrapped thread in Safavid/Persia, see: Hardin, Duffield 1992, pp. 43-59; Shibayama, Wypyski, Gagliardi-Mangilli 2015; Carboni, 2006, pp. 192-203.

[13] In *filé riant*, the metal strip can be either tightly or loosely plied, showing different proportions of metal to silk. The color of the silk core, and the spacing between spirals characterized the final aspect of the textile, giving a variety of tonal effects.

Photomicrography documentation has allowed for detailed comparison among the four weave structures.

It is important to highlight the extremely high thread count, i.e. the number of threads per cm, with an average of 90 main warps[10] and 25 main wefts[11] per cm, indicating the exceptional fineness and high density of the weaves. All fibers are spun in the "Z" direction (counter-clockwise), while the metal-wrapped threads are spun in the "S" direction (clockwise) around an S- or Z-twisted white or yellow silk core. These data can provide us with further information about the geographical attribution and the provenance of the pieces since there appears to have been consistency of certain twists within cultural regions.

Each of the natural fibers studied under the microscope has its own characteristic morphology and optical features that distinguish it from all the others. They were identified as silk and cotton, with the only exception of NEP 6, which was entirely woven using polychrome silk.

Metal thread analysis provided data relating to manufacturing techniques and conditions[12]. Both gilt-silver and silver metal threads are present. The sharp edges of these strips have preserved the marks of a cutting tool (fig. 3A). The strips are also characterized by their irregular widths (around 0.1-0.3 mm) and slightly different thicknesses (around 0.01 mm) (fig. 3B). Given these observations, they were most likely manufactured using the '*beaten and cut*' technique, i.e. the metals - both silver and gilt silver - were beaten into thin sheets (foil/leaf), and then cut into extremely narrow strips. As shown in fig. 3C-D, the short strips appear to have been joined by overlapping them as they were wound around the silk core. In addition, close visual analysis of the gilt-silver thread shows that the gold was only present on the exterior of the strip. All the metal strips were S-wrapped onto a smooth silk and did not completely cover it: this enhancement is called, in French, *filé riant*[13].

Finally, as shown in Figs. 3A-F, corrosion, dirt accumulation and tarnishing have affected the current appearance of the metal thread which stands out even more clearly than originally intended.

WEAVE STRUCTURE ANALYSIS AND DIGITAL RENDERING USING COMPUTER AIDED DESIGN

The sheer complexity of the velvets' technique, as well as their fragmentary and faded nature, made structural documentation a challenge. It became clear that both written and image-based methods would be necessary components of a thorough technical analysis.

Computer Aided Design software AutoCAD® was combined with photo editing software and photomicrography documentation taken from the obverse and reverse of each textile to create a digital reconstruction of the original color palette, the weave structure technique – in cross-section and axonometric view – as well as of the pattern sequence. Several color detection apps, mainly used by professional graphic designers, were also explored in order to digitally reproduce the original color shades, which have remained remarkably bright and intact on the reverse of the fabrics over the centuries.

The meticulous transformation of the textiles' technical data into digital information has allowed me to convey all the complexity, nuance and striking beauty of each fragment, rendering specific technical data in visual form, providing greater accessibility to the textiles and increasing possibility for systematic comparative analysis (tab. 1).

In short, the four weave structures present technical similarities, and can be defined as *figured cut and voided velvets with supplementary continuous and brocaded discontinuous wefts in silver and/or gilt-silver filé riant à liage repris with multiple colors, some of them, à disposition*. The labor-intensive *pile-warp substitution technique* is present only in NEP6 (fig. 6).
Figure 4 shows how the complex weave structures have been deconstructed and examined level by level in order to provide a detailed view of the entire complex system of different kinds of threads thoroughly intertwined into a unique, magnificent entity:

(1) 5-end warp-faced satin *doublé* (or extended) weave foundation. In all the four velvet fragments, a set of main warps interlace with a set of main wefts to create a satin *doublé* main weave. The term *doublé* means that the weave is longer than a typical 5-end satin-weave; in these cases: (6+1) + (6+2) satin instead of 4+1 satin in which the warps are dominant (warp-faced).[14] This simple weave forms a minimum number of interlacing avoiding diagonals, resulting in a very shiny, compact and homogeneous surface.

[14] Each successive warp goes over 6 wefts, under 1 weft, and over 6 wefts, under 2 wefts, instead of going over 4 wefts and under 1 repeatedly. Practically, the velvet satin *doublé* main weaves are characterized by 2 more paired and parallel main wefts that are tied together by the main warps since they have the specific function of binding the warp pile tufts. This pair may be considered a (pile-forming) *horizontal vise-like wefts* for securing the pile tufts on the obverse of the fabric.

4, above. NEP6. Main weave. The I, IV and VII / III and VI single main wefts (represented here in green) alternate with II and III / V and VI / I and II / IV and V double and paired main wefts (in dark blue). The paired vise-like wefts are tied together by the main warps (in pink). In contrast to NEP6, in the fragments NEP3, NE60, and NEP147, each of the pair of the vise-like wefts is of different thickness and material: one thick cotton weft is alternated with one thin silk weft. [Diagram credit: Martina Ferrari].

4, center. NEP6. Facing weft.

4, below. NEP6. Pile-warp.

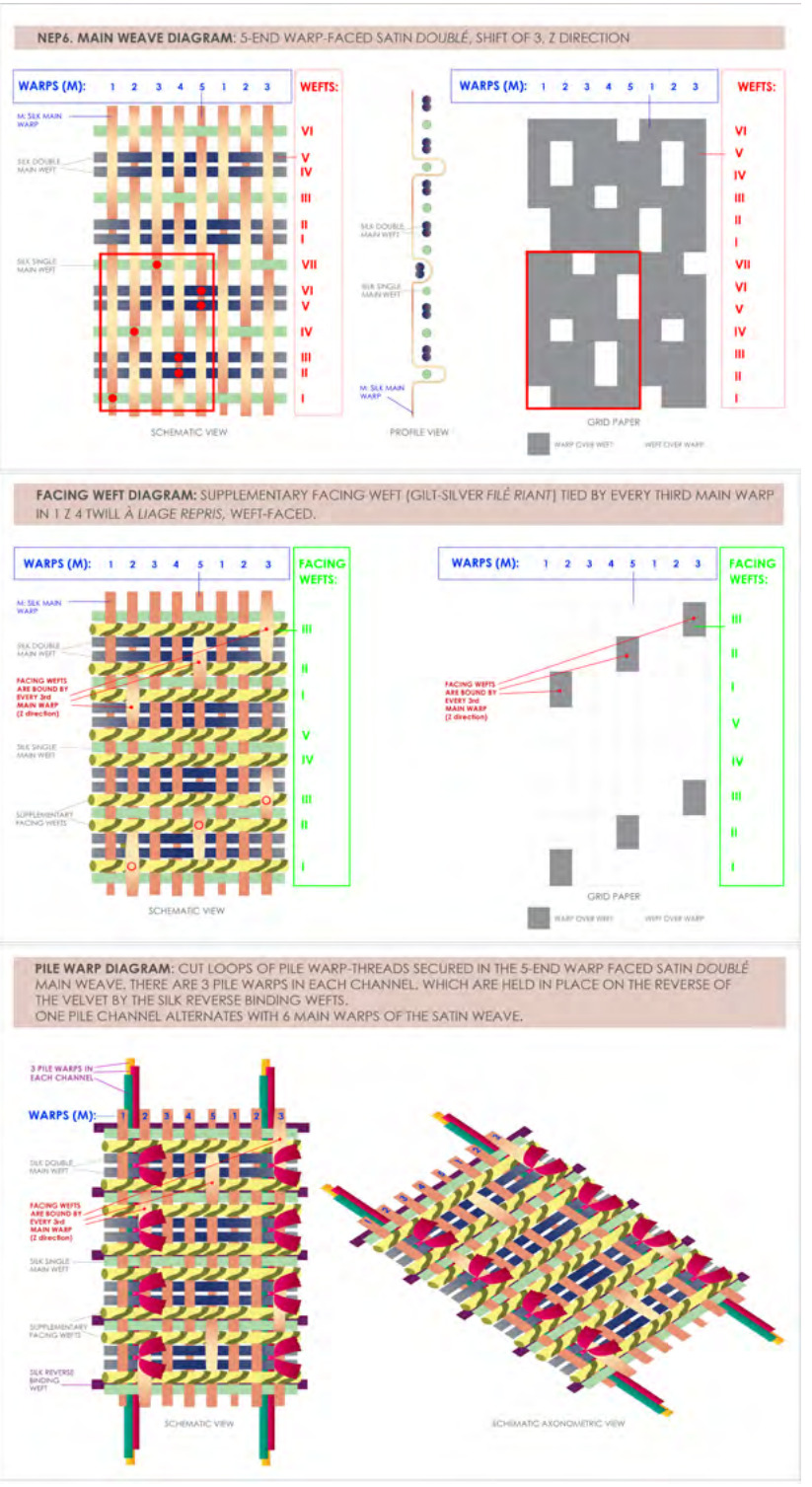

fig. 4

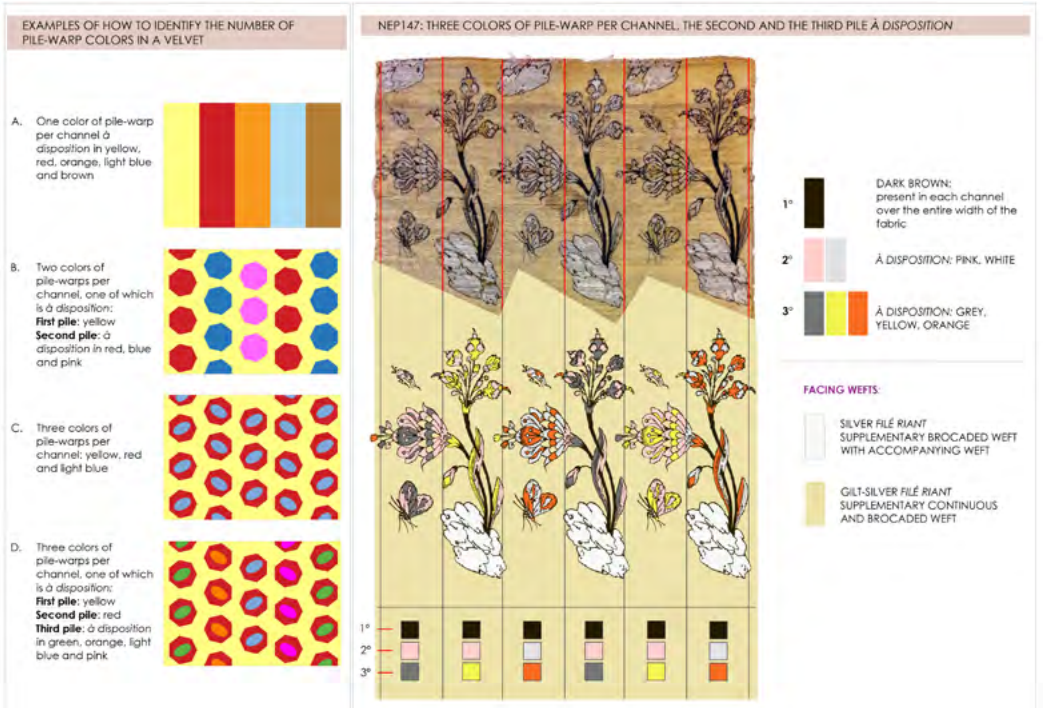

fig. 5

fig. 6

This interlacing is distributed, staggered and hidden by the wefts. The number of shifts (also called "interruption" or "*décochement*") of the satin *doublé* indicates which warp thread binds the following weft. (fig. 4, above)

(2) Supplementary brocaded discontinuous and continuous metal facing wefts.

In the opposite page
5 right. NEP147 is a three-color velvet: its design is described vertically by three different colors of pile. The first pile is dark brown, and it is the only color consistently present in each pile channel. The second pile is à disposition in white and pink; the third pile is à disposition in grey, yellow and orange. The velvet can, thus, be described as "velvet with three colors of pile-warps per channel, the second and the third pile are à disposition". [Diagram credit: Martina Ferrari]

5 left. Scheme of how to identify the number of pile-warp colors in a velvet. [Diagram credit: Martina Ferrari]

6. NEP6. Detail of the obverse and reverse showing pile-warp substitution technique. Colorful ends of different lengths of silk pile-warp yarns are taken in and out of the structure and are left hanging on the reverse of the fabric. An unmatched total of at least 18 different colors has been identified from the reverse of the velvet. [Images: Martina Ferrari]

[15] This technique of changing warp colors at will freed Safavid weavers from the color limitation that many of their Ottoman and European counterparts encountered while weaving. From a technical point of view, since the supplementary pile-warps were not structural, they could be removed and added to the velvet during the weaving process without creating additional tension to the cloth, and leaving the foundation intact. On the obverse, instead, colors change constantly and freely, with no hint of where the piles were actually taken out, cut or re-introduced.

In NEP6, (fig. 4, center), as the diagram shows, the facing threads are bound by every third main warp in a ¼ twill order with Z-direction à *liage repris*. When the main warp binds the supplementary wefts, they are called à *liage repris*. Two different types of supplementary metal threads, 'continuous' and 'brocaded discontinuous,' are present in the textiles under discussion. The continuous supplementary wefts (or *lancé*) are passed from edge to edge of the entire width of the fabric, running behind all the areas of pattern. The brocaded discontinuous wefts turn around on the obverse or reverse of the established design and/or at terminal edges of the cloth.

(3) The projecting polychrome warp-pile that runs vertically into pile warp channels. The channels are located between repetitive sets of six main warps (fig. 4, below).

(4) Finally, on the reverse, the last layer of the continuous supplementary binding weft system holds the pile-warps in place.

In order to identify the number of pile-warp colors in a velvet, one must trace a "virtual" vertical line on the pattern to count how many colors – corresponding to the number of different monochrome pile-warps – appear along it. The first step to identify the colors is, therefore, to read the design vertically (fig. 5).

The rich color scheme of the NEP6 velvet was achieved using an additional labor-intensive feature: the pile-warp substitution technique (fig. 6). In addition to using up to four colors per pile channel, master Safavid velvet weavers developed a complex weaving procedure in order to enrich velvets with myriad colors. They devised a way of freely taking out and of cutting individual supplementary pile-warp colors from the channels, and substituting them with other colors of yarn at different points in the weaving process, according to the pattern. These changes could be as large as an entire motif or limited to a small detail where a new color was required. Thus, every pattern repeat could be colored differently down to the last detail. Such flexibility of coloring and the velvets' pictorial qualities are a feat unmatched in velvet weaving anywhere else in any period[15].

TEXTILE TECHNICAL TERMINOLOGY

Finally, the AutoCAD® diagrams in this study will provide a primarily visual resource that has the potential to reduce any confusion caused by the lack of consistency in textile technical vocabulary. There has been a concerted effort in both past and

contemporary textile studies to create an international glossary of standardized textile terminology, but no standard has yet to be accepted by all textile scholars. During this research, velvet terminology was revisited according to known scholarly resources[16], and to the Italian and French methods developed by the *Fondazione Arte della Seta Lisio* in Florence and the *Centre International d'Etude des Textiles Anciens* (CIETA) in Lyon. These sources were translated, combined and adapted in order to provide the fundamental vocabulary for captioning the diagrams for the English language reader. Further research will include the possibility of using Persian terminology for their specific velvet techniques, in an effort to be more accurate, avoiding the predominance of western terminology.

CONCLUSION

As technology is rapidly changing our Museum scenarios, it is crucial to consider the future of textile documentation and conservation, ensuring that textile heritage presentation is increasingly accessible, interactive and diverse. Developments in technology not only allow for advances in conservation and documentation. They also facilitate greater understanding of materials and techniques, and broader access to scholarly research and knowledge of a diverse range of communities. The concept of "interactive accessibility" using different communication channels, such as museum labels, blogs, catalogs, online-publications, shared databases etc., is something we are planning to prioritize in our future research projects.

[16] The *naqshband* translated the design into the *naqsha*. The China Silk Museum defines the *naqsha* as "a detachable set of vertical drawcords and horizontal pattern lashes that acts as a template for pattern lifting". At the 2020 Textile Society of America conference, B. Pickett defined the *naqsha* as a "complex mass of cleverly knotted strings which control the fancy pattern design. [...] The *naqsha* is compressible, portable and lightweight", and C. Bier outlined that "the *naqsha* is the enigmatic device that is historically used to implement a repeat pattern in drawloom weaving. What looks like a messy bundle of strains, is really a complex bundle of logic." For more information on the *naqsha*, see Pickett 2018..

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BUILDING A CULTURE OF CONSERVATION

A CASE STUDY MEASURING THE BENEFITS OF A GRANT-FUNDED CONSERVATION PROJECT

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INTRODUCTION

In 2018, Bath Record Office (BRO) received a £138,000 grant from The Wellcome Trust to catalogue, conserve and package the archives of Bath's water supply & sewerage history and of the Bath Improvement Commissions. It was through this opportunity that the "Building a Healthier City" Project was created. The documents in the collections range from the 1700s to 1960s, and relate to street improvements and waterworks in the UNESCO World Heritage city of Bath. The collection at the start of the project measured over 70 linear meters with a variety of materials including photographs, linen backed maps, architectural plans, 20th century filing, letters and bound volumes. This project presented the first opportunity for Bath Record Office to implement an embedded conservation workflow. Setting up all aspects of conservation was required, including furniture, tools, materials and - perhaps the most important - a culture of conservation. Communication beyond conservation is necessary to demonstrate its benefits and express ourselves within the bigger picture[1]. This article will present historical sources of documented conservation to provide context of what conservation measures were and were not present. Through a survey of BRO staff an attempt at measuring the benefits born from the outputs of the project will be discussed. This article aims to demonstrate that the benefits of a single grant run further than just the documents on the conservation bench and that conservation is a beneficial core practice.

[1] Lithgow 2015.

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BACKGROUND AND CONTEXT OF CONSERVATION WITHIN THE BATH RECORD OFFICE

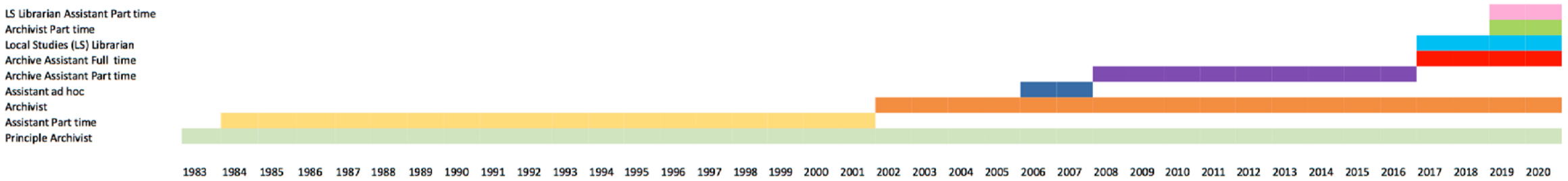
Bath Record Office was formed in 1967 in the Guildhall (a grade listed I building in the city centre of Bath, UK) with 1 strong room containing a maximum of 500 linear metres of collection. Between 1984-2018 the collection grew to be housed in 13 strong rooms with roughly 4.25 linear kilometres of archival collection. In 2017 the Local Studies Library merged with the Record Office. The Library included 2 off-site "temporary" storage facilities, which contain a further 820 linear meters of special collections. The Guildhall is a shared building, housing registrars' offices, local council chambers and offices along with historical event rooms that are hired out for special occasions. Within the local council of Bath, the Record Office sits in the Heritage department that is responsible for The Roman Baths, The Victoria Art Gallery and The Fashion Museum.

Staffing at the Bath Record Office has grown from 1 full time member of staff in 1967 to currently 4 full time roles and 2 part time roles in the core staff. A tracked history of roles can be seen in figure 1. Whilst the staff has increased 5 times, the collection has grown over 10 times.

Conservation was first documented in 1988, when a logbook was kept to record outsourced repairs and conservation work carried out. The logbook dates from 07 September 1988-21 November 2016 and notes 126 single item entries over the 30-year period. From 1988-2003 thermo hygrograph readings were taken every week and dehumidifiers installed. Conservation was carried out in a reactive manner, when and if something needed attention.

BUILDING A HEALTHIER CITY PROJECT (BAHC) AS AN OPPORTUNITY – MEASURING THE BENEFITS

Building a Healthier City Project (BaHC) marked the first opportunity of creating a conservation embedded workflow. A workflow that was pre-emptive, preventive and prioritised



1. Graph depicting the roles at Bath Record Office over time.

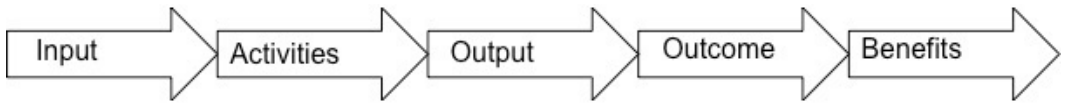


fig. 2

2. Flow chart showing the progression from project input to long-term benefits

as opposed to reactive and ad hoc. Assessing the outputs to outcomes is a necessary task for any project as these track and measure the project's goals[2]. Looking into this will also provide evidence for why a culture of conservation should be adopted. An output is any specialist product (tangible or intangible) and the outcome is achieved through the change created by using the output[3].

The Wellcome Trust Grant awarded £ 138,000 in total, of which £ 44,503 was assigned for conservation. In a room roughly 4.5 m x 2.5 m a conservation and packaging space was created consisting of 2 height adjustable tables, drawers for materials storage, a fume cupboard, a roller rack and a computer station.
A qualified conservator was hired on a 19 hours per week contract. These resources allowed for surveying, packaging and initial conservation treatments to be carried out on:
· 247 flat or rolled maps.
· 249 leather bound volumes
· 79.5 linear meters of archive boxes with filing consisting of reports, and correspondence.
It is estimated that the collection grew 12% through boxing items and a further 5% from the packaging of volumes and maps.
Before the project was underway, the anticipated benefits were clear to see. Previous studies and external surveys indicated that project funding had significantly improved collection access and care in the organisation. Measuring and assessing the benefits of projects not only quantifies their impact but also provides lessons and indicates areas of improvement for future funding or resources to focus on.

[2] Hirsenbergera 2019.
[3] Bennet, AXELOS 2017, p. 72.

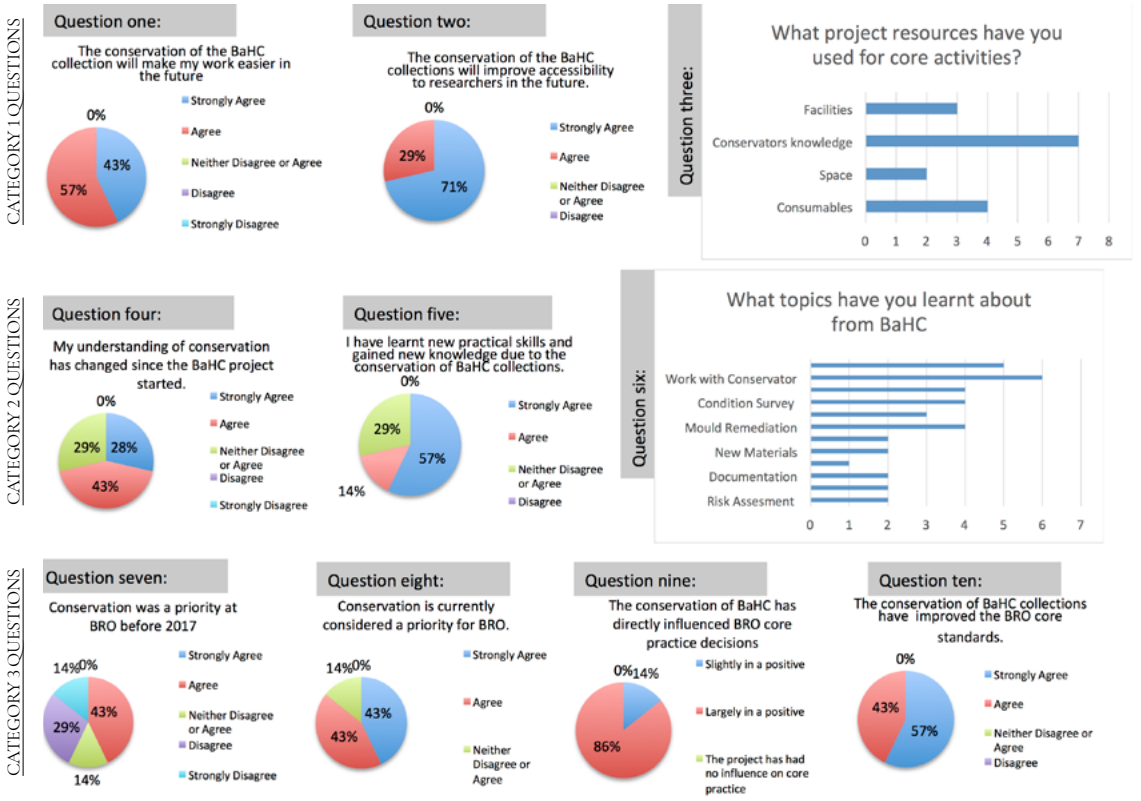
SURVEY AND RESULTS

A survey was carried out to assess how and if staff had gained from the conservation aspect of the project. 7 out of 9 staff (core and projects staff) completed the survey. The survey consisted of 10 questions that were submitted anonymously. 8 out of 10 questions were based on Likert Scale questions and 2 were multiple choice[4]. 3 categories of importance were selected to focus on the scale of benefit: the impact that the outcomes will have on work efficiency; education and professional development; and lastly, the change and influence of the project. All questions allowed for a comment option.
Figure 4 illustrates the results from the survey.
Comments submitted for question 7 indicated that "conservation activity was limited by resources", and a comment for question 8 stated that "As part of the project, yes, but generally no as the Conservator doesn't have the time to dedicate to collections overall, only project focused ones."

SURVEY DISCUSSION

Category 1 relates to the foreseen impacts of the outputs and outcomes. 100% of survey respondents gave a positive response, either strongly agreeing or agreeing, and all respondents used outputs of the project for core work support. Specifically in questions 1 and 2 (regarding increased efficiency of work in the future for staff and researchers), 57% strongly agreed and 43% agreed. Question 3 related to outputs that have been used: all respondents confirmed using the knowledge of the conservator over the 2-year project. 4 respondents used consumable materials, 3 had used tools and kit whilst 2 had used the physical conservation space.

[4] Jones 2013.



3. Results from BRO Staff Survey

Category 2 looks at education & professional development. 64% of responses from questions 4 and 5 showed a positive change in new skills, knowledge and understanding of conservation. 12 different topics of learning were mentioned. The remaining 36% responded, "Neither agree nor disagree"

Category 3 assessed change and influence beyond the project and showed that 98% of respondents confirmed a perceived change in a positive manner due to the project. By comparing question 7 to question 8 results, there is a clear perceived change of priorities. 29% more respondents believe that conservation is a priority currently as opposed to before the project. 2 comments were received stating that whilst conservation was a priority, either resources were limited or the conservator was project bound. On request, the current Principal Archivist commented that "… The visible impact of conservation of the BaHC collections has highlighted the need for a considered and strategic approach to conservation across the service and this has had a very positive effect on this area of work".

CONCLUSION

The outcomes of the Wellcome Trust Grant are easily identified within the project boundaries, however the impact of the benefits, which are generally seen longer term are already apparent before the end of the project. From survey results:

· 100% positive response to the future efficiency of work relating to the project's collections.

· 64% of staff have benefited from new knowledge

· 98% perceived an improved organisational conservation culture due to the project.

These encouraging responses show that conservation is more than just what happens on the bench, it directly affects people and organisations for the positive. Further assessment of long-term cost would be a beneficial addition. Only in the last 4 years has staffing increased from 2 full time staff to more but with the growth of the collections and a backlog of packaging, it pays to assess the benefits of projects and ensure that they are aligned with programme and organisational goals.

This case study shows that the conservator's job does not end at the bench and that using Project Management strategies to communicate successes and failures will go further to demonstrate the impact of conservation within a project.

The benefits from this single project have shown that a lot more can be gained than originally planned. It points to the potential of what a pre-emptive, planned and prioritised conservation process can achieve.

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SESSION 4

HISTORY OF CONSERVATION

Stefania De Blasi
Maria Beatrice Failla

The last session of the YPF – but certainly not the least – was dedicated to the history of conservation and its challenges.
The history of conservation is a fairly young discipline, a focus of interest for some time now but only really consolidated in university courses around thirty years ago, especially in Italy.
More and more it is becoming an essential tool for reflecting on a work of art, a collection, or a whole museum.
Studying the history of artworks and above all the history of the transformations that works have undergone over time, which may be more or less evident, are fundamental aspects to reveal the true essence of what we see today.
Each work of art is a palimpsest which bears within it the interpretations and culture of the historical eras when it was restored or conserved or even just rearranged in new contexts and new collections.
We often use the term “time machine” to summarize the power that the history of conservation has, also in terms of its appeal. Knowing what happened in the past offers an important starting point to interpret the present better and to select and plan the future with all the facts in hand. And not only in terms of technical choices for a restoration or conservation but also for new frontiers of research.
This is the essence of a discipline which, being based on history, may have little appeal to the new generations who are more driven towards the speed of communication and information tools.
In truth, the real challenge lies in being able to transform the narratives underlying the history of conservation into a new form of inclusion of the various targets which museums and cultural heritage authorities currently address.
Extending this investigative framework to the context of past restorations is a further step towards the future of research within the communication professions.
We believe that bringing a theme like the history of conservation to a forum whose aim is to create culture, but also collective empowerment, is an important opportunity for historical studies

to finally become a developmental and cultural-changing engine. Creating debate and awareness around the life of art works in an important occasion to reach new audiences for culture. Consequently, this is also a project with a potentially significant social impact.
And now some questions:
What sources do we have available that can tell us about the conservation and usage history of the artworks we analyse? What are the future prospects for this research? What tools can we use to reach out to people and generate genuine interest in this field?
There are some good news and some bad news; first the good news.
The good news is that the sources are many and increasingly varied. They range from archival documents to engravings, from photographs to video documentaries, television broadcasts and cinema. There is a lot of work still to be done and in all parts of the world.
The bad news is that there is a lot of work still to be done and in all parts of the world!
The contributions selected are all heading in this direction and this is something we are extremely happy about.
It was very difficult to choose only six papers because more than 20 papers were of great interest. They showed good methodology with a fresh point of view or addressed such new fields as the history of paper conservation or the rescuing and restoration of cinematic material, or even material from past restorations removed during new conservation activities. We had no doubt that there would be many contributions from Italian teams of researchers, however we were delighted to read excellent projects from many other European countries and beyond. A sign that the discipline of the history of conservation is expanding, and in the best way.
The projects we evaluated have given us much hope in this regard, because it is necessary to consolidate the historical methodology, but also to extend the studies to all areas of conservation, also for materials never dealt with before, and to consolidate the practice of communicating conservation work to a wider audience.
The added value lies in combining a solid scientific background with the profession of cultural communicator.
Today, conservators have a responsibility to be recognizable: both in their work, because they must allow the public to recognize their intervention in the works, and as public visibility, because if they cannot find a way to tell the media about their work, they risk disappearing behind the scenes: in this the digital culture can be a valid help, however, the flow of production of valuable contents needs to be carefully reconsidered.

Stefania De Blasi, Maria Beatrice Failla

THE BIRTH AND DEVELOPMENT OF SCIENTIFIC RESTORATION

FROM THE EIGHTEENTH TO THE EARLY TWENTIETH CENTURY IN RUSSIA

Alexandra Galitskaya
Sapienza University of Rome, project supported by Roma Tre University, Italy

In Russia, an interest in the practices of restoration, in the modern sense of the term, first emerged in the 18th century under Peter the Great, as part of the development of science as well as national consciousness[1]. Although various methods to repair icons had existed previously, restoration only became a specific branch of knowledge after the introduction of oil painting along with other innovative European technologies and procedures. From the mid-18th century, Russian painters went over from tempera to oil, which resulted in a need for a specific kind of restoration. What prevailed at that time was a restoration process consisting of an outmoded renovation process known as *ponovlènie*, habitually used on icons: this resulted in the aged images being refreshed or even completely overpainted, as happened to the Moscow Kremlin's monumental paintings in 1770[2]. In a best-case scenario, such restoration attempted to reconstruct the artwork's original forms and emulate its 'historical' style.
The birthdate of professional restoration in Russia fell in the year 1743, when two German painters arrived in Saint Petersburg on the invitation of Empress Elizabeth Petrovna: Georg Christoph Groot and Lucas Conrad Pfanzelt. Pfanzelt became the first professional restorer in Russia and laid the foundations for restoration at

[1] Zverev 2008, pp. 15-50.
[2] Древности. Труды Комиссии по сохранению древних памятников (КСДП), Moscow 1909, vol. 3, p. 11.

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WINNER OF THE SESSION 3

fig. 1

1. P. M. Tretyakov. From the Tretyakov Gallery website.

The State Hermitage Museum. He practised painting transfers, transferring Lucas Cranach the Younger's *Christ and the Adulteress* from its wooden panel to a sheet of copper in 1768. Instead, the first Russian to become a professional restorer was Semyon Shchedrin, who won a grant from the Imperial Academy of Arts to study abroad in 1767. Shchedrin learnt technical restoration in Italy and later restored and lined a good 167 paintings, however, his was an exceptional case. In 1797, Franz Labensky became head custodian at the Hermitage and hired new laboratory staff: a painting restorer named Pirolli in 1797, a custodian Alexey Andreev in 1800, and a *kamerdiener* (from the German for 'valet') Mitrokhin in 1801. Andrei Filippovich Mitròkhin (1766-1845) proved to be a technically skilled restorer, who could transfer paintings from a wooden support to canvas. His practice was interrupted by Napoleon's campaign of 1812, when the Hermitage collection was evacuated to Western Russian cities: this was known as the "secret expedition"[3]. Such a large museum collection pilgrimage was only the second case in European art history, after that of the Viennese collections in 1805.
In 1819, Labensky conceived a project for the Hermitage restoration school, supported by the Minister of National Education and the Imperial Academy of the Arts. In 1819, four Academy graduates entered the Hermitage. Their study course was divided into weekly sessions: for one week, two students were taught technical restoration by Mitrokhin, while the other two studied pictorial restoration with the Italian painters Brioschi and Bencini, and then swapped places. After graduating and serving for 10 years as an assistant, one could finally become a professional restorer. Labensky and Mitrokhin's restoration school was the first in Europe[4], its training courses in both technical and artistic restoration equally innovative. Mitrokhin greatly improved Russia's technical restoration during his 45 years of service. Unfortunately, a limitation on the Hermitage's needs brought about the end of the school whose alumni found no future outside it. Fyodor Tabuncov, Mitrokhin's last student, passed on his teacher's techniques to future generations, and a result, these became the basis of Russian painting restoration[5].
The need to preserve a growing number of artworks and historical objects favoured the creation of museums in Russia. While the first public museum in Saint Petersburg, the Kunstkamera, was founded in 1718, the Hermitage was only opened to the public in 1852. The largest national art museum in Russia, the Tretyakov Gallery, was founded by an entrepreneur Pavel Mikhailovich Tretyakov (fig. 1) who promoted progressive contemporary Russian artists, the so-called *Peredvizhniki*[6], and also collected Early Russian art. Tretyakov donated the Gallery to the city of Moscow, and it opened to visitors in 1893. He was the gallery's first restorer and its life-long curator until his death in 1898.

[3] Alyoshin 2008, pp. 181-264.
[4] Pietro Edwards (1744-1821) was an Italian restorer, restoration theorist, and author of the "*Carta del Restauro*" of 1771. His public restoration school project of 1819 was never realized (Tiozzo 2010, pp. 201-217).
[5] Nikogosyan 2012.
[6] *Peredvizhniki*, or "The Wanderers", were a group of Russian realist artists, opposed to the Academy's restrictions, who created their own cooperative for itinerant art exhibitions.

fig. 2

2. I. E. Grabar. From G. Vzdornov, Реставрация и наука, Moscow, Indrik, 2006.

Restoration regulations came into being thanks to the progress of historical sciences in the middle of the 19th century. I. P. Sakharov[7] authored the first manual on restoring antiquities in Russia: he standardized restoration operations and defined their aim as an unveiling of the painting's oldest layer, making it accessible to future study. Numerous scientific societies were founded, including imperial archaeological ones, such as the IAK Commission in Petersburg which oversaw all archaeological excavations, or the IMAO Society of Moscow which was responsible for the conservation of ancient monuments. These societies favoured the link between restoration and science. Meanwhile, archaeology pioneered such methods as the removal of non-original layers, producing original-size copies, photo-documentation, and the compiling and preserving of reports. The first restorations to follow these guidelines were those of the Moscow Kremlin's icons directed by N. I. Podkluchnikov. In 1855, he restored the iconostasis from the Dormition Cathedral in Vladimir, attributed to the legendary icon painter and monk Andrei Rublev; non-original layers were removed for the first time, initiating a discovery of genuine Early Russian art.
After the October Revolution, the entire sociopolitical structure became reversed, with both negative and positive consequences for cultural institutions. Nationalizing of all cultural assets in 1917 led to the creation of new institutions for their legal control by the Soviet government[8]. Special decrees were issued in order to stop damage, theft, and sales of such assets abroad. Lenin's Decree on the Separation of Church and State of 1918 facilitated access for scholars to Church-owned art monuments and the establishment of such new research organizations as the Commission for the Preservation and Identification of Ancient Russian Painting, created by Igor Grabar (fig. 2) shortly afterwards.
Igor Emmanuilovich Grabar (1870-1960) boasted both an art historian's profound knowledge and a painter's hands-on experience, as someone already intimately acquainted with the art world before the Revolution. One of the two key objectives of Grabar's Commission was to investigate the most ancient, pre-Mongol Russian painting, tracing the influences between the pictorial art centres of ancient Rus'. Despite the spread of the art historian Muratov's theory in the 1910s, which proposed the birth of autonomous Early Russian art in the 14th century, the Grabar scholar A. I. Anisimov was convinced that he had found even older artworks. The second goal was to discover the artworks of such famous artists as Theophanes the Greek, Andrei Rublev, or Dionisius[9]. It was necessary to intervene in the structure of monuments, removing non-original layers, with the result that all the previous studies suddenly seemed less than convincing given that they had been performed on overpainted

[7] Ivan Petrovich Sakharov (1807-1863), was a Russian ethnographer, archaeologist, and palaeographer.
[8] Roslavsky 2004, p. 376.
[9] Vzdornov 2006, pp. 11-57.

fig. 3

3. The CGRM, around 1924–30. From G. Vzdornov, Реставрация и наука, Moscow, Indrik, 2006.

artworks. From 1918-19, the Commission cleaned the frescoes of the Cathedral of St. Demetrius and the Dormition Cathedral in Vladimir, the iconostasis of the Trinity Lavra of St. Sergius and that of the Moscow Kremlin's Cathedral of the Annunciation. In the Dormition Cathedral in Vladimir a cycle was discovered painted, according to the chronicles, by Andrei Rublev and Daniil Chyorny in 1408. These frescoes, together with the *Trinity* icon from the Trinity Lavra of St. Sergius in Sergiev Posad, are still the only dated references out of all the studies on Rublev's art. The restored icon of the Virgin of Vladimir from the Moscow Kremlin enriched the roll-call of Byzantine masterpieces. The material collected thanks to the Commission's work of 1918-19 was exhibited at the Vkhutemas[10] in Moscow in 1920. In 1918-1919, the first scientific restoration of Rublev's *Trinity* was carried out by Grabar's Commission in collaboration with the Commission for the Protection of Monuments of Art and Antiquity of the Trinity Lavra of St. Sergius. High-level scholars worked in the Lavra Commission: the famous philosopher, scientist, and priest Pavel Florensky[11] and the restorer and art historian, Count Yuri Olsufiev[12], whose work in the conservation field was of inestimable value.
The activity of Grabar's Commission workshop in Novgorod, led by Anisimov, was halted in 1919 under criticism from representatives of Petrograd for focusing only on the cleaning of selected icons[13].

[10] Vkhutemas [Higher Art and Technical Workshops] was the state art and technical school active in Moscow from 1920-1927 (Энциклопедия Русского авангарда. Available at: http://rosdesign.com/design/istorofdesign_rus.htm).
[11] Pavel Aleksandrovich Florensky (1882 – shot in 1937) was a priest, philosopher, and scientist. From 1918-1923 he worked at the Commission of the Trinity Lavra of St. Sergius and designed the Lavra Museum and its catalogues (Vzdornov 2006, p. 178).
[12] Yuriy Olsufiev's cousin, Vasiliy Alekseevich, was the great-grandfather of the current director of the Vatican Museums, Barbara Jatta.
[13] *Idem*, pp. 57-88.

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[14] Lifshitz 2008, p. 91.
[15] Gorelova 2004, pp. 15-20.
[16] Roslavsky 2004, pp. 86-111.
[17] Gorelova 1981, pp. 171-201.
[18] Sadarova *et al.* 2018, p. 114.
[19] Rybnikov, Toropov, Основные положения диагноза заболевания картин, 1930-s (Firsova *et al.* 2008, p. 152).
[20] *Idem*, p. 121.
[21] *Idem*, pp. 123-124.
[22] *Idem*, p. 141.
[23] Grabar, Моя жизнь. Автомонография, Moscow–Leningrad 1937.

The contradictions that arose were heatedly discussed by the First All-Russian Conference on Restoration in 1921, where the Commission's approach was deemed a failure when measured against the necessity to consolidate monuments. The Conference reviewed all pf the work done to recover art monuments in the early 20th century, and apposite scientific-based guidelines were laid down[14]. In short, the foundations of scientific restoration had been established[15]. Even so, the activity of Grabar's Commission, renamed the Central State Restoration Workshops (CGRM) in 1924 (fig. 3), had incontestably influenced the development of Soviet restoration[16].
In 1918, Grabar was at the Tretyakov Gallery directing the restoration work. Its restoration department guided by A. A. Rybnikov included three workshops: for photography, handcrafts, and general restoration. Rybnikov developed a method used at the time to attribute paintings – analysis of brush strokes based on photographs taken in grazing light. In 1925, Grabar left the Gallery, but continued to actively collaborate with the CGRM; after detecting the drying out of a wooden panel belonging to Rublev's *Trinity* icon in 1931, a constant climate control system was installed[17]. Grabar wanted to develop the CGRM as an all-Russian centre for both scientific research and education. At the CGRM, X-rays were used in an innovative way to identify the non-original layers of a 16th-century painting in 1927. These experiments were performed in the Physics and Technology Research Laboratory of the CGRM, founded in 1925 and headed by Professor S. A. Toropov, a physicist and architect. By 1929, he had taken more than 150 X-ray images of various tempera and oil paintings[18]. Together with Rybnikov, Toropov authored an article on *Essentials of Diagnostics for Painting Diseases*[19].
In the late 1920s, the State intensified its ideological pressure[20]. Grabar retired from the CGRM in 1930 and went back to painting. Many CGRM members were accused of doing work for the Church or the upper classes, and were either tried or shot (Anisimov in 1937, Olsufiev in 1938)[21]. The CGRM was closed down in 1934. Only during the Second World War did the government start to become worried about saving the country's artistic-historical heritage. Grabar started directing a new institution, the Central Art Restoration Workshop (GCCRM), launched in 1944. Nowadays this is a scientific centre for the conservation and restoration of art monuments called the All-Russian Art Research and Restoration Centre, named for the Academician I. E. Grabar[22]. Grabar's written works and his monograph *My Life*[23] are still an almost unique source on the history of restoration in post-revolutionary Russia. It is abundantly clear that without the work of the restorers and scholars of Early Russian paintings, the quantity of artworks which have come down to us would not have been the same.

THE ROMAN SCHOOL AT THE NATIONAL GALLERY OF IRELAND

CONNECTING PAST AND PRESENT CONSERVATION PRACTICES THROUGH THE TREATMENT OF A PAINTING BY LAVINIA FONTANA

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This paper presents an overview of a case study involving research and various treatments carried out on a painting by Lavinia Fontana; *The Visit of the Queen of Sheba to King Solomon* (NGI 76) at the National Gallery of Ireland in Dublin, a project sponsored by the Bank of America. The paper will focus on information and documentation from the last conservation the painting underwent in the 1960s executed by a team of restorers from the Central Restoration Institute in Rome, and the decision-making challenges that apply in general to any new interventions. It will also afford a chance to point to the ethical choices behind a treatment which seeks to strike a balance to preserve the integrity of the original materials, allowing for legibility and interpretation while honouring the item's back story and the network of historical value related to it. Archival sources from both the National Gallery of Ireland and the Central Restoration Institute formed the basis for our understanding, paired with observations of the physical object during treatment, as well as conversations with retired conservators. This dossier of information was used as the basis for a novel treatment and, in the future, could be used as a model for similar treatments throughout the National Gallery of Ireland's collection.

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1. Italian team at work, archival image. Photo ©National Gallery of Ireland

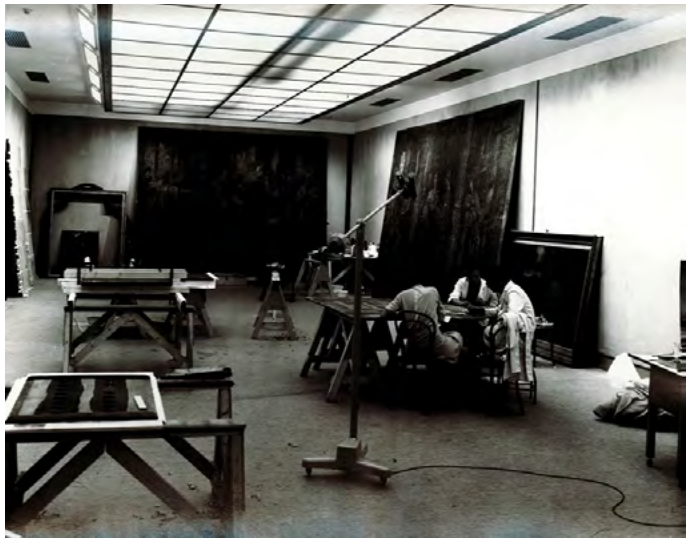

fig. 1

THE ITALIAN CONSERVATION PRACTICE IN DUBLIN

The unique history of the Conservation Department at the National Gallery of Ireland is the key to understanding its singular connection with Italian conservation practices. Ireland was a young independent republic in the 1960s and it was only then becoming feasible to focus on the care of its national art collection. By 1964, the time had come to establish a formal conservation department within the Gallery, and to this end it was decided to contact the Central Restoration Institute (ICR) in Rome. The ICR took the National Gallery of Ireland on as a protégé, sending three senior staff members to Dublin to appraise the collection and make a plan to carry out treatments, to build and kit out a workshop and to train the first Irish conservators to staff the department. An ambitious part of this plan was the sending of a large team of restorers from the ICR consisting of teachers and students to Dublin for five months over the summers of 1967 and 1968, during which they performed complex large-scale treatments on 120 items from the collection, ranging from works on canvas and wooden panels to sculptures (fig. 1). Following the ethical theories and approach of the ICR's founder Cesare Brandi, the Roman conservators were among the first to develop a scientific approach to restoration, which involved testing new materials and implementing less invasive techniques, and they brought this new methodology with them for their work at the National Gallery. For each painting, they created a dossier, which was then updated following the different phases of the treatments. By using this documentation kept in the

gallery's conservation archive, it has been possible to compare the materials and methods used throughout the collection, particularly on paintings in similar conditions.
Certain trends can be observed; for example in the lining techniques used. Depending on the painting, certain ingredients typically contained in traditional glue-paste linings would be substituted, above all pearl glue for gelatine or fish glue, while wheat flour would occasionally be replaced by hemp flour. In most cases, glycerine was used as plasticizer instead of turpentine and molasses. However, the most innovative change was the introduction of an adhesive called *Gelvatol* to improve the recipe; a PVA developed in the early 1960s and novel for the time. A lining based on fish glue and *Gelvatol* was already employed by the ICR team in 1965 and an article from the *Bollettino ICR* dated 1966 states, "it has been relined with a mixture much poorer in flour and based on fish glue and *Gelvatol*: a recipe which offers the advantage of faster drying, and therefore a limited use of heat during ironing."[1] It is likely that the same recipe was then applied over the following years to the paintings at the National Gallery of Ireland.
As for the cleaning methods, we can see from our survey that varnish removal was done using a solvent or solvent mixture, depending on the condition of the varnish and overpainting present.
As regards retouching, we found that a great variety of media had been used, including watercolours, the acrylic polymer Paraloid B-72, and varnish colours. It seems that the level of saturation required was among the criteria used when choosing the retouching media. There are examples of a mixture of different media being used in overlapping layers on a single painting. In most cases, despite the variety of media, the techniques were uniform – with *tratteggio* (hatching) used for the losses and mimetic retouching techniques to conceal abrasion.
The focus on synthetic resins as varnishes suggests that the restorers were already concerned with the instability and discolouration of natural materials and in search of new developments that would result in more durable varnishes.

ABOUT THE PAINTING

The Visit of the Queen of Sheba to King Solomon is an oil on canvas, painted in Bologna in 1599[2], and is the largest surviving work by Lavinia Fontana (fig. 2). In 1872, it was purchased for £100 from Christie's auctioneers in London[3]; after acquisition, the painting underwent thorough conservation and was relined in the United Kingdom before being transported to Ireland. In the intervening years, the painting was kept on display in the gallery rooms, hanging among other large Italian paintings of the collection.
The painting was treated once again at the gallery over the course of the two summers in 1967-1968. This treatment is a fine example of the work carried out by the ICR conservators, specifically in the way it has influenced the current conservation treatment plan for the painting.
Infrared reflectography already showed large areas of fillings and retouches while an ultraviolet fluorescence image illustrated the varnishes present and the levels of retouching across the surface. Given the levels of discolouration, unevenness and degradation throughout the layers of varnish, a rationale to treat the entire surface was developed.
In the course of appraising its condition, the quality and historical significance of certain aspects of the previous treatments came to light. The painting, or rather, the later materials associated with its treatment in the 1960s, represent and record the origins of the National Gallery of Ireland's

fig. 2

2. Lavinia Fontana, The Visit of the Queen of Sheba to King Solomon, 1599, oil on canvas, 252 x 327 cm, National Gallery of Ireland, Dublin (NGI.76), before treatment. Photo ©National Gallery of Ireland

[1] Urbani 1966, p. 65
[2] The last conservation treatment unveiled an inscription at the base of the clock borne by one of the ladies-in-waiting, which was previously obscured by discoloured varnishes, and certainly dates the painting to 1599.
[3] Minutes of the National Gallery of Ireland Board, 7 May 1872.
[4] O'Connor 1982.

Conservation Department and are evidence of a particular stage in the development of conservation ethics in both Italy and Ireland.

THE FORMER AND THE NEW TREATMENTS

Looking at the structural condition of the painting, the materials and techniques of the ICR restoration are clearly visible. The lining was done using a *Gelvatol*-based adhesive and a single open-weave canvas similar to the *patta* used in the traditional Roman lining method. The original tacking margin is missing all round and the edges of the painted area are irregular.
The adhesion of the lining was generally sound but there were local areas along the edges associated with old damage where it had become partially detached; these areas have now been consolidated using the ethylene vinyl acetate *Beva Film*, inserted between the original and lining canvases. It is interesting to notice that the aged *Gelvatol*-based lining appears to have good tensile strength but low resistance to peeling forces, which indicates an easy reversibility of the treatment; alas, it is also brittle and not particularly flexible.
In some areas, especially at the bottom, cracked fillings proved to be inadequately supported from beneath. Small tears in the original support had not been mended before lining but simply stuck in place and the gaps filled with gesso; furthermore, the long filling running along the bottom of the painting had been supported by a thin sheet of strawboard, used in place of a proper canvas insert to support the putty. Due to natural movement in the support over the years and the competing response of the strawboard and restoration fillings, the more rigid filling material had cracked and lifted, becoming unstable. A simple consolidation of the existing materials on the lining canvas would not provide adequate stability and so all unstable fills were removed, and a canvas insert was created.
After 50 years, the natural ageing of the materials used for the painting has resulted in yellowing and discolouration highlighting the extensive *Paraloid*-based retouching. Across the painting surface are examples of retouching using the typical techniques we found in the survey – a combination of *tratteggio* for the losses and mimetic retouching for abrasions. In the case of this painting, a varying quality is noticeable in the *tratteggio* and this may be due to the fact that the painting was treated by a number of different teachers and students. However, with a newly cleaned painting, this series of retouches would become

fig. 3

fig. 4

3. Category 1, the retouching is in good condition, to be preserved despite some discolouration. Category 2, retouching accepted because it reconstructs large areas of loss that would otherwise need to be reintegrated arbitrarily. Some modifications to be applied to improve the visual impact. Category 3, the appearance of the retouching is cruder and is distracting to the viewer; removal and replacement is required to obtain an optical balance in the image. Photos ©National Gallery of Ireland

4. The area before the treatment; after removal of retouches and infilling; after treatment. Photos ©National Gallery of Ireland

even more distracting. Therefore, to determine which areas of retouching should be removed and which should be corrected or left in place, they were assessed and categorized to allow systematic selective removal (fig. 3).
At least two different layers of varnishing materials were present on the painting – the final varnish from 1968 and a further one which was applied in 1982[4]. Where the 1960s' retouching was in good condition, and needed to be preserved, only the top layer of varnish was removed using a mixture of solvents specifically formulated to obtain a reduction in the degree of yellowing; where necessary some modifications to the surface of the existing *tratteggio* were also made. For areas where both the varnishes and retouches were removed, the reduction in discolouration was more dramatic. The new retouches were carried out using the *tratteggio* technique in order to maintain consistency throughout the painting (fig. 4). In this case, the filling that was present was unstable and not fully supported, so it was removed.

A new canvas insert and a filling were applied in order to obtain an even, stable surface which was visually reintegrated using a *tratteggio*-style technique. Furthermore, the new retouching, seen on the right, corrects the shape of the yellow drapery which had been left unresolved in the prior restoration attempt. With this approach we hoped to achieve a level of continuity with the existing *tratteggio* retouching. Ultimately, the aim of the project, which is still in progress, is to re-establish a correct reading of the composition, preserving the historical background of the painting and an optical balance in the image .

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THE APOTHEOSIS OF SANTA BRIGIDA BY LUCA GIORDANO

COLLECTING UNPUBLISHED DOCUMENTS TO RECONSTRUCT ITS CONSERVATION HISTORY THE RESTORATIONS OF YESTERDAY AND TODAY COMPARED

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Decoration of the dome and pendentives (with *Women from the Old Testament)* was begun by Domenico Viola, however he was unable to complete the assignment, with the result that, in 1678, the work was entrusted to Luca Giordano who cancelled all the previous painting and started from scratch. He frescoed the large surface of the dome free of charge, out of devotion and friendship towards the Lucchese fathers of the church (who were extremely poor). However, he did receive, in exchange, the possibility of being buried in the church, where his body still lies today[1].
The compositional scheme and his technique of painting in large chromatic masses, shows an attempt to combine the manner of Lanfranco with the new approaches of Cortona[2]. Giordano managed to accomplish an impressive feat:, a striking perspective painted on the intrados which makes the dome seem much higher than it really is[3]. These frescoes were not only one of the first commissions which Giordano received in Naples but also represent one of his most famous youthful masterpieces.
Restoration of the frescoes was extremely tricky, since they were painted on the intrados of a second internal dome in *camorcanna*[4], yet another peculiarity of this artwork. The restoration,

[1] Filangieri 1891, p. 302; Petraccone 1919, p. 65, De Dominici 2003 p. 767.
[2] Ferrari, Scavizzi 1966, vol. I, p. 77. Luca Giordano's direct knowledge of the works of Pietro da Cortona is testified by some of his drawings which studied the details of the vault painted by Cortona at Palazzo Barberini, Ferrari, Scavizzi 2003, pp. 103 and 104, no. D01, no. D08.
[3] In reality, it is just under nine metres high, because of the fact that, during its construction, the Castellan of Castelnuovo did not want an excessively tall dome to be erected, which would have represented an obstacle too close to the castle thereby diminishing the defensive capabilities of the artillery. Celano 1692, pp. 129, 163; Romanelli 1815, p. 154; Dalbono 1876, p. 20.

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1. L. Giordano, The Apotheosis of Santa Brigida, 1678, fresco, Naples, Church of Santa Brigida.

fig. 1

completed in June 2018, was carried out using traditional but effective and respectful methods and materials. Moreover, the thesis also afforded an opportunity to take a closer look at the phases of the fresco conservation work. Thanks to intense bibliographic research along with the discovery of unpublished archival sources, it was possible to reconstruct the history of the many conservation interventions.

The frescoes have undergone various restorations over the centuries, some of which have severely compromised their readability[5]. In chronological order, the first was that of 1852, commissioned by King Ferdinand II and executed by the painter Federico Maldarelli. These restoration works were financed by the Ministry of Ecclesiastical Affairs, lasted from 1852 to 1857, and were directed by the architect Federico Bausan and later by Pietro Gleijeses[6].

In 1861, during a storm, lightning struck the dome, causing serious damage to the frescoes which had to be restored again. Another significant restoration was carried out in 1889 by the painters Domenico Morelli and Agostino Conti, after the serious damage caused by the construction of the Galleria Umberto I next to the church. The Municipal Monuments Commission[7] devised a way to save Luca Giordano's frescoes. The paintings in the dome were in a bad state of repair, having been blackened by smoke and dust. In addition, the plaster on which the fresco was painted was badly cracked. During this restoration, some sections of plaster became detached (these were then put back in place by fixing them to the vault of the dome with metal chains). The cleaning of the pictorial film, which was stained by black smoke, was carried out using a very ancient technique: breadcrumbs and water[8].

On 15th March 1943, during the Second World War, the Church of Santa Brigida was hit by a German bomb. The war did not spare the numerous monumental buildings, witnesses to a long civilization and flourishing periods of Neapolitan cultural and artistic life from the Middle Ages to the Modern Age[9].

The United Nations had anticipated the need to safeguard the fate of Italy's cultural heritage. An expert in Italian art, Major Paul Gardner, Director of the Nelson-Atkins Museum of Art in Kansas City, Missouri[10], presided over a special office whose task was to supervise the conservation of art monuments and to assist the competent Italian authorities in this undertaking.

He carried out coordinated actions with the Monuments and Fine Arts Subcommittee, directed by Major Ernst De Wald (Professor of History of Art at Princeton University) and composed of allied students and experts in Italian art. After a few weeks, thanks to the collaboration of the Superintendency, which compiled technical projects with related cost estimates, and the Allied Military Government, which allocated the necessary financial means, the first most urgent works began[11]. During the restoration, highly specialized, exclusively Italian workers were employed under the direction of the Superintendency.

Thanks to this funding from the United Nations, numerous restorations were carried out, including that of the dome of Saint Brigida with Giordano's frescoes[12].

The restorer in charge was the Neapolitan painter Stanislao Troiano[13], a professor at the Fine Arts Academy in Naples, and well known in the field of Neapolitan restoration. He had received the Chair of Decorative Arts and his apprenticeship as a restorer began at the Academy's Restoration School[14] (directed from 1923 to 1930 by Pasquale Chiariello) attended by students of the Painting and Decoration courses, who learned the technical operations of relining, the transport of painted surfaces onto canvas and the detachment of frescoes. In 1932, thanks to Sergio Ortolani, Pinacology[15] and Restoration departments were established in Naples with Troiano as a member of the technical staff[16], ultimately assuming a key role along with Umberto Chiariello. With his significant past assignments, Troiano seemed

[4] The word *camorcanna* comes from '*camera-canna*', a term which Vitruvius used to indicate these structures. They are light vaults, also known as 'false vaults' or vaults '*in cannucciato*', made from reed mats and plaster fixed to wooden structures. Their name, 'false vaults', indicates that these surfaces were made with low-cost, exceptionally light materials (such as reeds and plaster) and therefore had no load-bearing function, but were purely decorative and helped to complete interiors. D'Orazio, Quagliarini 2004; D'Orazio, Quagliarini 2005; Quagliarini *et al.* 2010.

[5] Ferrari, Scavizzi 1966, vol. I, p. 76; Ferraironi 1931, pp. 142-143.

[6] Ruotolo 1999, p. 30.

[7] The commission consisted of the following influential personalities: Bartolomeo Capasso, Domenico Morelli, Federico Maldarelli, Benedetto Minichini, Giuseppe Pisanti, and Luigi Lubrano. Ferraironi 1931, p. 145;

[8] *Ibidem.*

[9] Casiello 2011, pp. 7-16.

[10] Colalucci 2010, pp. 54-59; Naples, Archive of the Fine Arts Academy, *Prof. Stanislao Troiano,* fasc. 154.

[11] *Ibidem;* Russo 2011, p. 46.

[12] Gardner, Molajoli 1944, p. 14.

[13] Mandolesi 2003, pp. 139-144.

[14] Lorenzetti 1952, pp. 342-343.

[15] De Rosa 2005, pp. 75-106.

the most qualified figure for this important restoration. Thanks to unpublished documents[17], it has now become possible to know the state of repair of the fresco at that time and the practices carried out by Troiano.
In a letter dated 20th July 1944, Troiano wrote to the Superintendency:
"The most damaged parts are those that fall within the radius of the directly affected area, those around some windows – where the ancient reed walls of the lunettes have shifted – and others at various points produced by the impact and displacement of the air. In the damaged parts are bulges – which in some areas have also affected the *arriccio* (mortar) and the reeds – deep cracks, detachments, crushing of frescoed plaster, a decrease of the adhesion of the plaster itself and eventually peeling of the coloured paste [...]. Since the micro cracks have made the surface of the frescoes similar to a mosaic, the result is that the wall paintings appear to be covered with a black net which has altered their tonal values and significantly reduced their legibility."[18]
The state in which the frescoes of the dome were found was somewhat critical. However, this would not only be a structural restoration but also an aesthetic one. Regarding the operations to be carried out Troiano wrote:
"1 – Radical consolidation of the detached plaster. This consolidation will also be extended in depth for a total retrieval of the cohesion of the plaster, for complete adherence between the plaster and the [underlying, t/n] *arriccio*, and between this and the masonry or *camorcanna*, depending on the area.
As regards the cohesion of the plaster and its adhesion to the *arriccio*, progressive pressure injections of an adhesive composed of casein, calcium carbonate and milk will be carried out.
As regards the adhesion between the *arriccio* and the masonry, and that between the reeds and the stone masonry, pressure injections of cement or plaster will be carried out, depending on the case and the structure of the underlying surface. In some areas, it will be necessary to detach the plaster, restore the underlying surface and reattach it again with casein-based mastic. [...] We shall also remove some ancient, summary, and ineffectual patching performed with nails, brackets, and iron wire. Suturing of the cracks and filling of the gaps left by fallen fresco fragments, will be performed.
2 – Dry cleaning (with breadcrumbs) of the entire painted surface to eliminate the black smoke on the chromatic surface, which has infiltrated the micro-cracks.
3 – Pictorial retouching (with watercolours) of large, medium and small gaps, to blend them into the local colouring."[19]

[16] The technical staff also consisted of: Giovanni Marchig, Anita Garzia and Selim Augusti, responsible for chemical analyses of the colour. In the Restoration Laboratory, directed by Molajoli in 1949, a chemical-physical section was set up, coordinated by prof. Augusti. Alabiso, Giusti 2006, p. 220.
[17] Naples, Archives of the National Library (henceforth ASBNN), *Lavori di restauro in Santa Brigida*, fasc. no. 36, I-XII.
[18] Naples, ASBNN, *Lettera alla Soprintendenza del 20 luglio 1944: Stato di conservazione, operazioni e preventivo per il restauro degli affreschi della cupola di S. Brigida*, fasc., no. 36 – I, cartella 83, f. 1v, 2v and 3v.

2. Photo of Stanislao Troiano and a page of his letter to the Superintendency, giving an estimated cost for the restoration work.

fig. 2

[19] *Ibidem.*
[20] For example, according to a *Carta del Restauro* from 1972, cement was still considered an advantageous material for the restoration of architecture, wall paintings, and mosaics.

Troiano closed this letter by reporting the costs related to the restoration (fig. 2). Troiano would send other letters to the Superintendent to keep him up to date on the works done and those still to be done. In particular, it was recommended to have a continuous supply of breadcrumbs for cleaning which, according to the restorer, meant around 2 to 4 kilos a day (precisely one kilogram per square metre), since "the breadcrumb is effective only when it contains the right degree of moisture."

Despite the use of substances that were harmful to the work (such as plaster and cement[20] whose salts cause the appearance of efflorescence) it can be said that the figure of Troiano stands as respectful and meticulous towards the artwork. Indeed, his figure must be interpreted from a historical perspective in which the rudimentary means and procedures used (and their effects) were not as well-understood as they are today. In fact, restoration has always been a field which demands effective innovation and constant updates to face the vast problems which arise from time to time in the conservation and restoration of artworks.
Other important but far from exhaustive sources allowed an incredible discovery. The restorations carried out between 1960 and 1961 cancelled the original decoration of the drum[21], conceived by Luca Giordano as a colonnade with the *Evangelists*

and Doctors of the Church, and uncovered the painter's original idea, namely, couples of *Angels with Festoons*. The first version was made in fresco, the second in tempera (and was still present during the 1944 restoration)[22]. In one of the first and most important biographies on Luca Giordano[23], written by the painter, art historian and biographer Bernardo de Dominici, the date when he realized the fresco is given as 1678 (confirmed by Luca Giordano's signature on the pendentives). However, this date does not coincide with that in a *Relatione*[24] dated 1681, whose anonymous editor in reference to the dome of S. Brigida wrote: "He is currently doing it, the intendants who saw it say it will be a great work of art." However, both sources may be correct, since according to Professor Renato Ruotolo, Luca Giordano certainly finished the fresco in 1678, but may have intervened in the drum a second time around 1681, perhaps because its decoration did not satisfy him. He had preferred to overpaint the fresco in tempera to avoid having to remove all of the plaster surface. The painter's afterthought may have been due to the fact that he wished to strengthen the separation between the lower and upper parts of the dome, to separate the 'earthly' space from the 'spiritual' one[25]. It must be remembered that Luca Giordano had frescoed a large surface free of charge; therefore, the costless nature of his work allowed him to operate with greater liberty towards his client and with timeframes compatible with his own numerous commitments. The question springs to mind: why did De Dominici not mention this afterthought? The biographer certainly could not have imagined that beneath the colonnade were *Angels* and that "Luca wanted to replace a banal motif with another of superior inventive quality."[26]

Returning to the restorations of 1960-1961, it is clear that the removal of the tempera decoration was realized in these years, as reported by the sources and as shown in the photograph taken before the restoration[27] (fig. 3). The restorers (not identified in the sources found) thought that this was a non-autograph addition and eliminated it. Today, it is well known that the removal of additions (which in this case were an afterthought of the artist himself) must be carefully appraised and permitted only in cases where the aesthetic or conservative values of the artwork are compromised[28].

During these restorations, the worst case of negligence was that of not having consulted the historical sources, "without even taking a look at the description already made by De Dominici who, in one of the four Evangelists, Saint Luke, wished to recognize the features of the painter himself."[29] We have no idea what other operations, techniques, and materials may have been used. Unfortunately, the various phases of these restorations remain a mystery to us today; despite assiduous archival and bibliographic research, the sources in our possession are still few and far between. It is to be hoped that in the future new research will delve deeper into the restoration executed between 1960 and 1961. Reconstruction of the history of an artefact, from its creation until today, is always an essential part of conservation work and represents a fundamental piece of the puzzle; historical research combined with scientific research helps us restorers to make the most suitable choices during the various restoration operations. The discovery of the use of cement, plaster and casein (as evidenced by the numerous technical reports) was subsequently confirmed by a diagnostic investigation: in this way, all the pieces of the puzzle were reassembled.

Thanks to the information received, for the cleaning phase we proceeded in diverse ways according to the areas and the material to be removed (fig. 4):

- to remove the "protein film" – derived from the use of milk and casein as a fixative for the pictorial film – cleaning was performed with solvent gels[30], or compresses with low percentages of Ammonium Carbonate[31];

fig. 3

3. On the left, a photograph taken before the restorations of 1960-61, in which the tempera decoration is still visible. On the right, a photograph of the painting as it appears today, with the original fresco by Luca Giordano.

[21] Ferrari, Scavizzi 1966, vol. I, p. 94; Di Mauro *et al.* 1995, pp. 613-614;
[22] In the final report dated 19 October 1944, Troiano, specifying the areas in which the consolidation took place, wrote: *"Painted architecture and a seated cherub [...], half figure of a saint with a white beard, and a reclining cherub [...], a lion and the half figure of a saint in the act of blessing [...], half figure of a saint, an eagle and two heads of cherubs."* This description clearly corresponds to the iconography of the *Doctors of the Church and the Evangelists* with their symbols; testifying that the tempera decoration was still present in 1944. Naples, ASBNN, *Lettera alla Soprintendenza del 19 Ottobre 1944*, fasc., no. 36 – I, cartella 83
[23] De Dominici 1742, p. 403.
[24] Anon., *Relatione della vita di Luca Giordano pittore celebre fatta sotto li 13 agosto 1681*, (edited by Ceci in *Napoli Nobilissima*, vol. VIII, 1899, p. 167); Scavizzi 2017, pp. 286 - 288.
[25] Ruotolo 1999, p. 40.
[26] Ruotolo 2004, p. 168.
[27] The photograph, kindly lent by Dr. Renato Ruotolo, was found by him in the convent (today it is impossible to find a copy) and was published in *Breve nota in margine alla relazione della vita di Luca Giordano del 1681 ed alla datazione del suo affresco nella cupola di Santa Brigida di Napoli*, an excerpt from: *Ricerche sul 600 napoletano* edited by De Vito, p. 167. It reproduces one of the spaces between the windows of the drum: a double row of columns with a balustrade (a sort of open gallery) in which a series of characters appear. On the left, we can see a seated cherub and the figure of a saint with a beard and headdress, holding a book and gazing upwards.
[28] Brandi 1963, pp. 34-37.
[29] Ruotolo 1999, p. 41; De Dominici 1742, vol. III, p. 403.

fig. 4

4. Restoration carried out in 2018: some details of the various cleaning phases.

- to remove the "saline efflorescence" (sulphates) – caused by the injections of plaster and cement – anionic resins[32] were used (which also effectively removed the protein film). Subsequently, repeated and controlled compresses of cellulose fibres and demineralized water were applied to extract the salts in depth[33].

In conclusion, the research into the artwork's conservation history was certainly one of the most interesting phases, together with the practical work carried out on site. The former represents an important starting point: the discovery of unpublished documents (in particular the restoration technical reports) not only steered us towards the most appropriate cleaning operations but also contributed to "enriching the History of Restoration" of this wonderful masterpiece by Luca Giordano.

[30] In particular, mixtures of low-toxicity solvents as acetone/ethanol in a 1:1 ratio or water/acetone / ethanol in a 1:1:1 ratio in Nevek, as a supporting gel. Contact time 10 - 30 minutes. Then the swollen protein film was mechanically removed using buffers and the surface rinsed with demineralized water.

[31] A solution of 10% Ammonium Carbonate and 3% Carbogel in water. Also in this case we proceeded by finishing with a buffer and a rinsing of the surface. Contact time from 10-20 minutes, depending on the thickness of the film.

[32] The strong anionic resin has a pH of 8-10, so it does not create an acidic environment which might damage the artefact. Mixed with a little water, these powders create a dense mixture which acts on the surface without penetrating too deeply. It is an extremely effective, selective and controllable cleaning method.

[33] The operation was checked from time to time by measuring the conductivity of the extract.

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A HISTORY OF RESTORATION IN LUCCA FROM MICHELE RIDOLFI UNTIL THE PRESENT

THE CASE OF A LARGE-SCALE PAINTING BY PIETRO PAOLINI

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The remarkable case of a painting damaged by a fire, subjected to five conservation treatments, and rolled up and kept in storage away from the public eye, constitutes the complex and engaging history of the *Convito di San Gregorio Magno* (circa 1652). This paper focuses on the history of the preservation, conservation and restoration of the most important work of art by a leading painter in 17th-century Lucca, Pietro Paolini (1603-1681).
The painting in question, a huge, arch-topped oil on canvas (about 460 x 800cm), was originally executed for the refectory of the Canons Regular of the Lateran (today the seat of Lucca's Real Collegio). It was subsequently moved to the public library at the end of the 18th century and now hangs in the National Museum of Villa Guinigi, Lucca.
This case study is of great interest for three reasons. First, it allows us to go beyond the single case and examine the national panorama from the point of view of a local context, retracing the culture of conservation in Lucca and beyond during the last two centuries from 1800 to today. The painting bears traces of changes in conservation technologies and methodologies; in addition, it

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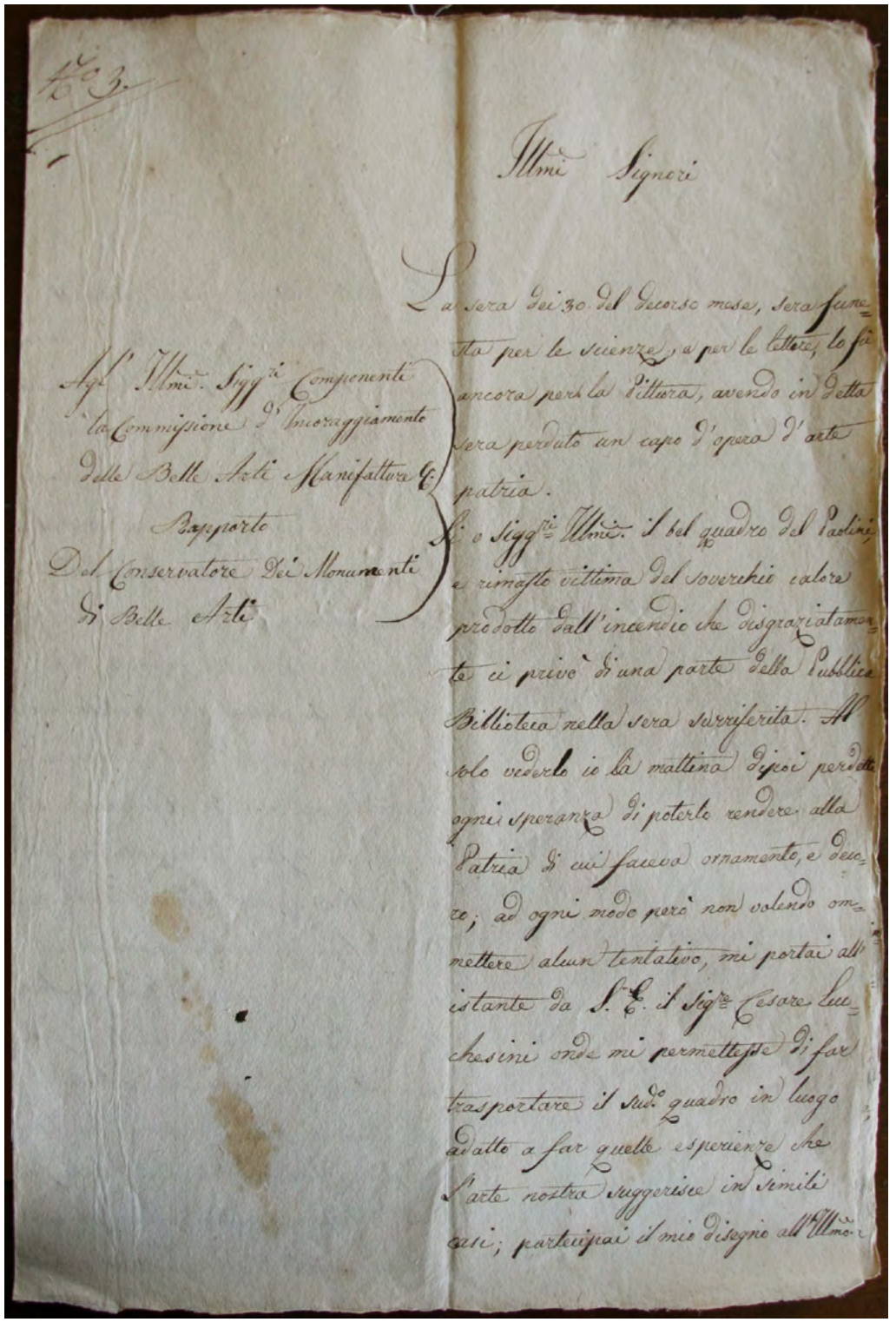
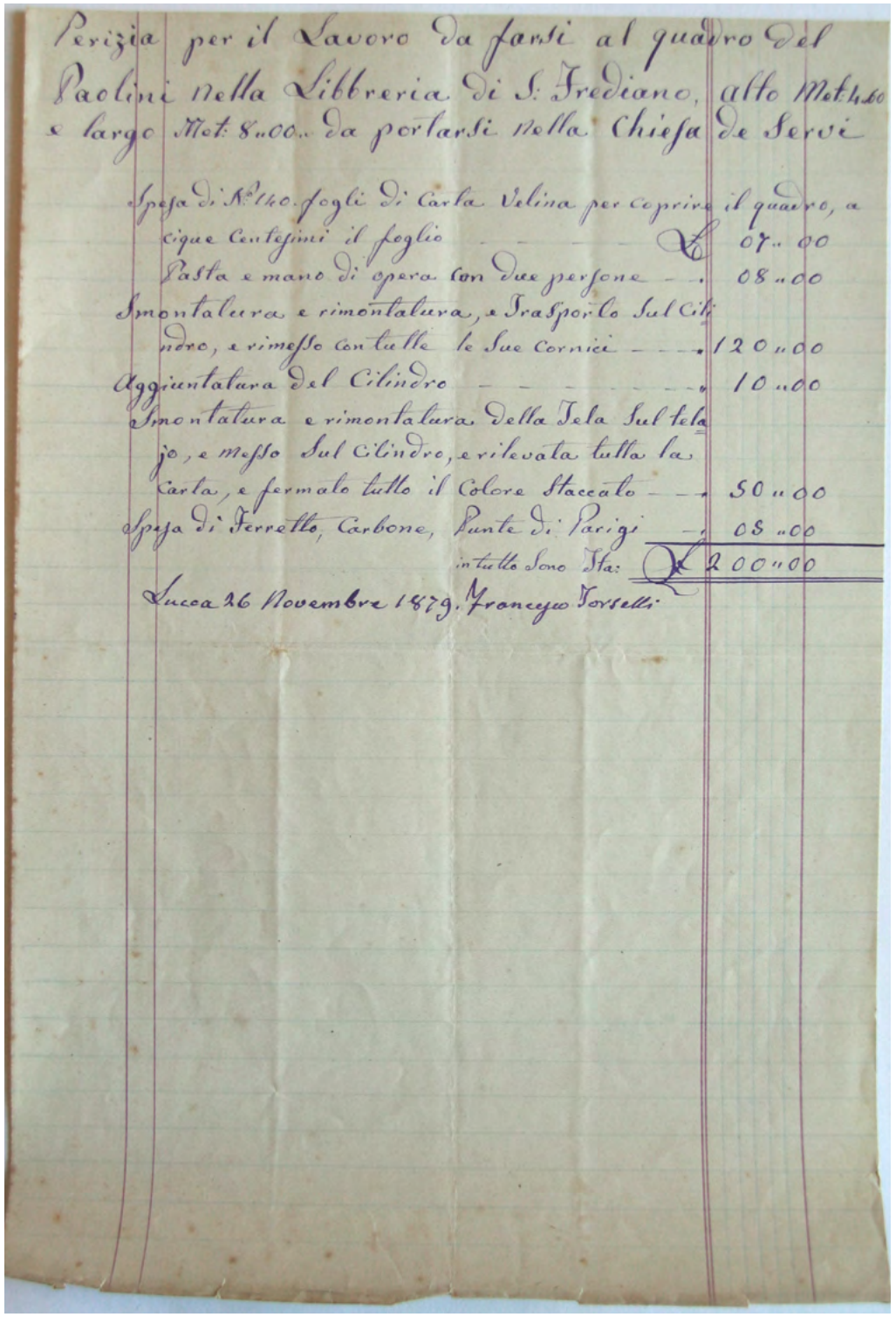


fig. 1


Perizia per il Lavoro da farsi al quadro del
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Smontatura e rimontatura, e Trasporto sul Cilindro, e rimesso con tutte le Sue Cornici — 120.00
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in tutto Sono Sta: £ 200.00

Lucca 26 Novembre 1879. Francesco Torselli

fig. 2

At page 181
1. ASL, Commissione sopra le Belle Arti (1819-1849), 4, Rapporto del Conservatore dei Monumenti di Belle Arti, Michele Ridolfi, February 5th, 1822 (by kind concession of the Minister of Culture and Tourism – State Archive of Lucca, further reproduction or duplication by any means forbidden)

In the opposite page2. ASCLu, Carteggio Miscellaneo, b. 6, f. 9, appraisal for the transfer of the painting made by Francesco Torselli, November 26th, 1879.

demonstrates how current ideas of maintenance, conservation and preventive conservation are a direct consequence of our past. We shall see that, as is so often the case, the ideas of the past were in fact surprisingly modern and forward-thinking. Secondly, this story puts into high relief the complex nature of interventions on large-scale paintings. Lastly, it confirms the importance of a multidisciplinary approach to conservation studies, of a synergy between art historians and conservators, and of a dialogue between disciplines (e.g., conservation and museology).

For our purposes, the history of the *Convito di San Gregorio Magno* can be said to begin on January 30th 1822, when a great fire broke out in one of the two rooms of the public library in Lucca, seriously damaging the painting – due especially to the great heat – to such an extent that it seemed to have been lost: "*La sera dei 30 del decorso mese, sera funesta per le Scienze e per le lettere, lo fu ancora per la Pittura, avendo in detta sera perduto un capo d'opera d'arte patria*" (fig. 1). In these years, Lucca was home to a cutting-edge painting conservation programme headed by one Michele Ridolfi, who, after training in Rome from 1813-1818, where he established close relations with Antonio Canova, Vincenzo Camuccini and Tommaso Minardi, helped set up a specific Fine Art Commission (1819). As a result, no pains were spared in the attempt to save Paolini's canvas, including surveys, tests, a painstaking analysis of the reaction of each colour to the heat, and consultations with local, national and international experts, including the painters Pietro Benvenuti, François Xavier Fabre, Vincenzo Camuccini and Gaspare Landi. The State Archive of Lucca holds only two reports on the episode, by Camuccini and Fabre, in all likelihood the only ones ever written. Interestingly, both artists recommended lining the painting to reactivate the adhesion between painting, ground and support. Despite these considerable efforts, in October 1822, the *Convito* was declared damaged beyond repair.

Only twenty years later, a conservation attempt, consisting mostly of cleaning and consolidating rather than in painting ("*più col lavare ammollire e fermare, che col dipingervi*"), appeared to have brought the painting back to life (1842). But evidently the intervention was not considered definitive, because in 1852 a cost estimate for lining was requested, and in 1869 another conservation treatment was undertaken, about which almost nothing is now known. In 1879, the painting sustained damage caused by infiltrations of moisture, which occasioned an accurate proposal for a transfer (fig. 2) associated with triple-action preventive conservation: a stucco frame to distance the painting from the wall and protect it from moisture, opaque windows to protect it from the sun, and a curtain

fig. 3

3. Lucca, National Museum Villa Guinigi, P. Paolini, Convito di San Gregorio Magno, circa 1652, after the conservation treatment by Fausto Giannitrapani and before the last intervention (by kind concession of the Minister of Culture and Tourism – Regional Directorate of the Museums of Tuscany - Florence, further reproduction or duplication by any means forbidden)

to protect the painting's surface from dust during cleaning of the surrounding space. However, none of this would be undertaken. Thereafter followed a new conservation treatment (1887), the transfer of the *Convito* to the Church of San Romano in Lucca (1895), and further accidents (in 1906, during restoration of the church roof, "a clumsy worker" leaned a ladder against the painting, holing the canvas in two places; it was subsequently mended with patches), until the painting was finally moved to the Pinacoteca of Lucca, at that time located in the Palazzo Ducale, with the intent of protecting it from additional damage (1906).

The painting's large size prevented it from being kept in a safer place during the Second World War. While many works of art were moved to the Charterhouse of Farneta, near Lucca, the *Convito* remained in a museum (the Pinacoteca) bereft of windows and with high levels of damp until 1948, when it was moved once again, this time to the National Museum of Villa Guinigi, where it remained rolled up in storage for many years. Only in 1983 did it join a major project to recover 100 paintings from the museum's repositories, being unrolled and lined with wax by the restorer Fausto Giannitrapani from Pisa. The use of wax instead of *collapasta* (a glue/paste adhesive based on animal glue, flour, Venice turpentine and water, and the most commonly used in Italy) was decided based on the poor condition of the painting and its large size – as the conservator kindly informed me. However, the conservation treatment was never concluded, in the absence of a definitive appropriate place where the huge artwork could be exhibited, as we learn from the then Director of the National Museum of Villa Guinigi, Maria Teresa Filieri: the *Convito* "*è rimasto per circa un secolo, in pezzi, arrotolato in un magazzino. Ne abbiamo iniziato ora, con una complessa foderatura, il recupero, ma il completamento del restauro potrà avvenire, viste le dimensioni dell'opera*

fig. 4

4. Lucca, National Museum of Villa Guinigi, P. Paolini, Convito di San Gregorio Magno, circa 1652, after the last conservation treatment (by kind concession of the Minister of Culture and Tourism – Regional Directorate of the Museums of Tuscany – Florence, further reproduction or duplication by any means forbidden)

[...] solo dopo che si sarà definita la sua collocazione". As a result, the canvas was rolled up once again (fig. 3).

Our tale of the *Convito di San Gregorio Magno* ends in 2005-2006, when a complex conservation treatment, directed by the Superintendency for Historical, Artistic, Ethno-Anthropological and Architectural Heritage and Landscape for the provinces of Lucca and Massa Carrara, was undertaken thanks to collaboration between three conservation firms. The restoration was a major challenge for the following reasons: the painted surface had been heavily damaged by the effects of the fire; many parts were missing, especially at the top; and the effects of three conservation treatments and the numerous accidents were evident. Moreover, the wax lining of the previous intervention had altered the colours and led to a progressive weakening of the textile fibres. During this restoration, several new methods, techniques and solutions were tried and tested due to the large size of the painting and the necessity of dealing with the consequences of the past treatments. Decisions about materials were also made, taking those already used in past restorations into account. For example, as regards the lining, the previous use of wax advised against using a water-based glue and led to a preference for a thermoplastic resin (Beva Film), activated by controlled heat and vacuum pressure. Moreover, the different states of repair of the painted surface advocated diverse techniques for retouching, for instance in the complexions of the figures, where, in the case of large losses, the underpainting which the painter had created with shading and finishing was left visible. In the final analysis, considering the hard life of this work

of art, the end result of this conservation treatment was nothing short of miraculous (fig. 4).
I would like to conclude with a question: how could museums effectively communicate to visitors that what we see today when we look at paintings is nothing less than a compendium of injuries of the past and the result of deliberate choices based on the always time-dependent culture of conservation? For example, without any such mediation, who would understand the curious aspect of the half-naked figure on the right of our painting (fig. 4)?

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THE 1932 RESTORATION OF APRILE BY FONTANESI

A CASE STUDY OF CONSERVATION, MUSEOLOGY, AND ART CRITICISM

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When talking about the history of conservation, we cannot leave aside other related disciplines. A case study of the 1932 restoration of the painting *Aprile* by Antonio Fontanesi (1873) – on show at the Turin Civic Gallery of Modern and Contemporary Art (GAM) – is a good example of the intimate connection between conservation, museology, and art criticism.
Aprile has undergone a number of conservation interventions over the years, due to its fragility. It was painted during the winters of 1872-73 on the same canvas which Fontanesi had used for *Il Mattino*, a painting exhibited at the *Esposizione Nazionale di Belle Arti* of Parma in 1870. *Il Mattino* was then bought by the Ministry of Public Education and given to the Civic Museum of Turin[1].
Despite this, when the exhibition ended, Fontanesi decided to pick the painting up and work on it to make some changes.
When its re-elaboration was over – in 1873 – the painting was shown at the Universal Exhibition in Vienna with a new title: *Aprile*. As a result of Fontanesi's continuous second thoughts and alterations, the canvas had begun to slowly deteriorate due to the number of layers of paint which left it heavy and thick – about 1½ inches in the centre. The GAM Director, Vittorio Viale, considered "the major thickness of the paint"[2] to be the cause of the canvas's fragility.

[1] Bernardi 1953, pp. 14-15.
[2] Viale 1932a.

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fig. 1

1. Antonio Fontanesi, Aprile, 1872-1873, oil on canvas, 171 x 254.8cm. Turin, Photographic Archive of the Civic Museums – Turin Museum Foundation (courtesy of the Foundation)

Furthermore, the detrimental conditions of the GAM's rooms – including extreme temperature changes – had affected the condition of Fontanesi's artwork. Which is the reason why the complex conservation history of *Aprile* is interwoven with different museum situations.

The first conservation intervention took place in 1904, when a section of the painting's sky was repainted by Fontanesi's pupil Marco Calderini[3]. His mimetic retouches filled the gaps, making them invisible to the naked eye.

The second intervention was carried out by Lorenzo Pene in 1920, after another part of the painting's sky had come loose because of water damage – on the night between November 3rd and 4th. Director Enrico Thovez described details of the damage in a letter to the Mayor of Turin[4]. Thovez told how the roof had fallen in because of heavy rain. *Aprile*, hanging in the centre of the room, was doused by the rainwater. A meeting of the GAM Board was called to decide what to do. One of the board members, the famous painter Giacomo Grosso, suggested replacing the painting's canvas with a new one, thus preventing major damage and guaranteeing stability for the years to come. Two names were proposed for the replacement of the canvas – Carlo Cussetti and Lorenzo Pene. The latter was chosen "for his enduring and deep knowledge of Fontanesi's particular technique"[5]. Pene accepted, but did not wish to take the responsibility for a further

[3] Thovez 1920.
[4] *Ibidem.*
[5] *Ibidem.*

fig. 2

2. Aprile at the retrospective exhibition of 1932. Turin, Photographic Archive of the Civic Museums – Turin Museum Foundation (courtesy of the Foundation)

repainting of the missing triangular section of sky. However, as reported by City Council Member for the Fine Arts Emilio Zanzi, there was no need for repainting.

The canvas was replaced in 1920, however, the same leaks happened again the very next year due to low temperatures. In order to remedy the situation, Lorenzo Pene suggested that a protective sheet of glass be applied to prevent other fragments of paint from coming away.

In 1927, Mario Soldati – author of the first GAM catalogue – mentioned the murky surface of *Aprile*. The paint was darkening and becoming heavier, affecting the legibility of the work. Soldati noticed this problem from the distinct separation between the tree in the foreground and the atmosphere of the surrounding space.

Art critic and journalist Marziano Bernardi wrote in the newspaper *La Stampa* in 1929: "To gaze today at the tragic ruin of Fontanesi's *Aprile* – one of the ultimate masterpieces of 19th-century European painting – is heartbreaking"[6].

This was echoed a few days later by art critic Ugo Ojetti, in the same newspaper:

"[*Aprile*] must finally be removed from public sight. It is broken and disfigured; it looks as if it has been kept in an oven in summer and in a fridge in winter. Keeping it on show might be a good way to say '*mea culpa*'. But when one is dead, one is dead"[7].

[6] Bernardi 1929.
[7] Ojetti 1929.

One should not underestimate the source of these words – *La Stampa* is *the* popular newspaper of Turin, not some specialist journal. It reaches out to various social milieus and sensitizes people to the state of the city's artistic heritage. In this way, the issue of the inadequate conservation of Fontanesi's artworks at the GAM reached the population, and was strongly criticized by contemporary public opinion and intellectuals alike.
When he became director of the GAM, Vittorio Viale realized that "destiny has frowned on the largest and best-known painting by Fontanesi, *Aprile*, which has been severely damaged by rainwater"[8].
In spring 1930, Viale began taking care of Fontanesi's masterpiece. He started by writing a number of letters to the city governors, reporting the urgent necessity for *Aprile* to be restored. Viale also wrote to the Royal Superintendency of Monuments of Piedmont and Liguria, stating that "huge cracks" covered the painting's surface. Furthermore, in conjunction with the cracks, temperature changes had resulted in "peeling paint"[9]. It was only the sheet of glass – installed 10 years earlier – that was preventing the paint from coming away completely.
In 1931, Viale proposed to the Superintendency a thorough restoration of *Aprile* – he ordered the transfer of the whole top layer of paint onto a new canvas[10]. A decision taken on the advice of Carlo Cussetti – the official restorer of Turin's Civic Museums under Viale's direction.
Cussetti himself was put in charge of the restoration, since he was not new to the "replacement technique". As Director Viale wrote to the Superintendency, "[Cussetti] has already restored another painting by Fontanesi. He has a reputation as an excellent restorer"[11].
Cussetti's intervention began in September 1931, as reported by Viale in the local magazine *Torino* the following year[12]. Cussetti carried out a daring transfer of the painting onto a new canvas. He removed 1,200 grams of paint, leaving only the final layer untouched. Director Viale defined his pictorial approach as "an honest and respectful one" based on a profound study aimed at restoring the condition of *Aprile* as it had been before the renovations of the first two decades of the 20th century.
The painting was then retouched after a long study based on old photographs, in order to bring back the highly original shapes, colours and tones of the missing part[13]. The lacuna was superficially retouched and then filled by reattaching the original fragments – kept by Fontanesi's pupil Marco Calderini. This was a mimetic, integrative restoration, dictated by the cultural environment of the time. Since *Aprile* was the GAM's masterpiece, it must not present any visual imperfections or lacunae.
The conservative intervention on *Aprile* in 1932 was widely reported by the press in order to sensitize the population to the issue of preserving Turin's artistic heritage. Many articles were published in *La Stampa*, making the people – not only the experts – aware of each phase of the interventions on the painting.
Under Vittorio Viale's direction, new museum projects were launched linked to the problem of conserving the civic collections. The case study of *Aprile* shows us how restoration treatments can lead to new studies of artworks. In fact, all conservation treatments must take into account the entire conservation history of paintings.
During the campaign, Viale employed conservative treatments to rehabilitate Fontanesi's art. This is another important aspect of this case study, since it demonstrates that restoration works can lead to fresh studies of a particular artist.
Viale made use of the restoration of *Aprile* to stop the controversies regarding his Gallery, the whole of the 19th century Piedmontese school of painting, and Fontanesi's pictorial technique. In fact, a poor appraisal of Fontanesi's art had gradually diminished the public's appreciation of the artist's innovations. For Marziano Bernardi and Vittorio Viale, the reason for this posthumous misfortune was one only – the lack of any systematic philological study of Fontanesi's works.
The aforementioned efforts of Director Viale – supported by Bernardi and the Mayor of Turin – were aimed at an appropriate positioning of Fontanesi's art, initiating a renewal of public interest in the artist. This process culminated in 1932 with the organization of a major retrospective exhibition. It featured all of Fontanesi's significant artworks, so that the whole story and art of this great artist could be told exhaustively, 50 years after his demise. The text of the exhibition catalogue, edited by Bernardi, would then become the first historical-critical contribution on Fontanesi and a valid philological milestone for future studies.
Viale's intervention ranged from museology to conservation and art criticism. These three aspects were intertwined in a link between cause and effect. The problem of the positioning of artworks forces us to reconsider another issue – the state of repair of paintings in general – breathing new life into the studies of art criticism.
To sum up, *Aprile* represents a case study full of key points related to conservation history. In effect, this area of study is necessarily interdisciplinary, impacted by a number of aspects which need to be considered as one.

[8] Viale 1930a.
[9] Viale 1930b.
[10] Genta 2001, p. 194.
[11] *Ibidem.*
[12] Viale 1932b, pp. 44-46.
[13] Genta 2001, p. 216.

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ANTIQUE ORIENTAL CARPETS

RESTORATION METHODOLOGIES FROM THE 19TH TO 20TH CENTURIES

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INTRODUCTION

Both the World Fairs and the Schools of Applied Arts which appeared in Europe in the 19th century became the means through which the taste for Oriental Art spread throughout the USA and the European continent. Oriental artefacts – metalware, glassware, textiles, carpets, and ceramics – with their distinctive geometric patterns, colours and decorations, inspired the new classes of industrial designers like William Morris. This was the century when Industrial and Applied Arts Museums were born, understandably connected to the Schools mentioned above. During this period, the South Kensington Museum in London (1857), the Musée de Cluny in Paris (1844), the Bargello in Florence (1865) and the Kunstgewerbemuseum in Berlin (1867) were founded. Paintings by artists such as Mariano Fortuny and José Villegas Cordero show that "fascination with the exotic" which was rife between the 19th and 20th century. It is easy to understand how dealers became suppliers for all the private and public collections assembled in this historical period. In 1883, the magazine *L'Illustrazione Italiana*, wrote: "Simonetti's Auction was a daydream for bibelot lovers and directors of Europe's Industrial Museums."[1] Celebrities like Stefano Bardini, Giuseppe Giacomini, Giorgio Sangiorgi, Giuseppe Salvatori and many others adopted the habit of sending letters with photographs of art objects enclosed. Thanks to this move, dealers managed to sell their goods all over the world. These documents are priceless to understand the phenomenon of the dispersion of artefacts caused by a lack of legislation in Italy.

[1] Bellinzoni 1883.

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CASE STUDIES OF CARPETS WITH OLD REPAIRS

In a rug with a damaged area, it was considered preferable to sacrifice the material aspect and the weave in order to suggest apparent completeness. Small or large portions of rugs were eliminated, replaced, rewoven, or sewn onto other kinds of textiles. The parts removed were usually used either for repairing sections of the same carpet when it had become smaller, or other carpets. Above all, these practices were meant to satisfy the purchaser's aesthetic taste, to improve the economic value of the artefacts and to let the object become usable again.

Resized and recomposed carpets

"The restoration of your carpet has started immediately, but despite my in-depth research, it is difficult to find similar pieces; so it will take longer than expected unless I can find a similar artefact"[2]. This letter, written by Bardini to Bode, testifies to two of the most common practices of old restoration work: the resizing and the recomposition of carpets. It is not unusual to find carpets cut into several pieces reassembled in a new composition. Thanks to the repetitive pattern and the presence of a number of examples with similar decoration, it was easy to sacrifice portions of a rug to create a complete one (fig. 1). An interesting example of this practice is the world famous Ardabil carpet (Persia, 16th century). It was sold by Robinson and Stebbing to the South Kensington Museum for £2,500 (a steep price at the time) at the end of the 19th century. But in 1910, an identical specimen turned up at the Yerkes Auction. Yerkes' carpet had no borders: these parts had probably been used to complete the South Kensington carpet. The remaining incomplete fragment was sold by Robinson and Stebbing to Yerkes later on. These practices were not merely functional but were also a way of aesthetically reapproaching and readjusting the patterns of damaged carpets. In the repository of the Scuola Grande di San Rocco in Venice there is an Uşak Medallion carpet (Turkey, 16th century) which had been cut in half. The two remaining portions are perfectly symmetric and were masterfully stitched together down the middle.

[2] ZA, SMB-PK, Nachlass W.V. Bode, *Schriftwechsel Bardini*, 629, vol. 3, fasc. 5 (23 October 1895).

1. Resized Lotto carpet, Turkey, probably 16thC, from the Casa Museo Pogliaghi repository, Varese.

fig. 1

Carpets with textile patches

Often, in the past, restorers used patches from different types of textiles or from other carpets too. Almost certainly they intervened with the most easily accessible materials.
In many cases we can find the coexistence of textile patches and fragment of carpets, like the Mamluk carpet (Egypt, 16th century) currently at San Rocco in Venice.
Sometimes they simply used fabric patches, as in the Tiger carpet (Persia, 16th century) now at the Poldi Pezzoli Museum. The fabric patches used had a similar texture and colour to the surrounding area of the carpet.
In other instance we see only the carpet patches. Most of these rug fragments were stitched onto the back. At least five artefacts in the Pogliaghi collection (Varese, Italy) were restored with this method. Conceivably, some of them have patches from one sacrificed old rug. In the same way, the Uşak Medallion carpet (Turkey, 17th century) from the Piersanti Museum (Matelica, Italy) was restored using very large patches.
In some cases, the fragments used for the restoration were grafted into the original weave, like the Lobed Uşak Star carpet (Turkey, 17th century) at the MET[3]. This last method

[3] Chiostrini 2012.

fig. 2
2. Painted patches in the Safavid carpet, Persia, 17thC, from the Museum of B&H, Sarajevo.

3. This photographic negative shows the Mamluk carpet (Egypt, 16th C) before the old restoration. Casa Museo Pogliaghi repository, Varese.

fig. 3

avoided the problem of the fragment's thickness at the rear. Occasionally, patches from different types of textile were used to support an aesthetic integration. In a Caucasian carpet from the Pogliaghi collection (Caucasus, probably 19th century) the fabric patches support an embroidery which reproduces the lost pattern.
In another case, the Safavid carpet (Persia, 17th century) from the National Museum of Bosnia and Herzegovina shows a successful restoration in which a: "part was drawn with oil pastels on canvas and inserted to fill the hole"[4] (fig. 2). The Pogliaghi Smyrna carpet (Turkey, 17th century) had had its borders painted on a textile support. Thanks to this restoration, the rug reacquired

[4] Popić-Filipović 2018.

4. The Mamluk carpet today, (Egypt, 16th C), displayed in the Golden Gallery of the Casa Museo Pogliaghi, Varese.

fig. 4

an appearance of completeness. If the restoration of the Safavid carpet exploited the painted part, in the Pogliaghi rug what prevails is the material aspect and texture of the support.

Carpets with re-woven areas

In the Pogliaghi Golden Gallery there is a Mamluk carpet (Egypt, 16th century) where the external borders and parts of the ground have been rewoven (fig. 4). It was Leone Esquenazi who sold and restored this carpet as we know because of a letter: "I, Leone Esquenazi, declare that I am receiving 1500L from Professor Pogliaghi for an Ispahan carpet with the seasonal cleaning agreement...and to repair the damaged area in the middle (especially the main four lacunae) and a portion of the border..., Leone Esquenazi"[5]. A period photographic negative preserved at the Museum shows the carpet before this restoration (fig. 3).

Carpet fragments

Today, fragmentary rugs can be found in Museums all over the world. Sometimes the fragments are the only surviving parts following some inexpert conservation. However, we can also find parts of the same carpet in different museums very far from one another. This most probably happened due to an economic interest of the dealers.

Two carpets which passed through the hands of Bardini were cut into pieces now stored at different museums. One of these is a Mamluk carpet (Egypt, 15th century): the larger part is currently in the Galleria Palazzo Mozzi Bardini in Florence (cut into several pieces), while a smaller piece is in the Textile Museum of Washington DC. The same fate befell the Uşak carpet with Seljuk motifs (Turkey, 16th century), which was divided into two large fragments: one of these was sold to the Islamic Art Museum in Berlin while the second part again remains in the repository of the Galleria Palazzo Mozzi Bardini.

Originals and fakes

In 1933, the Victoria & Albert Museum of London bought a large carpet with a white ground and a decoration known as "Chintamani", dated to between the 16th and 17th centuries. It was bought from a Mr F. P. Perlefter in London. The original provenance was the art collection of the Prince of Vienna. However, in the 1960s, Nessim Cohen[6] suggested that the Chintamani carpet may actually have been woven in the 20th century by a Rumanian factory. The original of this carpet is now in the National Museum of Prague.

This same factory, directed by Teodor Tuduc[7], also tricked Lodovico Pogliaghi. In the Golden Gallery we can see a Kashan carpet which is a copy of a Gulbenkian Kashan silk animal carpet. We know this thanks to a document in the Pogliaghi Archives[8]. These cases testify to both the past interest in and lack of knowledge of these masterpieces.

[5] ALP – Personali Cartella Antiquari 2.
[6] Famous carpet experts and dealers.
[7] 1888-1893.

[8] ALP – Personali Cartella Antiquari 3.

CONCLUSIONS

After reading this essay we should not be surprised if on the monumental staircase of the Bardini Museum we can see, hanging on the wall, several examples of carpet borders. Also in the Pogliaghi repository there are several small portions of carpets. The questionable practices of the conservators of the past mean that today these masterpieces merit closer scrutiny. It also suggests that we should investigate what has been lost from the lacunae and fragments.

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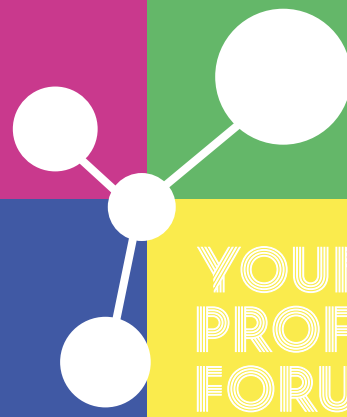
PARTICIPANTS



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