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Master Degree in Historical Sciences- Curriculum: Mobility Studies

Mobility at the museum: analysis of three Breda transport vehicles in Museo Nazionale Scienza e Tecnologia "Leonardo da Vinci" in Milan.

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“Surround yourself with the best and try to learn as much as you can from them”.

Maria XANTHOUDAKI

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Wishing you a good read,
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Introduction

The work contained in the following pages was born out of the curiosity to combine two interests of the undersigned, namely the vast topic of mobility and the realm of museums. As this thesis is the final work of the Master's degree course *Mobility Studies*, it is almost a matter of intellectual honesty to make mobility the protagonist of the research. In this regard, I considered it appropriate to place another equally vast and fascinating concept alongside it, namely that of the museum realm, so as to bring out interesting connections between the two.

The choice to include this field in the research is linked both to my personal interest and to the opportunity I had to perform my university internship in one of the most important museums in Italy. More than two months at the National Museum of Science and Technology (*Museo Nazionale della Scienza e della Tecnologia*) *Leonardo da Vinci* in Milan offered me a unique chance to deepen the knowledge and understanding of the work that takes place in a museum. This situation therefore represented a fertile ground for the dissertation work, since an analysis of the relationship between mobility and museums -in this case of technoscientific nature- is a type of study that is very little explored.

During my internship I was not only able to comprehend the workings of the mechanism behind the museum world, but also to get to know the people who make it all possible. Their knowing not only allowed me to understand some important traits of the professional figures within a museum, but also to realise how one subject can be seen from many different perspectives.

This aspect was fundamental, as their meeting gave rise to the idea of collecting their testimonies with which to enrich this study. The fact of recording their opinions and points of view on certain topics makes the work original and intriguing and to some extent reflects the academic background of myself.

Here I found a number of favourable conditions for the analysis development on my topics of interest. The result has been the formulation of a main research question, which guided the following work and around which my interest gravitated. This is in relation to the relationship between two concepts that by their very nature seem diametrically opposed; "mobility" -which refers to the idea of movement and dynamism- and "museum" -which for a physical matter is bound to a place and therefore characterised by an immutable static nature.

Hence, the question: "Does any direct relationship exist between mobility and technoscientific museums? If so, how does it manifest itself?".

The formulation of this question has played an essential role in the development of the work, because like a beacon in the fog it has always allowed me to have a point of reference, thus avoiding taking the wrong routes.

The combination of theoretical work -in the most classic and absolute sense of the term- with practical work -understood in this case as the conduction and transcription of interviews with experts-, unites the methodologies and analytical processes learned during my previous anthropological studies. These have been conducted for my Bachelor's degree and have been linked with those of historical nature -approached during the current Master's degree.

Another practical aspect of relevance is the archive work carried out within the Museum, as well as the intensive study and analysis of its collections.

In a certain sense, therefore, the following work is intended not only as a tribute to two of my interests, namely the investigation of the concept of mobility and museum realities, but also as a crowning achievement of the studies carried out so far, reflecting what I have learned and acquired over the years. It is only in this way that the thesis work can truly be considered as personal, as it clearly reflects the important traits of the completed academic course.

The reason for this thoughtfulness in alerting the reader to the nature of the content of the present research is related to the desire to make explicit and manifest my thinking behind this work. In terms of content, the types of technoscientific museums and science centres that have been investigated are diverse, and are: the *Science Museum* and the *London Transport Museum* in London, the *Deutsches Museum* in Munich, the *Exploratorium* in San Francisco, the *Technorama* in Winterthur and the *Miraikan* in Tokyo. The reason why these were chosen is due to their uniqueness in the museum scene. Each of them represents an excellence as well as a singular place, which gives this museum category an inimitable spirit. The peak is then reached with the aforesaid *Leonardo da Vinci* Museum -to which much of the research is devoted- with direct references to three different vehicles produced by *Breda*, which are exhibited in the Museum.

The cases studied and presented in the dedicated chapters are different from each other for several reasons and because of their international character a wide and heterogeneous overview is offered. For each of them, there is a description as well as a set of temporal and spatial indications. In this way, it is possible to understand the variety of a museum typology, seeing the different nuances present in the world.

What this research work strives for is to find a line of contact between mobility and the museum, investigating the ways in which this happens and highlighting the peculiarities of each case.

The link between these two points is the theme of means of transport and how each of them has its own story and its own way of narrating itself and being narrated to the public.

To achieve this, it was necessary to proceed in a step-by-step manner, tackling one topic at a time. Only in this way it was possible to connect the various points together, just as the different pieces form a mosaic.

Therefore, the first chapter deals with the concept of mobility. Here, the paradoxical difficulty of this notion emerges, since -although it is practised by everyone innumerable times every day- its definition and understanding are never easy. In order to offer a proper explication, it is essential to draw a dividing line with two other concepts that are apparently similar, but in reality very different from each other: movement and transport. It is only through the discussion of these two terms that it is possible to understand how they are dissimilar but at the same time complementary to each other.

In the second chapter, it is the turn of the definition of a museum and everything that is related to it. Among the various aspects that emerge, the one that is given great importance is the educational one. Since museums -of whatever nature- offer an educational service to society, it is really important to emphasise and thoroughly investigate this point.

This chapter, in fact, is essential for the discussion of the third chapter, devoted to science and technology (*ST*) museums and science centres. It is in this section that the aforementioned museums around the world are presented and analysed, in order to offer the most comprehensive and detailed overview of this museum category, with reference to some of the key institutions in the field. Their presentation is crucial as it has a preparatory function for the fourth chapter, entirely dedicated to the institution where I completed my internship, the *Leonardo da Vinci* Museum.

This chapter is quite articulate, as it does not only narrate the history of the Institution with its 50.000 square metres and almost seventy years of history, but also presents the one of its founder -the engineer Guido Ucelli di Nemi- referring also to the exhibitions inside. In this case, the presence of several original and unpublished photos of the Museum symbolises the intensive research work I have carried out in the Institution's Archive.

Subsequently, chapter number five is devoted to the three analysed objects displayed in the Museum. These are three very different means of transport, which have two characteristics in common: the manufacturing company and the historical period in which they were made. The chapter has a strong empirical character and does not only deal with their presentation and study, but also with the description of their manufacturing company, the Italian industry *Breda*, whose industrial history is very curious and fascinating.

This represented the Italian industrial identity for about a century, proving to be one of the pillars of the nation during the 20th century. What is most compelling about this industrial reality is its versatility, as depending on the historical period it has always managed to convert its production to meet the needs of the time. Founded to operate in the metal-mechanical sector, *Breda* quickly became a world leader in the production of weapons and bullets, and specialised in the production of various types of transport equipment. Some of these are analysed in this work, namely a locomotive, an aeroplane and a moped.

The second element that unites these three vehicles is the historical period, as they were produced in the first half of the 20th century. However, despite having two important features in common, each of the selected objects provide evidence of unique mobility stories. What emerges from their stories, actually, fully reflects the historical, social, political and economic context in which they were located and used.

The locomotive *GR. 552-036* tells a story of mobility that is the result of the encounter between a local and a global reality, bringing out interesting details of the new-born Italian State and how it wanted to assert itself politically on an international level.

The *Breda 15* aeroplane tells of *Breda*'s engineering qualities and innovations and is above all linked to the great figure of the Italian aviatrix Gaby Angelini. The fact that she was not only a top pilot, but also an avowed fascist, meant that this aircraft was consequently associated with the fascist movement, as a means for Angelini to achieve important successes and goals.

The *Breda 65* motorbike expresses *Breda*'s capacity for adaptation and industrial conversion, as the company was forced to convert its production for civil use at the end of the world wars. This vehicle was therefore designed for the transport from home to the factory of the working class, which in the 1950s represented the greatest hope of economic recovery for the devastated Italian Country.

The research work carried out on these three means of transport was possible through various channels. Firstly, thanks to the study of the information in the various printed and online sources, all of which can be found both in the footnotes and in the bibliography. Such information has allowed a thorough knowledge of the objects, enabling above all their definition and location in space and time.

The research of Museum's archive documents was also fundamental. The various correspondences between the donors and the Museum, as well as the acquisition documents of the objects, made it possible to understand how the three vehicles came to the Institution and from which source.

Finally, the constant exchange with the experts in the Museum -all of whom were mentioned in the initial acknowledgements- certainly contributed greatly to the outcome of the work.

Also worth mentioning is the contribution of my visit to the Historical Archives in Sesto San Giovanni -province of Milan- *Fondazione ISEC* (*Istituto per la Storia dell'Età Contemporanea*), where the exchange of opinions and ideas with the employees stimulated and allowed for a deeper understanding of certain themes.

The work ends with the chapter dedicated to conclusions, where space is devoted to final considerations. Here, there are thoughts on what emerged during the research, with direct references to the examined cases. There are thoughtful reflections as well as some personal wishes about the evolution of this kind of research.

As already indicated, the work contains five original interviews, the contents of which are an essential element of the research. Those who have been asked to participate and have contributed are: MORAGLIO Massimo, XANTHOUDAKI Maria, RONZON Laura, IEZZI Marco and BIASIORI Lucio.

All of them have opened the way to interesting insights that greatly enriched the content of the work. The full versions can be found at the end of the paper, in the "Interviews Appendix" section.

The approach that was used for the interviews was the same for all of them and always involved the audio recording of the speeches, with subsequent transcription and translation from Italian to English by myself. Before being used and thus becoming an integral part of the work, their translated transcripts have been sent to the interested parties so that they could verify that the texts were correct. All this followed a process of mutual fairness and transparency.

To conclude, the entire work contained in these pages has continually sought to find the right balance between theoretical and practical approaches, without one prevailing over the other, but on the contrary combining with each other in a proportionate manner.

The hope is to offer new and, above all, interesting content that can offer some food for thought and intrigue the reader to delve further into this unexplored topic. Perhaps this work can even inspire museum curators to adopt a new methodology, which considers the theme of mobility as the main beacon by which to see through the fog represented by the complex study of collections.

Chapter One: Definition of the concept of "mobility"

1. Mobility: an apparently simple notion

There are a multitude of concepts, which are well-known to all and that profoundly influence people's lives, but when it comes to being defined and explained, they become insurmountable hurdles. Like with all abstract and not immediately visible concepts, such as "life", "good", or even "love", it is difficult to provide a precise definition, because, due to their apparent simplicity and daily execution, their meaning is usually taken for granted.

Among these, there is one that is practised by billions of people every day in many different forms, which -due to its ordinariness and variety- is very difficult to define in a precise way; the notion in question is that of mobility.

Although this concept has been continually demonstrating its fundamental importance and essentiality over the millennia, it is still complex to find a definition that correctly represents it in its entirety and completeness. Effectively, one single explanation of this concept, by providing just one interpretation, would be reductive and limiting to its vastness.

One of the most authoritative English language dictionaries, namely the *Cambridge Dictionary*, simply describes it as: "The ability to move freely or be easily moved".[1]

Here, even if the enunciation itself appears to be correct and exhaustive, it can be noted that some terms or expressions of questionable nature are used.

First of all, the use of the noun "ability" refers to a type of capacity, innate or developed, thanks to which any kind of body, living or not, is able to move. Subsequently, the adverb "freely" directly refers to the free will of the subject, that decides in full autonomy whether and how to move. From this, it can be deduced that any movement is intentionally performed, not being induced by others. However, the final part of this definition states the opposite of what has just been said, since it highlights the passivity of the subject, that can be shifted without difficulty by others, as indicated by the expression "easily moved".

Therefore, according to a first definition's reading of the concept of mobility, it is understood that any animate or inanimate body has both an active and a passive character- according to the situation- being both subject and object of mobility and immobility. So, it is assumed, that in the case of active intentional movement, this occurs without coercion, and in the case of induced movement, this takes place smoothly, without obstacles.

[1] CAMBRIDGE DICTIONARY, *Mobility*, https://dictionary.cambridge.org/it/dizionario/inglese/mobility

Beyond these details, what really deserves a reflection is the fact that such an important and vast topic has been encapsulated in less than ten words. This approach can be erroneous and inaccurate, because, although the concept of mobility seems to be taken for granted, it has a certain degree of complexity, due to the dense network of meanings and interpretations that are concealed and manifested, and to which little attention is often paid.

2. Movement and mobility - Apparently similar but effectively different

In order to better understand the essence of such conceit, it is indispensable to unveil it, thus arriving at its intrinsic spirit, which is absolutely embedded in another concept, the one of movement.
This should not be trivialised, being reduced to a simple displacement from point A to point B. It is necessary to analyse it from a more precise point of view, not superficially.
The greatest risk is to confuse the terms of mobility and movement, assuming they are synonymous. Even if similar and belonging to the same category, at a closer look they show significant differences.
Movement means any act of dislocation practised by a body, from one point to another. What counts in this case, is the action in itself, without considering the various modal, functional, strategic and symbolic aspects that derive from it.[2] On the basis of the definition given by the *Cambridge Dictionary*, it can be read that movement is described as "A change of position or place".[3]
Although extremely concise, this explanation shows considerable dissimilarities with the one on mobility found in the same dictionary. Unlike the previous case, here there is no reference to the subject's ability to move or be moved, focusing instead on the dynamism, physical or figurative, that occurs in a space. Thus, even though the idea of movement refers to displacement, this is more based on concreteness, mainly highlighting the physical realm.
The concept of mobility, by contrast, is imprinted with a component rich in meaning and codes to be interpreted, which manifests itself through three distinct points.
The first aspect is that mobility, because of its connection with the dimensions of space and time, is detectable and therefore measurable. Therefore, the idea that its nature is merely abstract, as it is not immediately visible, is refuted by the possibility of seeing it through measuring instruments.
The second point concerns its depiction, which, depending on how it is performed, changes in meaning. Thus, mobility is a very subjective concept, whose interpretation is personal, and consequently its implementation varies according to the people who practice it.

[2] T. CRESSWELL, *On the Move- Mobility in the Modern Western World* (London:Routledge, 2006), P.3.
[3] CAMBRIDGE DICTIONARY, *Movement*, https://dictionary.cambridge.org/it/dizionario/inglese/movement

The third issue regards the experience of the mover, defining his/her personality and perception of the outside world.[4] Mobility is not just linked to physical phenomena, but goes beyond, affecting the experiential sphere of those who practice it as well.

Therefore, mobility means detection, subjectivity and experience.

Despite the complexity, its ultimate aim is to move a body from one point to another.

However, this does not occur in an abstract dimension, but rather in one determined by the concepts of space and time[5] -which are directed by particular push and pull factors.[6]

From this overview, it can be comprehended that mobility necessarily implies movement, but movement does not automatically do the same with mobility.

2.1 Another concept: Transport

A further differentiation to be made, is the one concerning the concept of transport. Like in the case of movement, the terms of mobility and transport are often confused with each other, being considered as synonyms. This is a significant mistake, as an incorrect understanding of terms implies a muddled comprehension of what mobility is and how it manifests itself.

It is therefore appropriate to address this situation by providing an explanation of what is meant by transport, so that anyone approaching this subject has a clear overview.

To fully understand the meaning of this concept, it is of great help to consider its etymology of Latin origin: *trans* ("across") and *portare* ("to carry").[7] From this brief indication, it is possible to comprehend, that it is about the act of overcoming an obstacle, whether physical or not, leading to the movement of someone or something. Interestingly, reference is made to the movement, i.e. its triggering principle, as in the case of mobility. The main objective of transport is therefore to go across space, a dimension which is strongly defined by factors such as time, distance and the geographical conformation.[8] This is to satisfy a demand for mobility, as transport only arises on an ontological level when there is a need to move people, objects or information. If there is no underlying necessity for mobility, this phenomenon has no reason to exist.[9] The importance of transport is based on its ability to enable movements, having a profound impact on social, economic, political and infrastructural spheres.[10]

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[4] T. CRESSWELL, *On the Move*, P.3.
[5] *Ivi*, P.4.
[6] *Ivi*, P.29.
[7] UNIVERSITÄT DUISBURG-ESSEN, *Means of Transport and Equipment*, https://www.uni-due.de/~kte010/modularte/html/main_modules/thoughtData/57/Means%20of%20Transport%20and%20Equipment.pdf
[8] J.P. RODRIGUE/ C. COMTOIS/ B. SLACK, *The Geography of Transport Systems* (Abingdon: Routledge, 2006), P. 1.
[9] *Ivi*, P.2.
[10] I. DOSTÁL/ V. ADAMEC, "Transport and its Role in the Society", in *Transactions on Transport Sciences* 4 (2): P. 1.

Given its relevance on different levels, it can be clearly deduced that its activity is multidimensional. Actually, a good handling of this topic requires that certain particular aspects are taken into account, thus outlining its historical, social, political, environmental and economic importance.[11]

Historically, transport has enabled different civilisations to emerge, grow and develop, making different cultures to meet, converge and clash, goods to circulate and be traded, and ideas to be disseminated and shared. At the social level, transport has defined human interactions, facilitating, or preventing, access to overall welfare, medical care and gatherings for the practice or sharing of particular activities and interests. The political aspect of transport is extremely relevant as well, since it manages and controls inclusion and exclusion, being in this way an important national and nationalistic tool. For this reason, transport is always on the top of political agendas, as the possible growth or decline of a country depends on it. From an environmental point of view, transport is always a debated and controversial issue; depending on how it is practised, the environment is more or less affected. This is due to the creation of certain infrastructures and the consequences that particular modes of transport have on the environment and living beings, including man. The last main aspect addressed by the transport issue is the economic one. Strongly linked to the political element, this point refers to the implication that transport has on the circulation of commodities and services, making transport and economic activities mutually dependent.[12]

In the light of this, the transversal nature of this concept is evident, and it is consequently possible to realize the regional, national and global influence it has.[13]

From a structural viewpoint, however, the field of transport consists of three distinct elements: infrastructures, vehicles and users' operations.

The first component refers to the structures that connect various sites together, such as roads, canals, rails, and air- and waterways, as well as to the intersections between them, representing nodes, which are spaces that mark the beginning, the end and the transfer of movements, such as stations, ports and airports.[14]

Then, it is indispensable to see how the infrastructure is approached. This can be done by land- walk, cycling, road, rail and pipe-, water- naval and inland waterway- and air.[15]

Finally, there are the users' operations, which include the rules, regulations, obligations and prohibitions on how to access the infrastructure, depending on the vehicle used.[16]

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[11] J.P. RODRIGUE/ C. COMTOIS/ B. SLACK, *The Geography of Transport Systems*, P.4.
[12] *Ivi*, P.3-4.
[13] *Ivi*, P.4.
[14] *Ivi*, P.6.
[15] I. DOSTÁL/ V. ADAMEC, "Transport and its Role in the Society", P.2.
[16] UNIVERSITÄT DUISBURG-ESSEN, *Means of Transport and Equipment*.

To encapsulate the relationship between the concepts of movement, mobility and transport, these three could respectively be described- without sinning in blasphemy- as spirit, soul and body.
Movement is the detonator of everything, as it gives life to the primary and necessary action, defining its conditions and characteristics. Mobility provides meaning, significance and creates the framework for the development of different forms and interpretations of it. Transport, instead, is the incarnation of the two concepts, reflecting in a concrete way what has been previously elaborated, highlighting its intrinsic manifestations and structures.
Although the various characteristics of the concepts of mobility, movement and transport have been clarified up to this point, there is still a certain degree of confusion and lack of clarity about the differences between them. Therefore, in order to shed light on this issue and clarify a couple of points for a more accurate understanding, the undersigned, in the course of writing this thesis, has interviewed Massimo Moraglio, Senior Researcher and Professor at the *Technische Universität Berlin* and expert of transports and mobility.
The professor argues that although the concept of transport is more powerful in terms of meaning, the notion of mobility has almost become chic, partly due to the great attention given to it in the Anglo-Saxon area.[17] A further difficulty that the concept of transport faces is the association that many people make with the idea of physical mobility. Mobility, however, is not only limited to the physical dimension, but goes beyond it, encompassing also the field of communication and telecommunication, even reaching concepts typical of sociology, such as "social mobility".[18]
M. Moraglio's suggestion should therefore be taken into consideration, namely that the vastness of the concept of transport should not be reduced in favour of that of mobility, and that the latter should not be blindly reduced to the physical dimension alone.
However, the fact that the concept of transport is so precise and refers to a specific reality- that of infrastructures and means of transport- makes it quite limited. On the contrary, the notion of mobility because of its broad, and sometimes even nebulous, nature, has much more possibilities to cover different topics and aspects.[19]

[17] L. MERY, *Interview with Massimo Moraglio*, 03.03.2022, Audio, 23:38.
[18] *Ivi*, P.2.
[19] *Ivi*, P.3.

3. Mobility is not just a human affair

According to the geographer Tim Cresswell, mobility is not only made up of space and time, but also acts actively on them: "(It) is the spatialization of time and temporalization of space".[20]

This highlights its active character, showing that mobility is not at the mercy of these two dimensions, but, on the contrary, how it ably manages and manipulates them. Moreover, this is not only limited to the human sphere, but also expands to the reality of material goods, such as objects, and immaterial goods, like information.[21]

The importance of the mobility of goods and information is such, that sociologist Frank Webster has coined the expression "Global Information Economy" to define the modern society. Here, reality is profoundly influenced by such circulation.[22]

The scenario of global information is articulated in various areas, touching on technology, economics, employment, space and culture.[23] It is thus clear that both tangible and intangible goods, namely commodities and information, are two sides of the same coin, and their mobility is as important as the human one, with which there is a constant relationship of interdependence.

Human life entirely depends on mobility. It is impossible to imagine an existence without it, since this is deeply embedded in all physical, social, cultural economic and political realms.

This view is supported by the thesis of sociologists Monika Büscher, John Urry and Katian Witchger, according to which there are five different forms of mobility. These are not limited to the human state, but go beyond, including objects and information.

Below are the "mobilities" in question.

The *Corporeal Travel*, which refers to the physical movement of people, in relation to space and time. As it has already been pointed out, mobility as such cannot be conceived without considering these two dimensions. Because of their importance, it is inevitable to regard the strong interdependence between this concept and the two dimensions. The *Physical Movement of Objects*, whose mobility's process goes from the producer through the retailer to the final consumer. Thinking that only man is capable of mobility, thus ignoring the same capacity of objects, would be a sign of ingenuity. Human mobility, indeed, is often directed, influenced or even aimed at the mobility of objects.

Then, there is the *Imaginative Travel*, which allows people to communicate, through the circulation of audio-visual content, print and visual media.

[20] T. CRESSWELL, *On the Move*, P.4.
[21] T. CRESSWELL, "Towards a Politics of Mobility", in *Environment and Planning D:Society and Space* 28: P.161.
[22] F. WEBSTER, *Theories of the Information Society* (London: Routledge, 2014), P.2.
[23] *Ivi*, P.8.

One of the characteristics of human mobility is to leave traces of the passage to both contemporaries and posterity, with the creation and distribution of information. They provide important knowledge about the historical, social and cultural period, in which they have been produced.

Subsequently, there is the *Virtual Travel*, which allows people to move while remaining immobile; this means being able to be present in different places at a distance, through the use of electronic tools such as computers and mobile devices.

Such form of mobility provides two interesting indications: on the one hand, the availability of tools that allow people to visit places without moving, and on the other, the desire to achieve a state of absolute ubiquity. Actually, this phenomenon has always been present in people's lives since the advent of printing, but with the introduction of technological means it has become increasingly fast, immediate and accessible.

Finally, the last type is the *Communicative Travel*, which involves the exchange of messages between two or more people, sent by analogical or digital means. Returning to the aspect of leaving a trace of one's passage, the exchange of messages between people reaffirms the assumption that mobility is not only human, but also of objects and ideas.[24]

One aspect these five forms of mobility have in common is that they belong to the category of spatial mobility. This, as the name suggests, refers to space and therefore to a mobility that involves moving from one point to another.[25]

The opposition to this category is social mobility, previously mentioned with reference to M. Moraglio. This concept does not refer to physical movements as in the previous case, but rather to ascents or descents on the social ladder, taking into account aspects such as work, economy, education, health, etc.[26]

According to this logic, therefore, it is clear that human physical movement is only one of several forms of movement, and that it is incorrect to consider it as the most important. Regarding mobility as a phenomenon exclusive to human beings is highly limiting, because although it is true that mobility concerns man, it is equally true that it does not concern only man.

[24] M. BÜSCHER/J. URRY/K. WITCHGER, *Mobile Methods*, (London:Routledge, 2011), P.5.
[25] DEMOPAEDIA, *Multilingual Demographic Dictionary*, http://en-ii.demopaedia.org/wiki/Spatial_mobility
[26] OECD, *A broken social elevator? How to Promote Social Mobility*, https://www.oecd.org/social/broken-elevator-how-to-promote-social-mobility-9789264301085-en.htm

3.1 "Mobiliscapes"

Human being, as a mobile being in absolute terms, is led by nature to make everything around him/her mobile.

This concept has been revealed and masterfully analysed by the anthropologist Arjun Appadurai, in his examination of the five "-scapes", that are part of global cultural flows.[27]

According to his thinking, the world is constantly characterised by movements of all kinds, which, because of their fluidity and irregularity, change its structure incessantly. Such phenomenon is most visible nowadays, as modern societies are strongly characterised by a globalised nature, but a thoughtful reflection allows to understand that, although in a less evident and manifest way, this process of fluctuations has always occurred in human history.

The first element identified by the anthropologist is called *Ethnoscape* and concerns the multifaceted mobility practised by human beings on a daily basis. This refers to mobility for migration, work, tourism and personal affairs, and highlights the profound flexibility of the resulting society.[28] The direct consequence of this element, or in some cases cause, relates to technological mobility, called *Technoscape*. This indicates the incessant movement of technical and technological commodities from one place to another, crossing not only geographical, but also political and economic borders.[29]

Since the economic issue is often at the heart of human mobility, it is impossible to overlook the fundamental aspect of money circulation, called *Financescape*. This "landscape" concerns the economic transitions made from one site to another, as well as the constant fluctuations in the stock market and the countless cases of financial speculation, which, due to their highly variable nature, have a deep influence on people and society in general.[30] The fourth dimension is of particular interest, because although it is intangible, it is decisive in shaping and developing society. This is *Mediascape*, which, with the incessant production of content and information distributed through different channels, predominantly moulds the human capacity to understand reality. Even in this case, the highly mobile nature of this "landscape" means that contents go beyond the boundaries of the place where it is produced, to be disseminated and enjoyed by the largest possible pool of users.[31]

The last aspect identified by A. Appadurai is called *Ideoscape* and, as a direct consequence of all the other "-scapes", makes reference to the circulation of political thoughts and ideologies of all kinds.

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[27] A. APPADURAI, *Modernity at Large: Cultural Dimensions of Globalization*, (Minneapolis: University of Minnesota Press, 1997), P.33.
[28] *Ibidem*.
[29] *Ivi*, P.34.
[30] *Ibidem*.
[31] *Ivi*, P.35.

This issue has profound repercussions, since its mobile nature enables it not to be confined to one single community, but to be welcomed on the opposite sides of the world.[32]

"Mobility, in short is vital. […] (It) composes society. One isn't just mobile with oneself or even other people. […] the world must be mobile too".[33] With these few words, geographer Peter Adey summarises in a significant way the absoluteness of mobility, and how this must be understood in its entirety, thus considering not only the human sphere, but also the surrounding environment and elements, as A. Appadurai has indicated.

In order to clearly and successfully understand the different forms of mobility, it is very worth considering the summary scheme developed by Heike Jöns, Micheal Heffernan and Peter Meusburger, in which the six main types are mentioned. These concern the mobility of: Material things (analysed by P. Bourdieu and B. Latour), People, living things in general and even robots (analysed by D. Haraway and H. Jöns), Knowledge, concepts and practices (analysed by P. Bourdieu and A. Appadurai), Imaginations and repressions (analysed by E. Said, D. Greogry and P. Bourdieu), Communication (analysed by H. Bathelt and P. Meusburger) and Virtual information (analysed by A. Appadurai and M. Castells).[34]

3.2 Malleability of mobility

P. Adey suggests that thinking about mobility leads to reflect on the transformation undergone by the context and the space where this takes place.[35] Such consideration provides the real key to grasp the intrinsic spirit of any form of mobility, i.e. the transformation it involves of everything it touches. Such change is not necessarily physical, in the sense that it is a visible mutation, but can be related to the entity's meaning, that undergoes this phenomenon, or to how this is understood and conceived. The surrounding reality that is perceived in a certain way can be exposed to an alteration in meaning and comprehension from one moment to the next, due to processes of migration, circulations of commodities, which can profoundly affect people and their lives, or introductions of revolutionary ideas that can overturn governments.

From this potpourri of different shapes of mobility, it can be realized how they are constantly intertwined with each other, generating situations of convergence and even overlap.

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[32] *Ivi*, P.36.
[33] P. ADEY, *Mobility*, (London: Routledge, 2010), P.4.
[34] H. JÖNS/ M. HEFFERNAN/ P. MEUSBURGER, "Mobilities of Knowledge: An Introduction", in H. JÖNS /P. MEUSBURGER/ M. HEFFERNAN (Eds.): *Mobilites of Knowledge* (Berlin: Springer, 2017), P.5.
[35] P. ADEY, *Mobility*, P.12.

Therefore, in order to be fully understood, they should not be divided into isolated compartments and studied in their singularity, but, on the contrary, they should be considered in relation with each other, and understood in a general framework.[36]

However, the common denominator of these examples of alteration and transformation is their intrinsic dynamic nature.

Seen from this perspective, mobility, whether spatial or social, always involves change. Depending on the importance of this change, in some cases it is even possible to speak of transformation as a direct consequence of mobility. A configuration of this kind, set up like a chain formed by three stages (mobility-change-transformation), is very reminiscent of the structure of the rite of passage, to make an anthropological reference.

Indeed, by taking the classical model of the rite of passage, developed by its greatest scholar, the ethnographer Charles-Arnold Kurr van Gennep, it can be seen that there are three phases:

Separation-transition-incorporation.[37]

So, by making an exercise of imagination, it is possible to see in this sequence the reflection of the above mentioned chain. This is a further indication of how mobility should not only be understood in spatial terms, but how its mobile nature also reveals itself in transformative processes, manifesting itself through the steps of transition and incorporation.

4. Understanding of mobility throughout history

The relationship of interdependence between mobility and the dimensions of space and time, is such that historical events have always been influenced by it. Since the 16th century, when international trade began to take on increasing importance in the Western world[38], mobility has acquired more and more controlling power over them, thus becoming not only the main condition for the development of any commercial system, but also a synonym for modernity.[39]

The introduction of advanced means and technologies, from the second half of the 19th century onwards, that allowed for fast, efficient and immediate mobility created a relentless drive towards modernity that is still going today, as highlighted by the economist Walt W. Rostow.[40]

[36] M. SHELLER/ J. URRY, "The New Mobilities Paradigm", in *Environment and Planning A* 38, P.212.
[37] BRITANNICA, *Arnold van Gennep*, https://www.britannica.com/biography/Arnold-van-Gennep
[38] T. CRESSWELL, *On the Move*, P. 12.
[39] *Ivi*, P.25.
[40] W. W. ROSTOW, "The Stages of Economic Growth" in *The Economic History Review* 12 (1), P.8.

The association, according to which mobility equals modernity, is today a key concept for many nations. For this reason, the more connected a country is and the more it allows fast and efficient mobility, the more its level of modernity will be recognised by its citizens and other countries.[41]

Such importance of investing in mobility to serve the nation has been discussed by W. W. Rostow, who, in discussing America's financial rise during the 20th century, stated that the development of mobility has enabled a significant economic increase.[42] This is therefore a point of great interest to modern societies, as this achievement is considered by many as a great sign of maturity.[43]

4.1 The guilt of being mobile

As already mentioned, the conception of mobility as a synonym for modernity was not immediate. Before the advent of international trade in the 16th century, those who had a mobile lifestyle were considered as extraordinaries. Ordinariness, in fact, was represented by stillness, in the sense of great attachment to a place, to the point of hardly ever leaving it, except in particular cases, thus conceiving mobility as an unusual event. Stability was a zone outside of which one should not step, on pain of having been considered as a person living on the margins of society.[44]

Among the most affected by this social stigma in feudal Europe due to their mobile lives were shepherds, nomads, gypsies, homeless people, runaway slaves[45] and Jews.[46]

Today, however, after five centuries since the first breakthrough in the conception of mobility as an extraordinary phenomenon, this concept has not only become more accepted, but has opened up like a fan, encompassing a wide range of practices, which change depending on who is performing them and in what context.

In this regard, the anthropologist Noel B. Salazar identifies different "movers", like: Workers, students, families, migrants, refugees, pilgrims, missionaries, diplomats, soldiers, researchers, artists, athletes, tourists, and of course all those who are employed in the field of transportation.[47]

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[41] M. AGUIAR/C. MATHIESON/L. PEARCE. *Mobilities, Literature, Culture* ((London: Palgrave Macmillan, 2019), P. 10.
[42] W. W. ROSTOW, *The Stages of Economic Growth*, P.11.
[43] A. GIUNTINI/ C. PAVESE, *Reti, Mobilità, Trasporti- Il sistema italiano traprospettiva storica e innovazione* (Milano: FrancoAngeli, 2004), P. 11.
[44] T. CRESSWELL, *On the Move*, P. 6.
[45] *Ivi*, P.17.
[46] *Ivi*, P.11.
[47] N. B. SALAZAR. "Theorizing mobility through concepts and figures", in *Tempo Social* 30 (2), P.154.

Reasonably, every person who decides to undertake a more or less extensive mobility activity is influenced by various reasons, which are the result of his/her own social, cultural, political and economic situation. With regard to this, T. Cresswell addresses the question "Why does a person or thing move?"[48], highlighting a fundamental issue regarding mobility. Is the starting point of any form of mobility the result of the individual freedom of those who practice it, or is it a condition to which those who move are forced to submit?

With this query in mind, one automatically questions the validity of the definition provided by the *Cambridge Dictionary*, presented at the very beginning of this work. Is mobility really "The ability to move freely"[49], assuming that it is an action voluntarily taken by the person who practices it, without any interference from the outside? And if there were third parties involved in the mobility of a person, would this action really "easily" happen?[50]

5. Mobility and its constituent parts

The *Freedom* of action of a mover is only one of several aspects that T. Cresswell addresses with regard to mobility. As already mentioned, during any mobility process, a key aspect is the personal condition of each mover. From this, it follows that this phenomenon is experienced differently by every individual, resulting in the fact that it is given a particular meaning in accordance with each case. This is actually the experiential aspect of mobility, whereby those who practice it can live it as a moment of necessity, pleasure, or even shock.[51]

Another theme that the geographer deals with is that of *Speed*, which is not only understood as a measurable quantity, but also as a source of meaning. In fact, depending on the context, speed, more or less high, is a symbol of exclusivity, representing a privilege for those who can perform it.[52] For example, modern sports cars that can reach incredible speeds, or exclusive tours in luxury trains where the journey lasts several days.

In turn, speed depends on another concept, that of *Rhythm*, which, depending on the intensity, determines the repetition of a subject's mobility. This intensity of mobility's rhythm defines the nature of the person practising it, thus distinguishing one with a highly mobile character from one who is more rooted to a specific place.[53]

[48] T. CRESSWELL, *Towards a Politics of Mobility*, P.163.
[49] CAMBRIDGE DICTIONARY, *Mobility*.
[50] *Ibidem*.
[51] *Ivi*, P.166.
[52] T. CRESSWELL, *Towards a Politics of Mobility*, P.164.
[53] *Ivi*, P.165.

The fourth aspect is *Routing*, according to which mobility, both urban and extra urban, is delineated by specific trajectories.

With the very short phrase "Mobility is channelled"[54], T. Cresswell offers interesting food for thought on the subject of freedom of movement, as explained in the dictionary definition. If it is true that an individual is more or less free to decide where to go, it is equally true that his or her decisional autonomy is constrained by the presence of infrastructures, and their configuration. Consequently, freedom of movement depends primarily on the surrounding infrastructure, allowing or restricting mobility.

5.1 Like a black spot on a white background

The last aspect of mobility treated by the expert is the one of *Friction*. This phenomenon involves the interruption, voluntary or forced, of any movement. This point is of particular importance because it highlights the fact that any form of mobility is not perpetual, and therefore requires moments of stop. For this reason, this focus on the alternation between movement and stopping times is easily linked to the previously discussed aspects of speed and rhythm.[55]

Because of its dual character, the relationship between movement and friction is of fundamental importance for the very essence of mobility.[56] The concept of friction is linked to its highest stage, which is that of fixity. This is the opposite of mobility, which precisely because of its contrasting nature, balances and allows the full implementation and success of any mobility phenomenon. Paradoxically, immobility acts as a detonator of mobility, stimulating its action and development.[57]

This relationship of reciprocal opposition recalls the most famous cases of dualism such as "life-death", "day-night", or "good-evil". The presence of one, precisely because of its being in opposition, permits the existence of the other.

Besides the question of balance, fixity, as an immobile element, accentuates the dynamic character of any form of mobility, making its localisation and identification possible. In the same way that a black spot stands out on a white background, mobility becomes evident and intelligible when placed in relation to its opposite, immobility.

[54] *Ibidem*.
[55] *Ibidem*.
[56] M. AGUIAR/ C. MATHIESON/ L. PEARCE, *Mobilities, Literature, Culture*, P.12.
[57] P. ADEY, *Mobility*, P.21.

In this perspective of mutual dependence between mobility and immobility, the concept of place, which by definition is linked to the idea of fixity, acquires a strong mobile connotation. Place, indeed, depending on different push and pull factors, manages to connect different people, goods and ideas with each other, proving to have a highly intrinsic dynamic nature.[58]

Mobility, therefore, in order to be fully intended in its entirety, must be always contextualized and regarded with consideration of its opposite.

The next chapter is devoted to the vast field of museums and their social and educational role. In this way, it is possible to offer an introduction to the in-depth examination about technoscientific museums and science centres.

[58] M. SHELLER/ J. URRY, *The New Mobilities Paradigm*, P.214.

Chapter Two: Inside the world of museums

1. The museum today: a place where to learn and ponder

A place that symbolises culture, where invaluable artefacts of all kinds are on display, where people go to learn and where situations for discussion and debate are created. This could be a brief description of the place which from 1683, with the advent of the *Ashmolean Museum* at Oxford University[59], came to be defined as the museum open to the public. However, the definition of this place is much more extensive and articulated, especially if it is considered the one provided by the main international non-governmental organisation representing museums and their workers: the *International Council of Museums* (*ICOM*).

The Council, indeed, defines the museum as:

> "[…] a non-profit, permanent institution in the service of society and its development, open to the public, which acquires, conserves, researches, communicates and exhibits the tangible and intangible heritage of humanity and its environment for the purposes of education, study and enjoyment".[60]

This definition, apparently immediate and easy to understand, turns out to be more complex than it seems. First of all, it is stated that the museum is not just a random place, but rather a permanent institution not aimed at generating any profit. Secondly, it is said that its function is to serve society, thus favouring its development, and guaranteeing access to all, without any form of discrimination. Lastly it is understood that the museum operates on various levels, dealing with the acquisition, conservation, research, communication and exhibition of artefacts, which change according to the nature of the museum itself. These actions are all aimed at the education, study and enjoyment of visitors.

Such a definition suggests the public nature of an institution like the museum, which tends to be as close as possible to society. What is intended, here, is an environment where it is not the exhibition of artefacts of any kind that prevails -with the aim of showing the importance and majesty of the place that contains them- but rather to create a point of contact with people.

From this point of view, therefore, the museum does not perform a monologue aimed at its own praise, but, on the contrary, continuously seeks a dialogue with the visitors who enter it.[61]

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[59] ASHMOLEAN MUSEUM OXFORD, *The Story of the World's First Public Museum*, https://www.ashmolean.org/article/the-story-of-the-worlds-first-public-museum#:~:text=The%20world's%20first%20public%20museum%2C%20the%20Ashmolean%20in%20Oxford%2C%20is,Ashmolean%20Story'%20which%20opens%20today

[60] ICOM, *Statutes as amended and adopted by the Extraordinary General Assembly on 9th June 2017* (Paris, France, 2017), P.3.

[61] M. ALIVIZATOU, *Intangible Heritage and the Museum: New Perspectives on Cultural Preservation* (London: Routledge, 2012), P.17.

The museum, therefore, is formally considered as an institution, but on a practical level it should be considered as a container, inside which objects are kept at the service of society, which is the main user.

The dialogue with visitors serves the communication of particular information, which varies according to the nature of the museum itself, being the basis of any form of cultural enrichment.[62] However, the transfer of knowledge from the institution to the audience is not without consequences. The main one is that visitors ask questions not only about the exhibition they see, but also about themselves and society in general:

> "Museums all over the world (are) challenged to explain where we come from and our place in nature; to explore who we are, and how we can develop a shared future; to examine changes from inequality to equality in human history and our present relations; and to illuminate where and why human conduct failed or changed positively over time".[63]

From here it becomes clear the profound educational significance of the museum itself, which is most evident when it is able to stimulate reflection on the part of the visitor.

Such a phenomenon is a direct consequence of the way of understanding the museum as an institution, which, in order to be comprehended in its entirety and complexity, must be considered not only as a container of objects -ready to be exhibited in front of an audience- but also as a holder of cultural, social and even civic meanings and functions. The meanings and functions in question have been known for several decades. One example is their identification by the *Reinwardt Academie* of Amsterdam already in the 1980s, according to which the main objectives of a museum are preservation, research and communication.[64]

Objects -of whatever type- can either be used, according to their nature and function, or owned and displayed as in the case of museums.[65] The phenomenon of possession by a museum is defined by some as a form of "violence" towards the object, due to the fact that there is a situation of detachment and removal of the object from its original context.[66] Such a process of uprooting the object from its context implies a distortion of its original meaning.

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[62] H.M. HINZ, "ICOM Turns 70: Ethics and the value creation role of museums", in L. M. BERNICE (Ed.): *Museums, Ethics and Cultural Heritage* (London: Routledge, 2016), P.3.
[63] *Ivi*, P.5.
[64] A. DESVALLÉES/ F. MAIRESSE, *Key Concepts of Museology* (Malakoff: Armand Colin, 2010), P.20.
[65] J. ELSNER/ R. CARDINAL, *The Cultures of Collecting* (London: Reaktion Books, 1994),
P. 8.
[66] M. DEZZI BARDESCHI. . "Il museo siamo noi", in *Spazi Espositivi Contemporanei- Dal Museo alla Città* 12, P. 41.

Consequently, when the object is placed into a museum collection, it acquires a new meaning and loses almost entirely its own. Therefore, objects that lose their original meaning in favour of a new one -in relation to the collection they are intended for- are called *semiophors*.[67] The alteration of the object's meaning highlights the many faces of the museum: while on the one hand this preserves, cares for, studies and displays an item, on the other hand it places it in a diverse context from its origin, giving it a different meaning and providing visitors with new interpretations, which sometimes go far beyond its true significance.[68]

For its part, the communication function, which in practice is the most visible of all -considering that it is the basis of the interaction between museum and society- includes the concepts of education and exhibition; the apparently most well-known and familiar elements of museum realities. This range of meanings related to the museum's functions can be further developed, and in a certain sense even complicated, by including under the concept of educational role, that of interpretation and communication.[69]

2. Education begets reflection

In purely practical terms, the educational aspect is aimed at the acquisition of new notions by visitors. Based on this, a reflection is hoped for, from which thoughts and considerations can arise not only on the observed object, but also on oneself and one's relationship with the surrounding reality.

The museum's boundary that runs between its understanding as a container and display of objects on the one hand, and a place of learning and reflection on the other, is very blurred. The risk, therefore, is that its main message is misunderstood and this would have consequences not only for the institution itself, but also for the visitor's experience.

If the museum is not able to bring out its intrinsic nature, characterised by a relational and historical character, related to its identity, then it is defined as a *non-place*, to use the famous concept coined by the anthropologist Marc Augé.[70] According to his thought, this dimension entails that those who inhabit it are indistinguishable from each other, as victims of a shared identity, because there are no references to grab on, which could enable them to develop their own.[71] In this condition, therefore, there are no prerequisites for the formation of individual identities, as the surrounding environment proves to have an effect of standardisation and homologation.[72]

[67] K. POMIAN. "Relics, Collections and Memory", in *Acta Poloniae Historica* 119, P. 15.
[68] *Ivi*, P.16.
[69] E. HOOPER-GREENHILL, *The Educational Role of the Museum* (London: Routledge, 1999), P. 3.
[70] M. AUGÉ. *Non-Places: Introduction to an Anthropology of Supermodernity* (London: Verso, 1995), P.77.
[71] *Ivi*, P.101.
[72] *Ivi*, P.103.

Keeping this thought in mind, therefore, it is understandable what are the possible developments that a reality like the museum, where hundreds of individuals gather, can undergo, in the event that this is not able to arouse visitors' spirits, with its educational offers and programs.

As a consequence, in order to be successful, the didactic activity has to take into account several aspects, including the reasons why visitors go to a museum, their level of knowledge of the exhibits, and the extent to which they are willing to pay attention to what they see. It is thus clear that the museum is supposed to stimulate the interest, curiosity and attention of visitors, giving rise to intense conversations and the proposal of didactic experiences designed and edited in detail.[73]

First of all, to ensure that this process of dialogue with an educational purpose between museum and visitor is successful, it is necessary for the institution to take into account the different motivations that lead a person to spend time viewing an exhibited object. The reasons may vary:

> "Most of the […] research assumes that a major objective visitors have when visiting a museum is to learn something. However, it is becoming abundantly clear that a large percentage of visitors are there to 'kill time', to be entertained, to satisfy curiosity, or to 'people watch' ".[74]

This declaration makes clear the wide panorama of visitors to museums, shedding light on the fact that talking about "general public" is wrong and how this term should be replaced by the term "differentiated audience".[75] On this basis, it is appropriate for the museum institution to consider the variety of interpretations that visitors may have about what they see, and how their perception and understanding of facts are deeply influenced by their social and cultural environment.[76] In this regard, during an interview with the Director of Education and the Centre for Research in Informal Education (*CREI*) of the *Leonardo da Vinci* Museum in Milan, Maria Xanthoudaki, the answer to the question "What competences should a museum educator be familiar with?" was:

> "[…] the main competences are those that allow the creation of a learning context that puts visitors at the centre of the experience. Such competences should facilitate the visitors' process for the development of new knowledge and making of a personal meaning of the museum experience".[77]

[73] L.U. TRAN/ P. GUPTA/ D. BADER.,"Redefining Professional Learning for Museum Education", in *The Journal of Museum Education* 44 (2), P.136.
[74] J.J. KORAN/ M.L. KORAN, "A Proposed Framework for Exploring Museum Education Research", in *The Journal of Museum Education* 11 (1), P.12.
[75] E. HOOPER-GREENHILL, *The Educational Role of the Museum*, P.5.
[76] *Ivi*, P.11.
[77] L. MERY, *Interview with Maria Xanthoudaki*, 28.02.2022, Audio, 23:35.

Some relevant factors are the age, lifestyle, interests and even the possibility of eventuality of visitors. Each visitor, whether young, adult, with family or with special needs, comes to the museum with particular interests, expectations and wishes.[78]

The consideration of these aspects, as obvious as determining the success of a museum, is then reflected on the development and creation of particular exhibitions: "The development of exhibition needs to take account of both what people want to know, would be interested in, and how they can […] learn".[79] Even if the acquisition of new information is one of the main museum's aims, a distinction must be made between learning and understanding. Although similar, these two activities are very different.

While learning means to increase knowledge, and thus to add a new piece of information to the memory, understanding means to capture the meaning and essence of a concept and to be able to create a series of mental connections with other ideas. The result is therefore a one-way situation, in the sense that if it is possible to know something without comprehending it, it is impossible to understand something without knowing it.[80]

3. Dissemination and didactic of heritage

In the context of heritage display, where the museum is seen as the centre par excellence[81], a distinction should be made between the process of dissemination and the one of didactic of heritage. The main difference between these two activities lies in the context in which they are performed. While dissemination of heritage is said to arise in non-formal educational settings, i.e. in a touristic or leisure context, didactic of heritage takes place in formal educational settings, complementing knowledge previously learned in a teaching context, such as school or academy.[82]

This difference, although apparently subtle, is actually very significant. M. Xanthoudaki considers it so important that she says she does not want to use the word "didactics" when talking about museums. For the Director of Education this word belongs to the school environment, where an instruction is given. The museum, on the contrary, is not such a place, and nor does it want to be.

[78] M. XANTHOUDAKI, "Un luogo per scoprire: il museo, strumento per l'educazione scientifica", in M. XANTHOUDAKI (Ed.): *Un luogo per scoprire: Insegnare scienza e tecnologia con i musei* (SMEC, 2003), P.9.
[79] E. HOOPER-GREENHILL, *The Educational Role of the Museum*, P.19.
[80] R. MILES/ A. TOUT, "Exhibitions and the public understanding of science", in J. DURANT (Ed.): *Museums and the public understanding of science* (London: Science Museum, 1992), P.27.
[81] M. J. MARTÍN CÁCERES, *La educación y la comunicación patrimonial: una mirada desde el Museo de Huelva* (Universidad de Huelva, 2012), P.78.
[82] *Ivi*, P.107.

Museum education, this is the most appropriate term, wants to be linked to the idea of experience and freedom, where visitors decide which object or exhibition they are interested in and where nobody is evaluated, as happens in educational or training institutions.[83]

Apart from the different settings in which they are embedded, these two forms do share the same way of transposing the specialist expertise about an object in a practical way, through the creation of museum exhibitions, in order to promote the visitor's learning and acquisition of new information.[84]

Under this perspective, the museum exhibition can be understood as an arena, where different actors interact with each other, through the use of particular messages and codes, within a specific context. The actors in question are the emitters and the receivers.

They are respectively represented by the heritage operator, who may be a museum director, a curator, a guide or any other figure related to the education, and the visitor, who is categorised as "initiated public", that is one who has a certain knowledge of the exhibited topics, or, on the contrary, as "uninitiated public", who is totally, or almost, unaware of the meaning and content of what is on display. The message that is sent by the emitter to the receiver refers to the exhibited object and the code it contains is the way in which it is presented to the public, either formally or informally. Finally, there is the context, which is the communication space where this interaction takes place, represented by the exhibition and which relates the original context of the object to the current reality in which it is located.[85]

The visitor, on a voluntary basis -i.e. belonging to the non-formal education group- has the freedom to choose which exhibition to visit, according to his or her own interests, as well as to decide whether to participate in the proposed activities or to leave without being entertained.[86]

Therefore, while for visitors the acquisition of information about the heritage on display means an increase in their own knowledge, for museums the transmission of such information satisfies the need and desire to promote knowledge of all those objects, phenomena or events that -directly or indirectly- contributed to the formation of present-day societies.[87]

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[83] L. MERY, *Interview with Maria Xanthoudaki*.

[84] I. MATTOZZI, "Il museo nel curricolo di storia: una questione di trasposizione didattica", in *Educar em Revista* 58, P. 75.

[85] M. J. MARTÍN CÁCERES, *La educación y la comunicación patrimonial*, P.115.

[86] *Ivi*, P.28.

[87] J. ESTEPA-GIMÉNEZ/ R. JIMENEZ PEREZ/ A.M. WAMBA AGUADO, *Fundamentos para una enseñanza y difusión del patrimonio desde una perspectiva integradora de las ciencias sociales y experimentales*, https://www.researchgate.net/publication/39218220_Fundamentos_para_una_ensenanza_y_difusion_del_patrimonio_desde_una_perspectiva_integradora_de_las_ciencias_sociales_y_experimentales, P. 23.

This situation of absolute interdependence between the various constituent elements of the museum reality can be summed up by the following formulation:

"[…] *el patrimonio no es possible sin el proceso de comunicación y sin comunicación, no se puede desarrolar el proceso educativo*".[88]

The task of museum educators is developed on several levels, as they must be able to transmit new knowledge to visitors about the heritage on display, keeping at the same time their interest and curiosity vivid, stimulating questions and providing a pleasant didactic experience.[89]

To make this happen, the museum should consider its approach to the public as if it were an economic one, where interactions are directed by the concepts of supply and demand.

Hence, the museum, even before dealing with how to explain and illustrate certain topics to visitors, has to understand what the public is looking for and what it wants to know.[90]

The biggest challenge that museums face is the need to constantly keep up with current events. This is expressed in the necessity to continuously develop new educational approaches that take into account the current state of affairs, favouring innovative learning opportunities, mainly based on exploration, experimentation, active and reasoned participation, investigation and questioning.[91]

In this perspective, the museum aims to be a place that provides new answers to questions arising from the continuous societal changes, to imagine new possible scenarios, and to develop innovative ideas for ongoing social and cultural developments and changes.[92]

In this context, the audience to which most attention is paid is that of young people, who -because of their age- are considered not only as visitors, but also, and above all, as future citizens. For this reason, the museum is seen as a place of formation, not only cultural, but also personal, because here people have the opportunity to question themselves and the surrounding reality.[93]

If one wants to draw a parallel with the classical world, one could compare this situation with that of the *gymnasium* in Ancient Greece.[94]

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[88] *Ivi*, P.113.- "The heritage is not possible without the communication process and without communication, the educational process cannot be developed".- Translated by L. MERY.

[89] E.W. TAYLOR/ A.C. NEILL, "Museum Education: A Nonformal Education Perspective", in *The Journal of Museum Education* 33, P.27.

[90] A. BARRY, "On interactivity: Consumers, citizens, and culture", in MACDONALD, Sharon (Ed.): *The Politics of Display: Museums, science, culture* (London: Routledge, 1997), P.85.

[91] M. XANTHOUDAKI*, I servizi educativi danno l'anima ai musei. L'educazione nel Museo Nazionale della Scienza e della Tecnologia "Leonardo da Vinci": 60 anni al servizio dell'apprendimento*. Museo Nazionale della Scienza e della Tecnologia "Leonardo da Vinci", P. 4.

[92] *Ivi*, P.6.

[93] M. XANTHOUDAKI, *Un luogo per scoprire*, P. 10.

[94] BRITANNICA, *Gymnasium*, https://www.britannica.com/technology/gymnasium-sports

In the same way that in these places young people learned not only discipline, but also important notions about the surrounding reality, deeply reflecting on themselves -through the practice of physical exercises-, museums too -through the practice of mental exercises, based on dialogue, discovery and experimentation- allow visitors to better understand themselves.

In this respect, M. Xanthoudaki, when asked "In museums of science and technology, like this one, when is the museum satisfied with its work in education?" answered that the greatest satisfaction of the museum comes from its ability to spark thought and reflection in the visitors, who, after the visit, takes time to reflect on what they have seen, felt and understood.[95]

[95] L. MERY, *Interview with Maria Xanthoudaki*.

Chapter Three: *STS* and the institutions that represent them

1. *STS* and the strong entanglement with reality

So far the notion of museum has been explained. Now it is opportune to explore the so-called *STS* and their history. A close reading of its complexity and variety is essential to comprehend properly what a science and technology museum is.

STS is the acronym for *Science & Technology Studies* and a clear and interesting definition of it is provided by the philosophy professor Sergio Sismondo:

> "Science & Technology Studies (STS) is a dynamic interdisciplinary field […], (which is the) result of the intersection of work by sociologists, historians, philosophers, anthropologists, and others studying the processes and outcomes of science, including medical science, and technology. Because it is interdisciplinary, the field is extraordinarily diverse and innovative in its approaches. Because it examines science and technology, its findings and debates have repercussions for almost every understanding of the modern world".[96]

Through this clarification, it can be realized how this discipline is concerned with the study of both internal and external mechanisms of the scientific and technological world, trying to maintain an approach as heterogeneous as possible.

Such a view is therefore concerned with the study of the processes behind the production of scientific and technological knowledge, questioning also the position of scientists and engineers towards the material world.[97] S. Sismondo writes that *STS* begin with scientific knowledge and then widen to include objects, materials, methodologies, observations, narratives, cultures, classifications and institutional structures.[98]

The analysis of the experts' position is not only limited to their thoughts and theories in relation to technoscience, but also includes the consideration of the role played by the instruments used for this purpose. "Technoscience" is the term used by *STS* to refer to both science and technology, as the boundaries between them are particularly fluid.[99]

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[96] S. SISMONDO, *An Introduction to Science and Technology Studies* (Hoboken: Blackwell Publishing Ltd, 2010), P.VII.

[97] *Ivi*, P.11.

[98] S. SISMONDO, *Science and Technology Studies and an Engaged Program*, https://www.researchgate.net/publication/261948467_Science_and_Technology_Studies_and_an_Engaged_Program, P. 13.

[99] N.A. VAN HOUSE, "Science and Technology Studies and Information Studies", in *Information Science and Technology* 38 (1), P.4.

These studies pay also attention to the material tools employed for the examination and manipulation of science and technology, thus highlighting the need to look at them in a deep and conscious way, in order to understand the social world in its entirety. So, *STS* are not only concerned with analysing the vast reality of science and technology, but also with the relevance of the equipment used for its study and working.[100]

The main concern of scientific and technological discoveries and inventions is twofold.

On the one hand, it is important that they fit well -both functionally and socially- into the context in which they are created and presented, being positively received by people. On the other hand, it is essential that their acceptance is followed by their validation and subsequent use, thus enabling the technoscience's success.[101] Indeed, it is of great importance to bear in mind that technoscientific practices must adapt to the social reality in which they are found, but that they are also capable of modifying it.[102]

The aim of the community of scholars of this study is to find out what the results of science and technology are and how they affect -positively or negatively- people and their lives.[103]

From this follows a situation of dialogue between the technoscientific reality and scholars in the *STS* area, where the latter incessantly try to grasp its innermost essence and to make it knowable to people.

The process of sharing knowledge about technoscientific innovations and discoveries is particularly complex. This is due to the fact that the institutions involved in this task always have to carefully filter and select the information they want to communicate to the public.

Whilst it is certain that innovations in this area have led to significant positive developments and benefits, it is equally true that the same tools can also be used for destructive purposes. Such ambivalence of technoscientific resources can therefore have a profound effect on public perception, especially depending on the narrative that cultural institutions provide.[104] Consequently, in order to cope with this situation, cultural institutions, including museums, often try to avoid the "dark side" of *STS*, highlighting only their positive sides and thus increasing public admiration and astonishment for this field.[105]

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[100] A. MATTOZZI/ P. VOLONTÉ, "Artefatti e materialità", in MAGAUDDA, Paolo/ NERESINI, Federico (Eds.): *Gli studi sociali sulla scienza e la tecnologia* (Bologna: Il Mulino, 2020), P.94.

[101] S. SISMONDO, *Science and Technology Studies*, P.17.

[102] J. LAW, "STS as Method", in FELT, Ulrike/ FOUCHÉ, Rayvon, MILLER, Clark A./ SMITH-DOERR, Laurel (Eds.): *The Handbook of Science and Technology Studies* (Cambridge: The MIT Press, 2017) P. 39.

[103] U. FELT/ R. FOUCHÉ/C.A. MILLER/L. SMITH-DOERR, "Introduction to the Fourth Edition of *The Handbook of Science and Technology Studies*", in FELT, Ulrike/ FOUCHÉ, Rayvon, MILLER, Clark A./ SMITH-DOERR, Laurel (Eds.): *The Handbook of Science and Technology Studies* (Cambridge: The MIT Press, 2017), P.1.

[104] S. ARNALDI, "Politiche della ricerca e partecipazione pubblica", in MAGAUDDA, Paolo/ NERESINI, Federico (Eds.): *Gli studi sociali sulla scienza e la tecnologia* (Bologna: Il Mulino, 2020), P. 84.

[105] S. CONN, "Science Museum and the Culture Wars", in MACDONALD, Sharon (Ed.*): A Companion to Museum Studies* (Hoboken: Blackwell Publishing Ltd, 2006), P. 502.

To make a new discovery and decide deliberately not to divulge it to the rest of society entails a great deprivation of the potential of knowledge, thus anchoring it jealously for the benefit of a small circle.[106] Science and technology are two pillars of the transformation of humankind and society, whose novelties and innovations have radically changed the way of living and perceiving reality, and as such it is appropriate to share them for the good of society.[107]

In order for this sharing of knowledge to be successful, it is indispensable that it takes place in a devoted environment. Here, information about certain objects, phenomena and topics in general are disseminated and society is educated. This place is the museum and those dealing with this topic are the science and technology museums.

1.1 A history rooted in the past

Thinking about today's *ST* museums without considering its past would be like imagining the modern automobile without knowing that everything started with the wheel.

Although many experts identify the birth of this type of museum in the 19th century in Europe, there are also those who go further and indicate that already in pre-Christian times there were places with a analogous function.

Among them there was the engineer and former member of the committee for the foundation of the National Museum of Science and Technology *Leonardo da Vinci* in Milan, Orazio Curti, who recalled that already in the 3rd century BC there were places in Alexandria, where scholars and scientists met and discussed their studies and research, like during the period of Pharaoh Ptolemy II Philadelphus.[108] This tradition was further resumed in the Medici period, giving great space to the study of mathematical and natural sciences. Such historical references that go so far back in time -with regard to the birth of what is now known as "museum"- are extremely useful because they allow to understand how ancient and rich is the tradition behind this reality. The fascinating aspect of the science and technology realm is that its study and application has always been consistent with the time to which it belonged. As a result, each museum's stadium has reflected this phenomenon in its own way, bearing considerable witness to the scientific development in the several ways it was received and understood in the world.

[106] M. MAGLIACANI, *Museo della Tecnica Elettrica- Un percorso esperienziale* (Pavia: Università di Pavia, 2017), P.8.
[107] *Ivi*, P.9.
[108] O. CURTI, *Un museo per Milano. Un protagonista racconta gli anni della nascita del Museo della Scienza* (Milano: Anthelios Edizioni, 2000), P.17.

According to this interpretation, therefore, the museum in history has not only had the function of preserving and protecting objects and information as cultural heritage, but also of reflecting a certain understanding of science and technology -depending on time and place.

In this regard, throughout the development of science and technology museum, the turning point dates back to 1794, with the establishment of the *Conservatoire des Arts et Métiers* in Paris.[109] It is precisely from this historical period onwards that great attention is paid to the development of technoscientific museums -as illustrated in the following paragraphs, that are intended to lead the way on this journey through time and across the world.

1.2 An overseas success

The Parisian *Conservatoire des Arts et Métiers* was founded by Abbé Grégoire[110], financed by the French government and conceived as an educational institution, where to display machines and tools of technical derivation, as well as illustrations, in order to show how they were made and to explain for which purposes they were used.[111]

The protagonists here are the objects made by the skilful hands of scientists and craftsmen, who contributed to the achievement of important scientific and technological results. Indeed, it is worth noting that today the *Conservatoire* contains more than 80.000 original objects.[112] These artefacts came from private collections and cabinets of curiosities, and over time formed a proper museum, namely the institute in question. This was clearly a testimony of technological developments and material culture, rendering it as one of the emblems of the history of *ST* museums.

In addition to an educational function, the purpose of this place was also to promote industrial development, by showing the most significant results to all interested parties, considering them as public heritage.[113]

The Paris *Conservatoire* held the primacy in its field for thirty years, until 1824, when another relevant centre for the dissemination of knowledge about scientific instruments and technological innovations was established overseas, the *Franklin Institute* in Philadelphia.[114]

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[109] *Ivi*, P.18.
[110] D. FERRIOT, "The role of the object in technical museums: the Conservatoire National des Arts et Métiers", in J. DURANT (Ed.): *Museums and the public understanding of science* (London: Science Museum, 1992), P.79.
[111] E.S. FERGUSON, "Technical Museums and International Exhibitions", in *Technology and Culture* 6 (1), P.33.
[112] D. FERRIOT, "The role of the object in technical museums", P.79.
[113] E.S. FERGUSON, "Technical Museums and International Exhibitions", P.33.
[114] E. KOSTER, "From Apollo into the Anthropocene: The odyssey of nature and science museums in an external responsibility context", in B.L. MURPHY (Ed.): *Museums, Ethics and Cultural Heritage* (London: Routledge, 2016), P 233.

The *Franklin Institute of the State of Pennsylvania for the Promotion of the Mechanic Arts* -this is the full name- built in honour of one of America's first scientists, Benjamin Franklin, was the brainchild of Samuel Vaughan Merrick and William H. Keating. Today it is one of the largest centres for the dissemination of scientific and technical knowledge in the United States.[115]

However, despite these two important cases, there are many specialists who associate the origins of the modern technoscientific museum with a particular place and date: London, 1851.

Such spatiotemporal indications refer to the birth of world fairs, which began in the English capital in the 19th century with the *Great Exhibition of the Works of Industry of all Nations*, better known as the *Crystal Palace Exhibition*.[116] The success of this event, both in terms of innovation and public acclaim, was such that it began a movement of world fairs, from which specific museums were subsequently established.

Among the most famous cases, it is worth recalling: The London's *Science Museum* which was a direct offshoot of the *Crystal Palace Exhibition* in 1851, the *Japan's National Science Museum* in Tokyo in 1871, the *Polytechnical Museum* in Moscow in 1872[117], the *World Exhibition* in Vienna in 1873, the *Deutsches Museum von Meisterwerken der Naturwissenschaft und Technik* in Munich -better known as *Deutsches Museum*- in 1903[118], the *Norwegian Museum of Science and Technology* in Oslo in 1932, the *Henry Ford Museum* near Detroit in 1929, the *Museum of Science and Industry* in Chicago in 1933, and the *Palais de la Découverte* in Paris in 1937. Later, in the post-War period, the scenery was further expanded with the opening of the *Pacific Science Center* in Seattle -from the United States pavilion of the 1962 World Expo-, the *New York Hall of Science* -from the 1964 New York World's Fair-, the *Lawrence Hall of Science* at the University of California in 1968, the *Exploratorium* in San Franciso and the *Ontario Science Centre* in Toronto, both in 1969.[119]

This brief historical overview shows how international fairs, as direct result of the Industrial Revolution, were the starting point for the birth and development of many of the world's most important science and technology museums. The potential of these events, indeed, has been demonstrated with the creation of the museum institution.

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[115] THE FRANKLIN INSTITUTE, *Mission & History*, https://www.fi.edu/about-us/mission-history

[116] R.W. RYDELL, "World Fairs and Museums", in MACDONALD, Sharon (Ed.*): A Companion to Museum Studies* (Hoboken: Blackwell Publishing Ltd, 2006), P.135.

[117] BRITANNICA, *Polytechnical Museum*, https://www.britannica.com/topic/Polytechnical-Museum

[118] O. CURTI, *Un museo per Milano*, P.19.

[119] *Ibidem*.

This was due to their pronounced international character -devoted to the constant search for the latest innovations in the technoscientific field -which fostered a continuous exchange of ideas, opinions and suggestions between exhibitors and visitors. The creation of a permanent and definitive place -like the museum- was therefore a direct and inevitable consequence of this situation of cultural ferment and excitement at international level.

2. Objects' immobility is contrasted by their great meaning's mobility

It is generally agreed that great international fairs were the precursors of today's technoscientific museums, representing the starting point of this category. These, in turn, were deeply influenced by temporary exhibitions about technoscience and its history, organised both nationally and internationally.[120] The aim of such events was to show the latest scientific and technological innovations from all over the world to the widest possible audience. In this way, it could be provided a specific education, giving the visitors the means to keep up to date with the latest innovations, by publicising the technological advances of each nation, primarily those of the host country.[121]

This is how historian Robert R. Rydell describes international fairs, focusing on how these events served to bring the general public closer to the technological advances of the modern countries: "World fairs […] were showcases of scientific and technological innovation. […] (They) introduced mass publics to the building blocks of modern civilization."[122]

Interesting here is the term "mass publics" which, according to a pillar of museology like George Brown Goode, mainly defines the difference between fair and museum. According to him, indeed, while the museum should be understood as a medium for adult instruction, the fair, on the contrary, tries to attract as many visitors as possible, without any distinction of age.[123]

The direct interaction with a large audience represented a real showcase for these events, in which the latest technological products could be displayed and where certain social messages were conveyed.

First of all, the focus shifted from the processes to the results of production, showing visitors the finished good in all its glory.

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[120] E. CANADELLI/ M. BERETTA/ L. RONZON, "Introduction", in E. CANADELLI/ L. RONZON/ M. BERETTA (Eds.): *Behind the Exhibit- Displaying Science and Technology at World's Fairs and Museums in the Twentieth Century* (Washington: Smithsonian Institution Scholarly Press, 2019), P. VII.

[121] R. FRIEDEL, "Science and Technology in the Twentieth Century Exhibitionary Complex", in E. CANADELLI/ L. RONZON/ M. BERETTA (Eds.): *Behind the Exhibit- Displaying Science and Technology at World's Fairs and Museums in the Twentieth Century* (Washington: Smithsonian Institution Scholarly Press, 2019), P.238.

[122] R.R. RYDELL, "World Fairs and Museums", P.143.

[123] *Ivi*, P.139.

In this way, the education of the public was not so much about the research and material work behind the creation of an object, but rather about the final product as the flagship of a country's production. Moreover, the fact that many of these fairs were international meant that a single space was shared by several exhibiting nations at the same time. The principle of division by country was firstly adopted with the *Crystal Palace Exhibition*, allocating one section of the available space to each state, by dividing the pavilions and making the visit orderly and easy to go into.[124]

In such a context, where spectators had access to a space in which they could see the latest technical and scientific innovations the contents were looked at with great astonishment and admiration.

Taking advantage of the public's enthusiasm and admiration, fairs' organisers used the exhibitions as a means of mass persuasion, in order to directly link technical and scientific progress to national advancement.[125] So, in order to encourage more and more visitors, fairs began to design ad hoc management policies. These included setting low and fixed admission charges, opening late to allow the working class to come after their shift, and distributing booklets on how to enter the exhibition, referring to changing from work clothes to more formal attire.[126]

At closer look, such policies concealed political purposes, as they give the idea that the nation cares about the education of its citizens, by teaching them how to dress according to the situation. From this imparting of discipline, together with the display of technoscientific objects that highlight the advancement and progress of the nation that made them, derives a phenomenon of propaganda:

"[…] exposition authorities sought to use the power of display to convince the public of the necessary connection between scientific and technological innovation and national progress".[127]

Considering these elements and aims, it is possible to outline a scenario in which fairs first, and museums then, from places where objects of technoscientific, historical and cultural importance are displayed, can be transformed into sites where a national identity is developed and strengthened, with significant nationalistic impulses.[128]

Thus, the exhibits are not only displayed to be seen, admired, studied and desired, but also to influence people and popularise technical and scientific advances as a matter of pride for an efficient and advanced nation.[129]

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[124] T. BENNETT, "The Exhibitionary Complex", in T. BENNETT (Ed.): *The Birth of the Museum* (London: Routledge, 1995), P.94.
[125] R.R. RYDELL, "World Fairs and Museums", P.143.
[126] T. BENNETT, "The Exhibitionary Complex", P.85.
[127] R.R. RYDELL, "World Fairs and Museums", P.143.
[128] F. BARRECA, "From Instruments of Science to Instruments of History: Andrea Corsini and the Birth of the Museo Galileo", in E. CANADELLI/ L. RONZON/ M. BERETTA (Eds.): *Behind the Exhibit- Displaying Science and Technology at World's Fairs and Museums in the Twentieth Century* (Washington: Smithsonian Institution Scholarly Press, 2019), P.51.
[129] E. CANADELLI, "I musei scientifici", in C. POGLIANO/ F. CASSATA (Eds.): *Storia d'Italia. Annali 26. Scienze e cultura dell'Italia unita* (Torino: Einaudi, 2011), P.884.

On this point, anthropologist and museologist Sharon Macdonald states in the frankest terms that: "[…] science displays are never, and have never been, just representations of incontestable facts. They always involve the culturally, socially and politically saturated business of negotiation and value-judgment; and they always have cultural, social and political implications".[130]

A better understanding of this situation is provided by M. Moraglio, who suggests that science and technology, from being major fields of research aimed at making new discoveries, can become precious propaganda tools for convincing the public of the great level of technological advancement of the producing country.[131]

Considering this use of science and technology, it is therefore reasonable to think that technoscientific artifacts are strongly linked to politics and to a use of mass persuasion: "There can be little doubt, in short, that fairs sought to discipline bodies -and body politics- in industrializing nation-states".[132]

M. Moraglio, indeed, holds that objects are implicated in politics as much as politics is intrinsic to objects.[133] This thought, in order to be deeply appreciated, must not be understood as a point of arrival, but rather as a point of departure. Such a consideration is also strongly shared by S. Macdonald, who argues that despite the relentless attempts to attribute an aura of neutrality to the exhibits, this attempt is in vain because of the intrinsic spirit of the objects themselves. From the moment an object, a theory -or more generally a thought- is exposed to the public, a reaction of the latter must be taken into account. Whether it be one of agreement, appreciation, opposition or rejection, anyone confronted with an exhibit is inclined to take a position. This situation is even more pronounced if the exhibit is embedded in a defined social setting, which strongly and decisively channel the visitor's perception.[134]

It is necessary to start from the assumption that no object in itself has a political character. This connotation is only attributed to it by man, whose actions and thoughts place it in situations with a strong political significance.

As a consequence, the object, finding itself incorporated in a context characterised by a certain political inclination -depending on the context- assumes this nature, being recognised by those who use it as an emblem of a specific thought or political tendency. This circumstance is directly referable to the K. Pomian's concept, *semiophor*, discussed above.

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[130] S. MACDONALD, "Exhibitions of power and powers of exhibition: an introduction to the politics of display", in S. MACDONALD (Ed*.): The Politics of Display: Museums, science, culture* (London: Routledge, 1998), P.1.

[131] M. MORAGLIO, *Driving Modernity- Technology, Experts, Politics, and Fascist Motorways, 1922-1943* (New York: Berghahn Books, 2017), P.1.

[132] R.R. RYDELL, "World Fairs and Museums", P.143.

[133] M. MORAGLIO, *Driving Modernity*, P.2.

[134] S. MACDONALD, "Exhibitions of power and powers of exhibition: an introduction to the politics of display", in S. MACDONALD (Ed*.): The Politics of Display: Museums, science, culture* (London: Routledge, 1998), P.1.

Therefore, in order to gain a full comprehension of the object's nature, it is always required to consider the context in which it is found, that, depending on the political, economic and social context can radically change, but without altering its form.[135]

For example, the forerunner of the technoscientific museums, the *Great Exhibition*, was officially designed to foster British industrial production, so that it could compete with other world nations.[136] This willingness to attach political significance to the exhibitions is, in turn, dictated by the historical period of the time. Indeed, depending on each historical period, exhibitions provide information about their era, as well as the community they are aimed at, thus conveying certain interpretations of objects and messages.[137]

In such an environment, the divulgation of technoscientific knowledge does not only serve to show the contribution that the exhibits had throughout history in the formation of societies and how the lives of their citizens have been affected, but also to corroborate nationalistic or patriotic feelings.[138]

2.1 The difficulty of speaking clearly

Over the years -with the advent of new technologies- the reproductions of tools, machines and objects that have contributed to history, have been often replaced by interactive displays with audio-visual content, computers, and animated screens. The reason for this change was dictated not only by the need to stay up-to-date with the times, especially if it concerns technoscientific museums, whose cornerstone is represented by modernity and development, but also by visitors' interest and willingness to be actively involved in educational experiences.[139] These offer a high level of interaction and as such they entail that visitors do enjoy the museum's activities by being intellectually and physically stimulated.[140]

This change should not, however, never lose sight of the educational aspect, which technoscientific museums try to keep alive. To pursue this goal, it is advisable that museums do follow some relevant indications: to use a clear language, in order to not confuse the visitors and allow them to learn without difficulty, to do not make them living a situation of passivity, and to do not overload them with a large amount of information.[141]

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[135] L. WINNER, "Do Artifacts Have Politics?", in *Daedalus* 109 (1), P.122.
[136] E.S. FERGUSON, "Technical Museums and International Exhibitions", P.36.
[137] E. CANADELLI, "I musei scientifici", P.867.
[138] E.W. TAYLOR/ A.C. NEILL, "Museum Education: A Nonformal Education Perspective", P.20.
[139] J. DE ROSNAY, "Intellectual ergonomics and mutlimedia exhibitions", in J. DURANT (Ed.): *Museums and the public understanding of science* (London: Science Museum, 1992), P.23.
[140] *Ivi*, P.24.
[141] *Ivi*, P.25.

The importance of underlining the difference between learning and understanding is strongly linked to one of the most famous educational techniques of all time; that of Richard Feynman.

The 1965 Nobel Prize-winning physicist, known as the "Great Explainer", because of his clarity in explaining complex theories, developed a learning method based on three steps. The main objective of this technique is to learn how to explain difficult concepts in the easiest way possible. [142]

This is done by: 1) using simple terms that even a child could understand, 2) filling in the gaps concerning the concept to be explained, so as to have full mastery of the topic, 3) further simplifying the language and making connections with other subjects to facilitate the comprehension.[143]

In terms of interaction with visitors, the greatest challenge of cultural institutions, like those involved in the technoscientific dissemination, is the transfer of comprehensible information on complex topics.

Therefore, in order for this educational process to be successful, it is necessary that experts develop their exhibitions not with themselves or their colleagues as reference, but rather with the public in mind, i.e. the visitors[144], keeping in mind, more or less accurately, the model of R. Feynman.

3. Science centres: where active learning takes place

Before concentrating on some real examples of *ST* museums, it is appropriate to devote some space to another type of objects exhibition, which began to develop from the second half of the 20th century: the science centres.

These are places intended for the dissemination of scientific and technological knowledge, characterised by a particular form of education and interaction with the public, very different from the one adopted by museums.

Starting from the assumption that the surrounding reality is radically influenced and conditioned by science[145], science centres take on the role of providing the necessary tools to understand it, striving to reach the widest possible audience.[146]

The main purpose of these places is to provide an education, which visitors are encouraged to take part in, by offering many different types of learning experience.[147] Like in the case of museums, this form of knowledge dissemination is not frontal as in a school or university, but rather non-formal, as previously highlighted with M. Xanthoudaki.

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[142] E. P. REYES/ R.M.F.L. BLANCO/ D.R.L. DOROON/ J.L.B. LIMANA/ A.M.A. TORCENDE, "Feynman Technique as a Heutagogical Learning Strategy for Independent and Remote Learning", in *Recoletos Multidisciplinary Research Journal* (December), P.2.

[143] *Ivi*, P.4.

[144] R. MILES/ A. TOUT. *Exhibitions and the public understanding of science*. P. 30.

[145] A. MINTZ. *Science, society and science centre*. P. 271.

[146] *Ivi*, P. 272.

[147] *Ivi*, P. 277.

At this point it is required to clarify the distinction between science centres and museums. They differ a lot in the way they understand their educational approaches and how they relate to the public.

In science centres, visitors are offered a more or less wide range of activities in which they actively participate. The aim of these places is to promote a proactive education, where people are invited to participate in experiments, exercises and workshops, discovering in this way the exciting and fascinating sides of science and technology.[148] Following the *Learn by doing* approach[149], the acquisition of new knowledge by visitors in these centres has an experiential and participatory character[150]:

"An important aim of STCs (Science and Technology Centers) is, […] that visitors will encounter hands-on, interactive exhibits and first-hand experiences with scientific phenomena".[151]

Through a clever management of technoscientific knowledge, presented to the public in an interactive and entertaining way, science centres do offer a unique educational opportunity.[152] However, this task is not without difficulties.

The learning of science is often rejected and kept at a distance by people, as it is considered difficult to understand, complex and even somewhat intimidating.[153]

Due to certain stereotypes, the situation for those who study and represent science, namely scientists, is not easy at all. These are often described as introverted people, who find it difficult to interact with others, shutting themselves away in their own world of research and experiments, and with an unattractive appearance that is often juxtaposed with the stereotypical figure of the mad scientist.[154]

This is mainly due to the dissemination of inaccurate and misleading messages by the media, which -with their great persuasive power- manage to inculcate in the collective imagination images and thoughts that are not always true, as in this case.[155]

In the face of this situation, therefore, the effort made by science centres to attract the attention and involve all those who are hesitant is great.

This commitment, however, remains high even with those who do not show any scepticism and claim to be interested in the subject. Indeed, the fact of manifesting concern for a topic is not the same as being well informed about it.[156]

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[148] S. TOUZA. *The Science Centre Movement*. P. 13.
[149] B.C. BRUCE/ N. BLOCH. *Learning by Doing*.
[150] J. W. GENTRY. *What is Experiential Learning?* P. 20.
[151] E. DAVIDSSON. *Investigating Visitor's Learning*. P. 33.
[152] S. TOUZA. *The Science Centre Movement*. P. 13.
[153] *Ibidem*.
[154] *Ivi*, 270.
[155] B. FIELDS. *Impact on Public Perceptions*. P. 3.
[156] A. MINTZ. *Science, society and science centre*. P. 268.

Therefore, because of the obstacles related to the conception of science and scientists, science centres are not always immediately successful in terms of popular attention. In order to cope with this issue, many of these institutions have begun to include objects related to the world of art, knowing that this sector always generates great curiosity and interest.[157] Among the various centres that include art, many do not only provide a space for it, but also integrate and approach it with science and technology, in order to enable new insights from a different perspective.[158]

Amidst the most important science centres it is due to mention the *Ontario Science Centre* and the *Exploratorium* in San Francisco, both opened in 1969.[159] In these two sites -which are considered as the forerunners of science centres- the conception of visitors changed significantly. These started being conceived no longer as a mere spectators, but rather as active participants.[160]

In a nutshell, science centres are places of learning through practical demonstrations, experiences and workshops. Here, what matters are not so much the objects or the phenomena per se, but rather the participation to particular activities, through which visitors can fully grasp new information.

Again, this is the aspect in which these centres and museums differ most; the approach and educational experience.

4. Differences and similarities between *ST* museums and science centres

Generally speaking, in museums the importance of the object on display is paramount, while the attention devoted to participatory activities directed at the public is much less, if not non-existent, unlike in the science centres.

With regard to the relevance of the object, one criterion that is highly esteemed is the one of originality, which is believed to define its cultural and educational value.[161]. A further aspect to be considered is the uniqueness, because the fact of being non-reproducible gives additional significance to the object.[162] Considering this information, it becomes well comprehensible the difference between a museum and a science centre, where the latter often hosts copies and replicas of the originals, thus losing its esteem in the eyes of some experts.[163]

However, the belief that the feature of originality gives more relevance and credibility to an object than a copy, is not shared by many, who claim that there are no obvious reasons for talking about an alleged educational superiority of the original over its opposite.

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[157] A. MINTZ. *Science, society and science centre*. P. 273.
[158] *Ivi*, P. 276.
[159] S. TOUZA. *The Science Centre Movement*. P. 1.
[160] A. BARRY. *On interactivity: Consumers, citizens and culture*. P. 88.
[161] C. HAMPP/ S. SCHWAN. *The Role of Authentic Objects in Museums*. P. 162.
[162] *Ivi*, P. 163.
[163] *Ivi*, P. 162.

As the original and the copy are often very similar -usually only experienced eyes do notice some differences- what really marks the difference between them is the explicative caption that accompanies the object.

The idea of copying branches out into different categories, all of which have their own particularities. For example, models used to facilitate the understanding of complex concepts in technoscientific museums are called "experimental models", while those for knowledge communication are called "demonstration models".[164]

Other types of models used in this museum category are "illustrative models", "didactic models" and those replacing the originals. The first type of model refers to small-scale reproductions, made in three dimensions, which are primarily intended for the general public. The second category is more specific, as it shows the structure or operation of a mechanism. Again, the aim is to facilitate the understanding of concepts of a certain difficulty. The last category is concerned with the total replacement of the original, rather than with its complement as in the other cases, since the latter is impossible to display. The causes of this impossibility can be various, such as the unavailability of the object, lack of space or excessive purchase costs.[165]

So, the acquisition of particular knowledge about an object is not so much due to the object per se, but rather to the way it is conveyed. As was pointed out previously -with regard to the political impact of exhibitions- here too it is not the object that speaks for itself, but rather the context that makes it speaking in one way rather than another.[166]

Nonetheless, one aspect common to *ST* museums and science centres is that they are both geographically transversal. With the incessant circulation of information, objects and people, both of them are integrated in an international network, where local needs are addressed on a global scale.[167] This panorama allows the members of such cultural institutions to cooperate internationally, exchanging views, ideas and lending various objects to each other.[168]

Such a situation of interconnectedness is directly linked to the concept of "glocalisation", popularised by the sociologist Roland Robertson.

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[164] O. PETRIK. *Models in museums of science and technology*. P. 237.
[165] *Ivi*, P. 240.
[166] R. MILES/ A. TOUT, "Exhibitions and the public understanding of science", P.27.
[167] S. TOUZA, "The Science Centre Movement: The Science of Branding and the Branding of Science", in *Journal of the Union for Democratic Communications* 18, P.5.
[168] E. CANADELLI, "Crossing the Iron Curtain. Milan's Museum of Technology and Transnational Exchanges Before and After World War II", in E. GANTNER/ H. HEIN-KIRCHER/ O. HOCHADEL (Eds.): *Interurban Knowledge Exchange in Southern and Eastern Europe. 1870-1950* (London: Routledge, 2020), P.263.

According to this notion, there is a convergence of local and global levels that results from the need to adapt to and be inspired by global models while maintaining a focus on the local level.[169]
Such a phenomenon -to refer to the already discussed topic of mobility- might also be encapsulated in a framework that might be called "cultural mobility". In this case, indeed, the cultural sphere turns out to be not only the driving force behind great movements of people, objects and ideas, but also the point of arrival that is constantly being sought and desired.

4.1 London crosses new frontiers

As can be inferred up to this point, the position of England -especially London- has played a decisive role in the world-wide scene regarding the evolution of technoscientific museums. The international *Crystal Palace Exhibition* was not a one-off event, but rather the trigger for a long process that inspired and gave rise to various institutes around the world, aimed at the dissemination of technical and scientific knowledge. The most striking example of the influence of this event was the creation of the *South Kensington Museum*, located in the homonymous London borough.
With part of the profits coming from the highly successful *Great Exhibition*, it was decided -at the behest of its patron, His Royal Highness Prince Albert- to retain some of the exhibits, purchase new ones and display them permanently for educational purposes.[170] The site chosen for this operation was South Kensington, that extended from Kensington Gore to Brompton, where a building was purposely constructed to house the objects, which were moved there in 1856. Officially opened in 1857, this place contained not only scientific and technological objects, but also collections of art, food education, animal products and architecture. All this took place under the strict supervision of Queen Victoria.[171]
The special technological nature of this place was not only evident inside, with the presence of objects that were very advanced for the time, but also outside. The structure was entirely made of iron and covered with the same material; for this reason, due to its unattractive shape, it was renamed by many as "The Brompton Boilers".[172]
An emblematic date for the *South Kensington Museum* was 1876, when the exhibition 'The Special Loan Collection of Scientific Instruments" was held. On this occasion many important scientific instruments, that enabled the most significant advances in scientific technology, were collected from all over the world and displayed to the public.[173]

[169] J. BLATTER, *Glocalization*, 2022, https://www.britannica.com/topic/glocalization.
[170] F. GREENWAY, *A short history of the Science Museum* (London: His Majesty's Stationery Office, 1951), P.3.
[171] *Ivi*, P.4.
[172] SCIENCE MUSEUM, *A Brief History of the Science Museum*, https://www.sciencemuseum.org.uk/about-us, P.1.
[173] *Ivi*, P.2.

For the first time, people could admire the tools used by the great scientists, arranged in a systematic and didactic manner, so that they could understand the processes behind the great discoveries.[174]

Fig. 1A. VICTORIA AND ALBERT MUSEUM. "*Brompton Boilers*".[175]

During the 1880s, the Museum grew not only in the number of objects it contained, but also in importance, assuming a form similar to that of a national science museum. This was also made possible by the opening of the internal library accessible to the public.

At the end of the 19th century, the Museum underwent a further development with the extension of the building, thus allowing a clear division between the artistic and the technoscientific collections. Again, the work was supervised by Queen Victoria, who, at the time of the opening in 1909, demanded that the new museum be called the *Victoria and Albert Museum*.[176] The same year occurred the separation of the science and engineering collections from the *South Kensington Museum* -now the *Victoria and Albert Museum*- which officially gave rise to what became known as the *Science Museum*.[177]

Over the years, the Museum continued to develop and expand, withstanding even the First World War without great damages.

[174] F. GREENWAY, *A short history of the Science Museum*, P.8.
[175] VICTORIA AND ALBERT MUSEUM, *South Kensington Museum, remains of the "Brompton Boilers"*, 1897, Photograph. https://collections.vam.ac.uk/item/O1055812/south-kensington-museum-remains-of-photograph-department-of-science/
[176] F. GREENWAY, *A short history of the Science Museum*, P.9.
[177] SCIENCE MUSEUM, *A Brief History of the Science Museum*, P.3.

However, the Second Conflict was a major obstacle, as it forced the Institution to close. For this reason, from June 1940 until the end of the War, the Museum remained closed, as England was constantly bombed.[178]

Despite the dramatic period, the Museum was lucky because it was one of the least affected in the country. Moreover, this circumstance forced it to develop and introduce measures for the protection of its artefacts.[179]

In this scenario, therefore, the Museum moved part of its collections to sheltered locations, safe from enemy incursions, moving from an amateur to a professional approach by developing for the first time in its history a procedure to protect, preserve and monitor the objects. Until then, the Museum had no records documenting the objects it contained. Therefore, if any calamity had occurred, like a fire, not only would the objects have been lost, but the cultural and economic damage could not even be estimated.[180]

With the end of the War and its reopening in February 1946, the Museum acquired a vast amount of War material for study and display, and continued to be a landmark in the international panorama of technoscientific museums.[181] Today the Museum boasts one of the world's finest and most valuable scientific and technological collections, with an inventory of more than a quarter of a million objects spanning several periods from all over the world.[182]

Thanks to its prominence, the *Science Museum* is today one of the most important institutions on the international scene, forming a highly cooperative, competitive and active scientific community.[183]

An interesting extension of the museological branch described above is the transport museum.

In the same city of the *Science Museum* -London- there is also one of the most important institutions in Europe dealing with the history of transport; the *London Transport Museum*.

This institution originated in the 1920s, when the *London General Omnibus Company* decided to conserve two Victorian horse buses and one of the earliest motorbuses in order to show them to the next generations. Over the years, the collection grew in volume and the increasing number of objects were first stored in an old bus depot in Clapham in the 1960s and then moved to Syon Park, in West London, in the 1970s.

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[178] T. PARSONS III, "The Science Museum and the Second World War", in P.J.T. MORRIS (Ed.): *Science for the Nation- Perspectives on the History of the Science Museum* (London: Palgrave Macmillan, 2010), P.71.
[179] *Ivi*, P.72.
[180] *Ivi*, P.74.
[181] *Ivi*, P.76.
[182] R. BUD, "Collecting for the Science Museum: Constructing the Collections, the Culture and the Institution", in P.J.T. MORRIS (Ed.): *Science for the Nation- Perspectives on the History of the Science Museum* (London: Palgrave Macmillan, 2010), P.250.
[183] T. SCHEINFELDT, "The International Context and the Context of Internationalism", in P.J.T. MORRIS (Ed.): *Science for the Nation- Perspectives on the History of the Science Museum* (London: Palgrave Macmillan, 2010), P.309.

The collection was moved definitely one last time in the 1980s at the Covent Garden location. Here was born what is now known as the *London Transport Museum*.

The structure in which it is located is made entirely of iron and glass, strictly in the Victorian style, recalling the forms of the *Crystal Palace* of 1851. This structure was built about a century earlier, in the 1870s, to house the flower market. In fact, this area of the city was London's main market place for flowers, fruit and vegetables in the 19th century. It was inaugurated in March 1980 by Her Royal Highness, Prince Anne, and has never been moved again.[184]

Fig. 1B. CULTURAL HERITAGE ONLINE. *London Transport Museum*.[185]

Over the years, the Museum has undergone a number of changes, but the most substantial came in 2007 with the rebuilding of the exhibitions. Not only did the layout change, but also the messages it transmitted and the meaning of the museum experience it offered.

With this transformation, visitors can now take a journey through the history of urban transport, following a precise chronological order.

The Institution no longer presents the different objects individually, trying to highlight certain features of each one, but draws a line that unites them all, to emphasize their contribution to the historical and social development of urban mobility in London.[186]

[184] GOOGLE ARTS & CULTURE, *Celebrating our 40th birthday*, https://artsandculture.google.com/story/NgVB5bDJJstmJQ

[185] CULTURAL HERITAGE ONLINE. *London Transport Museum*, Photograph. https://wiki-turizm.ru/uploads/countries/united-kingdom/museums/london_transport_museum.jpg

[186] B. SCHMUCKI, "New Insights, New Approaches: The London Transport Museum (Museum's review)", in *Journal of Transport History* 30 (2), P.229.

Such an approach is intended to stimulate visitors' awareness of the role of transport in society and how this has always influenced the vision and perception of the surrounding reality. This is an interesting key to interpreting the realm of transport, which instead of being considered as a stand-alone phenomenon, is understood as an essential element in the historical development of London society, which has evolved according to each period:

"Well-established techniques of interpretation place the technical development of each vehicle in the social, economic, legislative, and regulatory context of its period. Textual panels, many liberally interspersed with large photographs, accomplish this task, along with small touch screens […] that offer a short selection of slides and brief texts relating to individual vehicles."[187]

In this place it is told the story of London's transport that has developed over two hundred years, showing visitors how this has transformed radically, and consequently how the way it is perceived today has also changed.[188]

4.2 The *Deutsches Museum*, a place for everyone

Two of the museums mentioned so far, namely the *Conservatoire des Arts et Métiers* in Paris and the former *South Kensington Museum* in London, inspired the foundation of a museum dedicated to science and technology, which over the years has become a worldwide reference: the *Deutsches Museum* in Munich.[189]

According to sources, the man who was to become the founder of this institution, the Bavarian engineer Oskar von Miller, after visiting the *South Kensington Museum* in 1891, said these words dreamily:

"If only it were possible that Germany, too, would have a major museum dedicated to science and technology- a place of knowledge, and one that would encourage learning, this motivating young people to great deeds".[190]

These few words make clear O. von Miller's desire to open the first German museum of this kind, where the dissemination of knowledge was not the privilege of few, but rather the right of all, and where people were encouraged to learn and be instructed.

[187] C. DIVALL, "Changing Routes? The New London Transport Museum", in *Technology and Culture* 36 (3), P.631.
[188] C. DIVALL, "The London Transport Museum", in *Technology and Culture* 49 (4), P.1012.
[189] W.P. FEHLHAMMER/ W. FUESSL, "The Deutsches Museum: Idea, Realization, and Objectives", in *Technology and Culture* 41 (3), P.517.
[190] W. P. FEHLHAMMER/ W. RATHJEN, "The Deutsches Museum: past, present and future", in *Arbor* (Noviembre-Diciembre 1999), P.403.

This dream came true just a few years after he expressed his admiration for the *London Museum*, in June 1903. It was in this year that the *Museum für Meisterwerke der Naturwissenschaft und Technik* -later simply known as the *Deutsches Museum*- opened for the first time.[191]

The fact that the engineer conceived the Museum as a place for everyone can already be guessed from the name, as it refers to the German identity in a broad sense, without placing too much emphasis on the Bavarian nature.

This is a very important detail, because Germany in the early 20th century was made up -like today- of several *Bundesländer*[192], four of which were separate kingdoms, like *Königreich Bayern*[193], whose main city was -and still is- Munich.[194] Therefore, a particularly nationalistic feeling, in the sense of a deep attachment to one's own federal state, would not have aroused much resonance in such a historical period. However, this did not happen, since the intention was to demonstrate the museum's identity as democratic and open to all, regardless of visitors' place of origin. From the moment of its opening for about two decades, the Museum's collections were continuously housed in different buildings in the city, thus highlighting the lack of a fixed place with which to symbolically associate the museum. The turning point came in May 1925, when the Museum was permanently moved to the new building on the island on the river Isar, which runs through the city of Munich, covering an area of 25.000 square metres.[195] Over the years this area increased considerably up to 45.000 square metres.[196]

The collections never moved in isolation, but were always accompanied by the movement of the archives, which have been an integral part of the Institution since 1903. Nowadays, with more than one hundred years of history, the archives of the *Deutsches Museum* cover a vast time span, containing documents of all kinds from the 13th century to the present day. Just to give a brief overview, more than 20.000 manuscripts, 500.000 photographs, 120.000 technical drawings and 10.000 maps are stored. The main reason why the Museum is particularly attached to its archives is due to its desire to make them accessible to all, thus remaining coherent with its principles about sharing knowledge.[197]

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[191] *Ivi*, P.409.
[192] *Bundesländer*="Federated states".
[193] *Königreich Bayern*= "Kingdom of Bavaria".
[194] W. P. FEHLHAMMER/ W. RATHJEN, "The Deutsches Museum: past, present and future", P.407.
[195] W.P. FEHLHAMMER/ W. FUESSL, "The Deutsches Museum: Idea, Realization, and Objectives", P.518.
[196] DEUTSCHES MUSEUM., *Pressemitteilung: Das Deutsche Museum- unterwegs in die Zukunft* (München: Presse- und Öffentlichkeitsarbeit, 2021),. P.3.
[197] W. P. FEHLHAMMER, *Deutsches Museum- Ingenious Inventions and Masterpieces of Science and Technology* (Munich: Prestel Verlag, 2003), P.74.

Fig. 1C. C. NEUKIRCH. *Luftbild des Deutschen Museums*.[198]

The popularisation of knowledge was given a significant boost in 1932 with the opening of the library to the public. With a repertoire of more than 900.000 volumes, it is one of the world's largest libraries in the field of science and technology. Even in this case, access is free to all, making the library a popular and frequented site for many researchers and amateurs.[199]

What has made the *Deutsches Museum* one of the most important and authoritative technoscientific museums in the world is not only its great variety of objects and surface area, but also its research-oriented nature, always keen to actively contribute to progress through investigation.

This became apparent in the 1960s when the Museum physically housed three research centres. Two were under the direction of the Munich universities *Ludwig-Maximilians-Universität* and *Technische Universität*, while the third was managed by the Museum itself. These three centres remained separate until 1997, when it was decided to bring them all together under the same research organisation: the *Münchner Zentrum für Wissenschafts- und Technikgeschichte*.[200]

[198] C. NEUKIRCH, *Luftbild des Deutschen Museums auf der Münchner Museumsinsel aus einem Zeppelin heraus fotografiert*, Photograph, https://www.deutsches-museum.de/assets/_processed_/5/1/csm_Museumsinsel_Ansicht_aus_Zeppelin_2d7d3597cb.jpg

[199] W. P. FEHLHAMMER, *Deutsches Museum*, P.82.

[200] *Münchner Zentrum für Wissenschafts- und Technikgeschichte*= "Munich Centre for the History of Science and Technology" -W. P. FEHLHAMMER/ W. RATHJEN, "The Deutsches Museum: past, present and future", P. 426.

This important event was preceded by approximately two decades with the opening of the *Kerschensteiner Kolleg* in 1976, dedicated to the educator Georg Kerschensteiner. This place was a kind of college, designed to host teachers and instructors, who were offered the opportunity to be trained and spend a week together. During this time, various lectures were held on the history of science and technology, the different teaching approaches and the studies of collections and exhibitions. At the end of the stay, the participants were deemed qualified to pursue their profession.[201]

In the light of these facts, it is clear that the Museum, at the end of the 1990s, was one of the most active and renowned research and training centres in the world.[202]

With its rapid rise and increasing success, the *Deutsches Museum* never stopped. From the 1990s onwards, its collections were so extensive that it was decided to open additional sites to house and display them to the public.

The first centre to be opened was the *Deutsches Museum Flugwerft Schleißheim*, located in the Bavarian municipality of Oberschleißheim, in 1992. This place is mainly devoted to the exhibition of aircraft of all types and eras, with more than seventy models on display. The second centre to be opened was the *Deutsches Museum Bonn*, located in the homonymous city, in 1995. Conceived for the exhibition of contemporary research and technology in Germany, this centre has now become an international reference point for artificial intelligence. Eight years later, in 2003, a third centre was opened: the *Verkehrszentrum*, located in the Bavarian capital. Here, as the name suggests -*Verkher* means "traffic"- the theme is "transport". Because of this, within this structure there are more than two hundred seventy historical vehicles, including cars, trains, cycles, motorbikes and many others.

The last site in chronological order is the *Deutsches Museum Nürnberg*, located in the Bavarian city and opened in 2021. Given its novelty, the main theme here is "science fiction", with extensive use of tools for augmented reality experiences.[203]

Counting the main building and the four subdivisions, the area covered by the *Deutsches Museum* exceeds 68.000 square metres.[204]

[201] W. P. FEHLHAMMER, *Deutsches Museum*, P.86.
[202] W. P. FEHLHAMMER/ W. RATHJEN, . "The Deutsches Museum: past, present and future", P.426.
[203] DEUTSCHES MUSEUM, *Pressemitteilung*, P.1-2.
[204] *Ivi*, P.3.

In addition, the Museum has an annual average of more than one million visitors[205]. Such an information makes the following words expressed by two key figures of the Museum -the former director Wolf Peter Fehlhammer and the archivist Wilhelm Fuessl- easy to understand: "The Deutsches Museum was soon enjoying a reputation as a true technological Mecca: to be represented in these hallowed halls was seen as a great honour".[206]

4.3 The need for change: The San Francisco-Winterthur axis

A revolution in the world of science and technology museums took place at the end of the 1960s, when the aforementioned *Exploratorium* in San Francisco was opened in 1969. Such an institution was the brainchild of the physicist Frank Oppenheimer, after having worked for several years as a university professor. This name was already popular on the international scene well before the opening of the *Exploratorium*, as it was associated with his brother Robert, also a physicist, who was well-known as the father of the atomic bomb, created in the 1940s.[207]

Even before becoming a university professor, when he was still working as a high school teacher, the founder Frank claimed that the main reason why he taught was his desire to transmit his love for science to his students.

With this in mind, his aim was to enable his pupils to understand complex phenomena and processes, thus making the study of science fun and satisfying. Through this approach and teaching method, he hoped that this was only the first step for future deepening and learnings.[208]

Oppenheimer's idea regarding teaching methods was therefore clear: it was necessary to facilitate the study of science so as to make its approach interesting and exciting. Therefore, this was -and still is- the dogma of the *Exploratorium*, making this institution a worldwide forerunner of a new educational concept.

In order to make this actually happen, it was imperative to rethink the way in which scientific knowledge was transmitted, especially to those who were not familiar with it.

[205] W. P. FEHLHAMMER/ W. RATHJEN, "The Deutsches Museum: past, present and future", P.421.
[206] *Ivi*, P.415.
[207] EXPLORATORIUM, *History*, https://www.exploratorium.edu/about/history/.
[208] F. OPPENHEIMER, *Teaching and Learning* (Pagosa Springs: Pagosa Springs High School, 1957), P.1-2.

This is how Oppenheimer described the situation of science museums, before the advent of the *Exploratorium*, highlighting the absolute need for a change of approach:

> "There have been many attempts to bridge the gap between the experts and the laymen. The attempts have involved books, magazine articles, television programs and general science courses in schools. But such attempts, although valuable, are at a disadvantage because they lack props; they require apparatus which people can see and handle and which display phenomena which people can turn on and off and vary at will. Explaining science and technology without props can resemble an attempt to tell what it is like to swim without ever letting a person near the water. For many people science is incomprehensible and technology frightening. They perceive these as separate worlds that are harsh, fantastic and hostile to humanity".[209]

From this statement, it is clear that Oppenheimer felt the need to start a revolution in terms of communication between the institution and the visitors.

This need for change and for the adoption of a new method, different from the one already followed by technoscientific museums, can be explained not only by the forward-looking and innovative figure of Frank Oppenheimer, but also by the historical period in which it was born. At the end of the 1960s, indeed, the United States experienced a time in history full of revolutions, tensions, countercultures, successes and defeats, which profoundly influenced the way of understanding culture and how to spread it to the society.[210]

If the aim was to transmit a difficult and not immediate knowledge to the general public, it was absolutely necessary to create the conditions for this to happen. Thus, the simple display of objects in glass cases with a descriptive label was no longer sufficient.

It was fundamental to go further and find a new approach. Spurred on by this need, the *Exploratorium* was born. Here, the relationship between the exhibits and the visitors was absolutely direct and above all based on active participation. The Founder wanted visitors to learn through different experiences and activities within his Institution, by stimulating them on several levels.

As well as offering visitors the opportunity to experience the exhibitions at first hand, taking part in interactive activities to enhance the learning process, Oppenheimer's innovation consisted in the stimulation of the senses and perception; his name soon became associated with "hands-on-" and "participative-learning".[211]

[209] F. OPPENHEIMER, "Rationale For A Science Museum", in *The Museum Journal* 1 (3), P.206.
[210] EXPLORATORIUM, *History*.
[211] L. DACKMAN, "The Aesthetic of Frank Oppenheimer", in *Museum Magazine and Leonardo*, P.1.

This marked the beginning of a new way of understanding museums. Henceforth, institutions that aimed at the dissemination of technoscientific knowledge have moved from being places where visitors merely observed the exhibits -with very few or even no interaction- to become sites where science is not only visible, but also tangible and accessible to a wide variety of audiences.[212]

This revolution in the educational approach is further manifested by the freedom left to visitors. No predefined route is imposed on them, but on the contrary, they are given complete liberty to move from one activity to another without any impediment or obligation.[213]

A cultural institution, therefore, from the moment it is experienced in this way, is no longer perceived by visitors as a static site, but rather as a place where people are constantly stimulated on a sensorial level, thereby acquiring a playful character.[214]

The reaction that Oppenheimer tried to stimulate in visitors is the same that triggers scientists' processes of understanding. Therefore, "to bridge the gap between the experts and the laymen", to mention the quote above, the *Exploratorium* strives to put visitors in a similar position as specialists, so that they can understand the same concepts and phenomena from the same point of view.[215]

Through direct interaction with the surrounding environment, visitors, whose senses are aroused, not only broaden their knowledge of the displayed topic, but also learn more about themselves.[216]

This point about the reflection that the museum stimulates in the visitors is very important and recurrent, as it also emerged during the interview with the Director of Education and the Centre for Research in Informal Education (*CREI*), M. Xanthoudaki.[217]

[212] EXPLORATORIUM, *Our Story*, https://www.exploratorium.edu/about/our-story.
[213] F. OPPENHEIMER, "Rationale For A Science Museum", P.207.
[214] F. OPPENHEIMER, "The Exploratorium: A Playful Museum Combines Perception and Art in Science Education", in *American Journal of Physics* 40 (7), P.5.
[215] L. DACKMAN, "The Aesthetic of Frank Oppenheimer", P.1.
[216] R. BESIO, "Idee und Erfahrungen der ‚Science Centers' ", in *Beiträge zur Lehrerbildung* 16 (3), P. 383.
[217] L. MERY, *Interview with Maria Xanthoudaki*.

Fig. 1D. TADA IMAGES. *San Francisco, Exploratorium*.[218]

The innovation in providing a different scientific and technological educational service by the *Exploratorium* was such that it inspired the establishment of other similar centres around the world. One of the most interesting cases is that of the Swiss Science Centre *Technorama*, based in Winterthur, which took Oppenheimer's centre as model.[219]

With more than 200.000 visitors a year[220], *Technorama* is one of the largest and most renowned Science centres in the world as well as Switzerland's biggest out-of-school educational site.[221] Although the opening of the first exhibition dates back to 1982, the organisation from which it originated was established already in 1947. This was devoted to collecting objects from the engineering achievements of the "Swiss Golden Triangle", Winterthur, Zurich and Baden. It later became a foundation, taking on the name *Technorama of Switzerland* in 1969, the same year the *Exploratorium* was opened.[222]

The philosophy of this place is the same as the Oppenheimer's Centre, according to which learning about science takes place through a hands-on approach.

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[218] TADA IMAGES, *San Francisco, CA, USA: Exploratorium, a museum of science, technology and arts in San Francisco*, 2020, Photograph, https://image.shutterstock.com/image-photo/san-francisco-ca-usa-mar-600w-1678305784.jpg

[219] R. BESIO, "Idee und Erfahrungen der ‚Science Centers' ", P.380.

[220] R. BAGO/ N. CHARLES/ K. EHLERS/ M. LE, *Designing Interactive Activities at the Swiss Science Centre Technorama* (Worcester: Worcester Polytechnic Institute, 2018), P.III.

[221] H. KAUL/ R. SCHEDLER, "Means-end-Evaluation am Beispiel des Technorama", in *Zeitschrift für Kulturmanagement* 3 (1), P. 157.

[222] SWISS SCIENCE CENTER TECHNORAMA, *History,* https://www.technorama.ch/en/about-us/history

At *Technorama*, the element of play is of great importance, to the extent that it is referred to as "constructivist learning". Here, visitors are expected to acquire information of various kinds by actively enjoying the activities and experiences, without someone imparting knowledge to them.[223] All activities, therefore, are designed for visitors to actively participate, stimulating their reasoning, hypotheses and ideas that feed and contribute to the collective learning experience.[224]

The fact that the *Technorama* is three floors high, containing more than five hundred stations for participating in activities and experiments, allows visitors to have complete freedom in choosing the topic of greatest interest, regardless of their age, level of education, interests or previous knowledge.[225] This freedom of movement is further demonstrated by the fact that there are few indications within the structure that guide visitors from one point to another, leaving them to move as they prefer, driven by their own curiosity and interests.[226]

Fig. 1E. R. KELLER. *Swiss Science Center Technorama*.[227]

In addition to the various interactive stations and public workshops that last about forty five minutes each, visitors are offered the opportunity to attend one of the four daily demonstrations, in which experts show the public scientific phenomena in a theatrical way, as if it were a spectacle.

[223] I. FEENEY/ T.H. JE/ N. SHIMKUS/ T. WORTHINGTON, *Improving Student Learning at the Swiss Science Center Technorama* (Worcester: Worcester Polytechnic Institute, 2019), P.9.
[224] *Ivi*, P.10.
[225] H. KAUL/ R. SCHEDLER, "Means-end-Evaluation", P.163.
[226] R. BAGO/ N. CHARLES/ K. EHLERS/ M. LE, *Designing Interactive Activities*, P.1.
[227] R. KELLER, *Swiss Science Center Technorama, Winterthur, Switzerland*, Photograph, https://lh3.googleusercontent.com/p/AF1QipNvfuafhbF56tlK0BXol0YMJ6gt7cVPHv3y51p7=s1600-w1600

The reason why these demonstrations are staged theatrically is due to the idea that in this way the explained concepts will be better impressed in the minds of those who have watched them.[228]
As a result, in such an environment where so many activities and initiatives are offered, and where visitors are totally free to move around and see what they have a preference for, the impression is of living an educational experience of a certain intensity, but in a playful and entertaining way.[229]

4.4 The Japanese avant-garde

Following the chronological order, one of the last institutions which has followed the science centre model with particular interest is the Japanese National Museum of Emerging Science and Innovation, *Miraikan*. Nevertheless, this officially belongs to the category of *ST* museums.
This institution was opened at the beginning of the new millennium, in 2001, in the Nipponese capital Tokyo.[230]
The urban area in which it is located is the artificial island Odaiba, whose particularly modern and advanced character is defined by the fact that it is mainly accessible by a futuristic monorail.[231]
On this island, the *Miraikan* Museum is part of the Tokyo Academic Park, which also includes the cultural centre Tokyo International Exchange Center (TIEC) and the National Institute of Advanced Industrial Science and Technology (AIST).[232]

Fig. 1F. MIRAIKAN- *Miraikan*.[233]

[228] I. FEENEY/ T.H. JE/ N. SHIMKUS/ T. WORTHINGTON, *Improving Student Learning*, P.11-12.
[229] H. KAUL/ R. SCHEDLER, "Means-end-Evaluation", P.163.
[230] M. SHEA, *Visions of the Future at the Japanese Museum of Emerging Science and Innovation* (London: University College London, 2015), P.13.
[231] *Ivi*, P.14.
[232] TOKYO ACADEMIC PARK, *About Tokyo Academic Park*, 2019, https://unit.aist.go.jp/waterfront/daigakumura/en/index.html.
[233] MIRAIKAN, *Miraikan- The National Museum of Emerging Science and Innovation*, Photograph, https://www.miraikan.jst.go.jp/en/

The main missions of the *Miraikan* are to expand the knowledge of science and technology, to crown the Japan's goal of becoming a scientifically and technologically advanced nation and to create an active interaction between the public and scientists.[234] It is therefore interesting to note that museums do not only have a social and civic function, referring to the education of society, but also serve to strengthen the identity and spirit of a country.

Although almost one hundred and fifty years have passed between the inauguration of the *Miraikan* and the *Crystal Palace Exhibition*, there is a common underlying philosophy, which is very solid and anchored: to make use of displays of the most advanced and effective technologies to reinforce the image of a nation.

On the official documents of the Museum, indeed, it is written the following:

"We believe that science and technology are part of our culture. We provide an open forum for all to ponder and discuss the future roles of science and technology".[235] This short communication reiterates what has just been written, namely that the Museum serves as much for the education of the community as for the strengthening of the spirit of national identity.

On the official *Miraikan* Web Page, it is indicated that the three pillars on which it is based are: The communication of science, the development of science communicators and the creation of connections.

The first task refers to the transfer of technical and scientific knowledge of a certain complexity to the public at large. The Museum is committed to offering activities and exhibitions that can be understood by anyone, even those with no scientific knowledge, thus demonstrating a great openness to everyone.[236] This is done through permanent and special exhibitions, lectures and interactive educational activities of various kinds. Among the most interesting exhibits there is "Explore The Frontiers", where visitors can see how the world was formed over the millennia and how this is linked to the solar system and the universe.[237] In "Create Your Future" visitors can see how societies and lifestyles might look like in the future. There is even the possibility to actively interact with an android.[238]

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[234] N. MIMA/ F. NAGAMI, "Making a Bridge Between Scientists and Public: Providing a Venue for Live-Talk for Young and Upcoming Scientist", in *The 9th International Conference on Public Communication of Science and Technology* (Seoul, 17-19 May 2006), P.2.
[235] MIRAIKAN, *What is Miraikan?* (Tokyo: Miraikan, 2021), P.1.
[236] M. SHEA, *Visions of the Future at the Japanese Museum*, P.62.
[237] MIRAIKAN, *What is Miraikan?*, P.10.
[238] *Ivi*, P.11.

Another performance worth mentioning is “Life In 2050”. Here the public can see a reproduction of a hypothetical city in 2050, called “Itookashi”, where there are highly futuristic infrastructures and buildings, and where visitors are invited to interface with interactive screens to “become citizens” of this utopian reality.[239]

The second mission of the Museum relates to the training of science communicators, who are required to undergo a period of formation within the Institution, through educational activities, guided tours and planning of events and exhibitions. The selection of these personnel takes into account not only their educational background and professional skills, but also their ability to shatter the classic stereotypes about scientists, which portray them as wearing the classic white coat, unkempt hair and thick spectacles. To do this, young scientists are expected to demonstrate a certain degree of passion for the subject and cleverness, as well as an ability to interact smoothly with public.[240]

In addition, a very important aspect that further demonstrates *Miraikan*’s modernity and advancement is its ongoing commitment to seek out female scientists to integrate into its staff. Thus, one of the next goals of the Museum is to have a team of scientists made up of half men and half women.[241]

The third pillar of the Japanese Institution refers to the creation of connections with the global network of scientific museums and industries. By organising projects and activities, *Miraikan* aims to enrich contacts and expand its connections with the rest of the world. In this way, not only is the network enlarged, but also the possibilities of interacting with a wider and more international audience are increased.[242]

The Japanese case, therefore, is a very important and interesting testimony of how the technoscientific museums of the 2000s are conceived, and as such how they are different, but at times also similar, to their predecessors.

The Institution’s focus is not only on exhibition spaces, but also and above all on educational experiences and the transmission of certain social messages, such as the impact of technology and science on the future of the world, the likely changes in lifestyle and understanding of reality, and even gender inclusion in the working environment.

[239] M. SHEA, *Visions of the Future at the Japanese Museum*, P.74.
[240] N. MIMA/ F. NAGAMI, “Making a bridge between scientists and public”, P.3.
[241] *Ivi*, P.4.
[242] MIRAIKAN, *Activities- Three Pillars*, https://www.miraikan.jst.go.jp/en/aboutus/

5. Conclusion

In this chapter the history of *ST* museums has been discussed, referring to their history, peculiarities, novelties, initiatives and the way they interact with both culture and public. Not only museum institutions were addressed, but also science centres. This made possible a clarification of the characteristics of both, by highlighting their distinct objectives and methodologies. However, even though they are different, some points show a certain closeness, almost suggesting that museums and science centres are closer than one might think.

The idea of offering such a wide panorama of technoscientific museums and science centres, both in terms of space and time, is entirely deliberate. Indeed, only the consideration of several variations of the same institutional typology allows an accurate and thorough understanding of the phenomenon.

My interest in this type of cultural institution is linked to their inextricable connection with scientific and technological development, industry and the vast topic of transport. It is precisely this last element that is central to the discussion of this research, as it is the one that prompted the examination of the *Leonardo da Vinci* Museum, presented in the following pages. In fact, the study of means of transport and the way they are presented in a museum tells a lot about their evolution over time and how they have been differently perceived by the public according to historical and social periods.

The historical slant, together with a certain interest in the educational and anthropological spheres present in this paper, makes it possible to analyse the same theme from several angles, highlighting its varied and complex nature.

In little more than one hundred and fifty years of history, it has been possible to witness a continuous evolution of museums, both in terms of their relationship with science and with visitors.

The importance of some museums and science centres has been demonstrated above all by the fact that they have inspired other institutions belonging to the same category, which came into existence later. For example the great influence of the *South Kensington Museum* of London and the *Exploratorium* of San Francisco. However, although these were highly influential, the institutions that were established afterwards succeeded in developing their own identity, demonstrating unique traits of their nature. This has meant that the range of facets of both institutional categories has constantly widened, with reference to the opening of new research and education centres around the world.

In this regard, the following chapter refers to an institution that belongs to the reality of technoscientific museums, which, however, does not disdain some of the main features of science centres.

This is one of the most important and relevant cultural institutions in Italy, which thanks to its nature -as special as unique-, and to its vastness -both in terms of collections and surface area- is also of great significance at international level. The museum is the National Museum of Science and Technology *Leonardo da Vinci* in Milan, which for almost seventy years has been Italy's largest exponent of this museum category.

In this chapter, the approach is different compared to the previously analysed cases, since, in addition to the fact that the undersigned had the opportunity to spend two and a half months within this Institution -as part of an internship project, there is a direct reference to some objects present in the museum's collections.

These will serve to make direct reference to the relationship between the concept of mobility and the museum reality.

Chapter Four: The museum dedicated to *ST* in Italy

1. The National Museum of Science and Technology *Leonardo da Vinci* in Milan

In the Italian museum scene there is one cultural institution deeply focused on the study, research, conservation and exhibition of artefacts and phenomena related to science and technology: the National Museum of Science and Technology *Leonardo da Vinci* in Milan.

This place is very important for several reasons.

First of all, with a surface area of over 50.000 square metres -35.000 of which are covered and 28.000 of which are for display- it is not difficult to believe that this museum is the largest in Italy, with regard to those of a technoscientific nature.

A site of this size enables the large-scale development of 36 large thematic exhibitions, 14 interactive workshops and 165 educational trails. It also includes eight locations for events, one auditorium and one official shop. Around 200 events are organised annually and the average number of physical visitors per year exceeds 540.000, while virtual visitors to the website are over one million.

The size of the spaces is directly proportional to the vastness of the collections, which makes the Museum one of the richest at national level in terms of exhibitions.

Regarding its core, i.e. the heritage, the numbers are really considerable; there are more than 19.000 historical material goods. In addition, the more hidden sides of the Museum, which are equally essential to its success, namely the library and the archive, contain over 50.000 volumes and 250.000 items of photographic and audio-visual material respectively, covering over 400 linear metres of storage space.[243]

Therefore, in the European panorama the *Leonardo da Vinci* ranks among the first technoscientific museums in terms of size and relevance, together with the *Science Museum* of London, the *Deutsches Museum* of Munich and the *Universcience* -which is directly linked to the *Palais de la Découverte*- of Paris.[244]

An interesting peculiarity of this place is the presence of the research centre for informal education *CREI*[245], which makes the Museum a centre of excellence in Europe in "STEM Education" -Science, Technology, Engineering, Mathematics. Created in 2009, *CREI* focuses on research and training, educational programmes for schools and families, and the relationship between science and citizens.

[243] MUSEO SCIENZA, *Il Museo in cifre*, https://www.museoscienza.org/it/museo/museo-in-cifre
[244] MUSEO SCIENZA, *La missione*, https://www.museoscienza.org/it/museo/missione
[245] *CREI= Centro di Ricerca per l'Educazione Informale* ("Research Centre for Informal Education").

The driving force of this centre is the desire to offer experiences through which to develop an awareness of the importance of science and technology in everyone's daily life, and at the same time to enable the learning of useful skills to better interface with this topic.
The work of *CREI* is not only limited to the research of new methods of education and learning in the Museum, but also to the development and professional training of those working in educational services and science centres, as well as teachers.[246]
From this brief description, it is therefore clear that the big *Leonardo da Vinci* Museum is not only designed for the exhibition of scientific and technological artefacts, but that it is also a place for practical activities -thanks to the workshops offered by the various thematic laboratories-, for research and training of professional workers as well as for activities for schools, families and citizens -thanks to the work of *CREI*.

1.1 A journey through time

The description that has been provided up to this point of the National Museum of Science and Technology in Milan refers to its current state, which is only the last stage of a history that goes back a long way.
The history of this museum is one of great personalities, difficulties and successes.
First of all, to better understand how the *Leonardo da Vinci* became what it is today, it is appropriate to take a step back, looking at the origins of this building. The building in which the Museum is located, is situated at Via San Vittore 21, in the heart of Milan, about twenty minutes' walk from the Duomo, the city's greatest landmark.
A structure occupying an area of more than 50.000 square metres, located in such a renowned and strategic area, both culturally and economically, is very likely to have been built in ancient times. This is the case of the *Leonardo da Vinci*, indeed.
The first construction here dates back to the 8th century, in reference to a church erected to house the remains of the martyr Vittore, from whom today's street takes its name. However, this area was already built up earlier in Roman times, probably in the 4th century. This is known from post-war reconstructions. Next to this building, in 1005 the first monastery dedicated to the martyr was built by the archbishop of Milan, Arnolfo II. This structure was entrusted to the Benedictine order and reached the peak of its splendour with the end of Visconti domination in the 15th century.

[246] MUSEO SCIENZA, *CREI*, https://www.museoscienza.org/it/education/crei

However, the same century also saw the beginning of the decline of this monastic order, mainly due to a drop in vocations. For this reason, in 1466 Pope Paul II issued a commendation, following which in 1500 the structure was entrusted to another congregation: The Olivetans.

This community, which already enjoyed a certain power in Milan, laid the foundation stone for the monastery rebuilding in 1509. Two cloisters were built inside the structure; the first was completed in 1525, the second between 1553 and 1578. Today, both of them are still present and can be visited.[247]

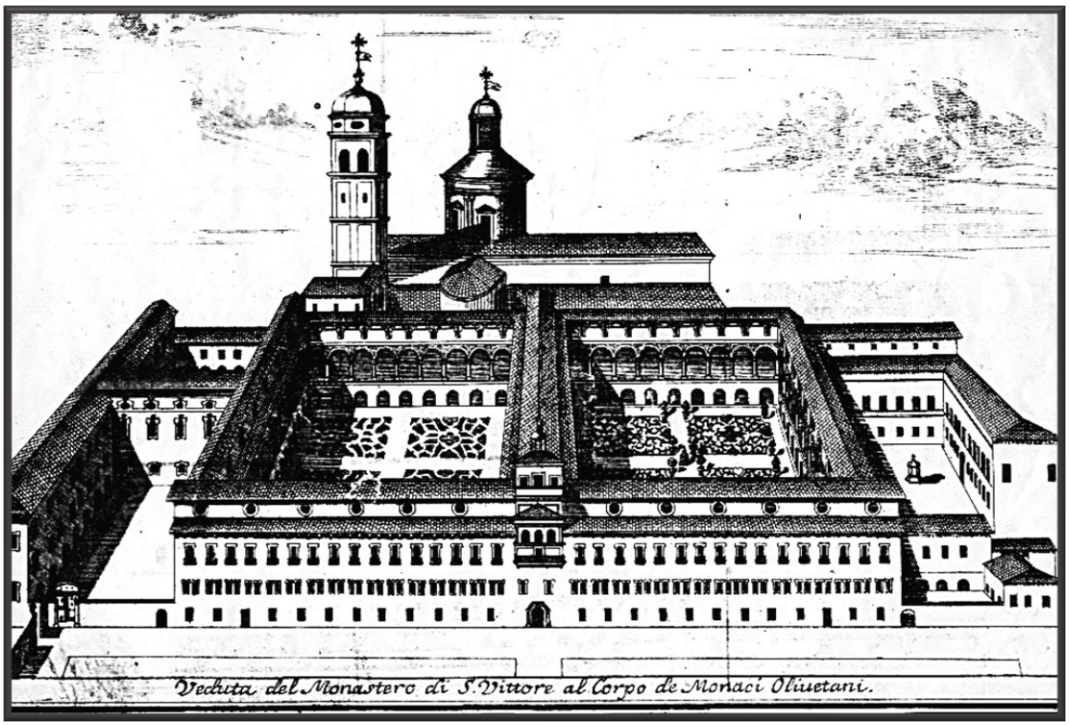

Fig. 2A. S. LATTUADA. *Veduta del Monastero di S. Vittore al Corpo dei Monaci Olivetani.*[248]

[247] O. CURTI, *Un museo per Milano*, P.127.

[248] S. LATTUADA, *Veduta del Monastero di S. Vittore al Corpo dei Monaci* Olivetani, 1738, in ARCHIVIO STORICO FOTOGRAFICO DEL MUSEO, Illustration.

Fig. 2B-1. *Interior of one of the two cloisters*. Photo by L. MERY.

Fig. 2B-2. *Arcade above one of the two cloisters*. Photo by L. MERY.

Fig. 2C. *Interior of one of the two cloisters*. Photo by L. MERY.

During the course of the 18th century, the Olivetans carried out important works inside the building: they created a large frescoed cenacle and decorated the convent with marble, stucco and paintings.[249]

Fig. 2D-1. *Frescoed cenacle- 1*. Photo by L. MERY.

Fig. 2D-2. *Frescoed cenacle- 2*. Photo by L. MERY.

[249] MUSEO "LEONARDO DA VINCI", *Cinque anni del museo* (Milano: Alfieri e Lacroix Editori, 1988), P.85.

The presence of the Olivetans lasted for over two centuries, until the monastery was first turned into a military hospital in 1805 by a Napoleonic decree and then into barracks in 1807.[250] From this moment on, a period of deep decline and neglect began for the monastery. The arcades of the cloisters were blocked off, the ground floor was turned into a stable for horses, the library, the cenacle and the large loggias were converted into dormitories and storerooms. Even the name of the building changed from being the monastery of the Olivetan order to "Villata barracks", in memory of a Napoleonic general.[251] After more than a hundred years of military occupation, the monastery suffered further ruin as a consequence of the War. Especially the attacks in summer of 1943 caused fires and destruction, to the point that at the end of the Conflict -in 1945- the building was almost unrecognisable due to its devastation and collapse.[252]

At this point in history, almost ten years remained before the Museum opened.

During this time, several episodes took place, which constantly revolved around a single figure, that of the future Founder of the *Leonardo da Vinci*: Guido Ucelli di Nemi.

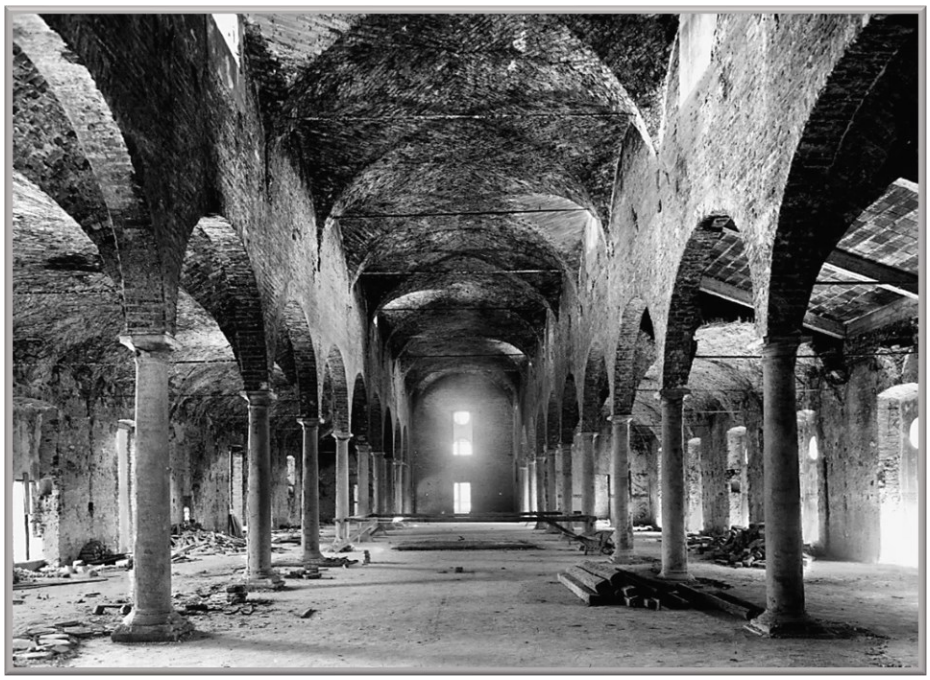

Fig. 2E-1. ARCHIVIO STORICO FOTOGRAFICO DEL MUSEO. *Monastery library destroyed by bombing.*[253]

[250] O. CURTI, *Un museo per Milano*, P.129.
[251] MUSEO "LEONARDO DA VINCI", *Cinque anni del museo*, P.85.
[252] O. CURTI, *Museoscienza* (Milano: S.p.A. Alberto Matarelli, 1978), P.30.
[253] ARCHIVIO STORICO FOTOGRAFICO DEL MUSEO, *Monastery library destroyed by bombing.* Photograph.

Fig. 2E-2. ARCHIVIO STORICO FOTOGRAFICO DEL MUSEO. *Monastery library after reconstruction.*[254]

1.2 An engineer with a passion for culture and history: Guido Ucelli di Nemi

If it is true that the National Museum of Science and Technology in Milan is associated with the name of Leonardo da Vinci, it is equally true that this cultural institution is linked to another prominent figure, that of its Founder: Guido Ucelli di Nemi.

Guido Ucelli was born in Piacenza in the second half of the 19th century, on the 25th of August 1885, as the fourth of five brothers. He stayed in his home town until he graduated, after which he decided to move to Milan to study at university. In the Milanese city, Ucelli studied at the *Politecnico*, where he graduated in electrical engineering in 1909.

Shortly after graduating, engineer Ucelli found work at *Riva*, one of the oldest industrial companies in Lombardy. *Riva* had already become a prominent company at the end of the 19th century, as it specialised in the production of hydraulic turbines and established itself as the leading Italian manufacturer.[255]

[254] ARCHIVIO STORICO FOTOGRAFICO DEL MUSEO. *Monastery library after reconstruction.* Photograph.
[255] P. UCELLI GNESUTTA, "Guido e Carla: Una vita", in ASSOCIAZIONE GUIDO UCELLI AMICI DEL MUSEO DELLA SCIENZA E DELLA TECNOLOGIA/ MUSEO NAZIONALE DELLA SCIENZA E DELLA TECNOLOGIA LEONARDO DA VINCI/ CENTRO PER LA CULTURA D'IMPRESA (Eds.): *Guido Ucelli di Nemi- Industriale, Umanista, Innovatore* (Milano: Editore Ulrico Hoepli, 2011), P.7.

This success is associated with 1889, when the Company's founder, engineer Alberto Riva, took over the plants of a factory in liquidation, the *E. Galimberti e C*. and started the production of hydraulic turbines. However, the *Riva* company was already established in 1872 as a representative agency for foreign-made agricultural and industrial machinery.[256]

In any case, over the years *Riva* gained more and more popularity, winning an international competition in 1899 for the installation of the first hydroelectric plant at Niagara Falls.

The chance to work for such a prestigious and professional company was a unique opportunity for Ucelli. For this reason, the Engineer immediately became very committed to *Riva*, thus earning the esteem and faith of its founder, Alberto Riva, who entrusted him with management responsibilities.[257]

A few years after his employment at *Riva*, in 1912, Ucelli met Carla Tosi, who from 1914 became his wife and inseparable life partner. Over the years, indeed, Mrs. Tosi proved to be not only the mother of Ucelli's five children, but also an important point of support for the Engineer both with regard to the *Riva* and to the realisation of the Museum. Throughout the years, Ucelli built up a career within *Riva*, until he became the general manager of the Company after the First World War.[258] The bigger Ucelli's positions and responsibilities were, the greater was the role of Mrs. Tosi, who became more and more important in his life, to the point of taking on the role of councillor of the society, alongside her husband.[259]

In addition to showing an attraction to engineering, which he turned into a profession, Ucelli also cultivated a passion for culture in general and history. This interest was materialised between 1928 and 1932, when his name was directly associated with the recovery of the ships of Nemi, in the province of Rome, by draining the homonymous lake.[260] Since the 15th century, there has always been an interest in resurfacing the Roman ships sunk in Lake Nemi. Over the centuries, several attempts have been made using rudimentary and often destructive methods, with poor results and causing considerable damage to the wrecks.[261]

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[256] G. BIGATTI, Storia di un imprenditore", in ASSOCIAZIONE GUIDO UCELLI AMICI DEL MUSEO DELLA SCIENZA E DELLA TECNOLOGIA/ MUSEO NAZIONALE DELLA SCIENZA E DELLA TECNOLOGIA LEONARDO DA VINCI/ CENTRO PER LA CULTURA D'IMPRESA (Eds.): *Guido Ucelli di Nemi- Industriale, Umanista, Innovatore* (Milano: Editore Ulrico Hoepli, 2011), P.85.

[257] P. UCELLI GNESUTTA, *Guido e Carla: Una vita*, P.7.

[258] *Ivi*, P.10.

[259] *Ivi*, P.15.

[260] E. ROVIDA, "Ingegnere e tecnico", in ASSOCIAZIONE GUIDO UCELLI AMICI DEL MUSEO DELLA SCIENZA E DELLA TECNOLOGIA/ MUSEO NAZIONALE DELLA SCIENZA E DELLA TECNOLOGIA LEONARDO DA VINCI/ CENTRO PER LA CULTURA D'IMPRESA (Eds.): *Guido Ucelli di Nemi- Industriale, Umanista, Innovatore* (Milano: Editore Ulrico Hoepli, 2011), P.163.

[261] *Ivi*, P.188.

This determination persisted even in the 20th century, when Guido Ucelli, already at the head of *Riva*, offered Giuseppe Belluzzo, Minister of Public Works, the Company's availability to provide machinery and personnel for the recovery, free of charge. So, with the Government's approval of the plan, in 1928 work began on the recovery, by drawing water from the lake through the use of water-scooping machines provided by *Riva*.

The work was long and not without difficulty, but in September 1929 there were the first significant results; the first of the two ships had emerged completely, having reached 11.28 metres below the level of the lake.[262] The second success came three years later, when in October 1932 the second ship was also recovered, having lowered the level of the lake by almost 22 metres.[263] Unfortunately these two extraordinary artefacts are no longer visible, because they were deliberately burnt during the War in 1944. Both ships were kept in the Museum of Roman Ships on the shores of Lake Nemi, but because of the attack they were destroyed together with structures that contained them.[264]

However, Ucelli's effort and commitment earned him the title *di Nemi*, which always accompanied his name from then on. One year before that, in 1931, he was awarded another honorary title, that of *Cavaliere del Lavoro*, making him the youngest industrialist to receive it at the time.[265]

Considering that Guido Ucelli di Nemi is remembered not only for being head of the *Riva* and making the recovery of the Roman ships possible, but also for creating the *Leonardo da Vinci* Museum, it is rather natural to divide his life into many different chapters.

The fascinating and rich story of Ucelli ended on 23 August 1964[266] with his passing, although a part of him had already left earlier, when on 3 January 1963 the person who had always been a pillar and point of reference for him, his wife Carla, died.[267]

Up to this point, it has been narrated the first part of his life, which, as it turned out, was full of industrial and historic achievements and successes. Now it comes the second part of his life, characterised by the opening of his great creation: the National Museum of Science and Technology *Leonardo da Vinci*.

1.3 The creation of a new museum for Milan and Italy

In the years that followed the various successes and recognitions obtained, Ucelli continued to manage *Riva* with determination, having his sons and family members, all engineers, join the Company in the 1950s.

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[262] *Ivi*, P.193.
[263] *Ivi*, P.196.
[264] *Ivi*, P.198.
[265] P. UCELLI GNESUTTA, "Guido e Carla: Una vita", P.13.
[266] *Ivi*, P.22.
[267] *Ivi*, P.21.

With such conditions, where the Engineer could rely on collaborators linked to him by family ties, Ucelli was finally able to devote himself to a project he had in mind for several decade: to provide Milan, the main industrial centre of Italy, with a museum of science and technology, dedicated to the greatest engineer and scientist of all time, Leonardo da Vinci.

Ucelli was just over twenty years old when in 1906, on the occasion of the International Exhibition of Sempione, he thought for the first time that Italy needed -and was ready to host- an industrial museum, following the example of similar institutions abroad.

At the beginning of the century, indeed, the capital of Lombardy, where the young Ucelli was studying at university, enjoyed a fervent and favourable environment for the development of projects that would confirm Italy's international competitiveness. The period that other European and non-European countries had already experienced finally arrived in Italy as well; the one that allowed the creation of a technoscientific museum.

Despite Ucelli's great enthusiasm and hope the time was not yet ripe for such a project and it would take several years before a proposal was actually made. A first signal came in 1928, when the Head of Government, Benito Mussolini, commissioned the president of the *CNR* (*Consiglio Nazionale delle Ricerche*)[268], Guglielmo Marconi, to provide for the creation of research laboratories and museums where the progress of science, technology and industry could be made evident.[269]

At that time, G. Marconi's name was already well known on the international scene, and such an assignment created great excitement throughout the Country. One of the first to take action was the City of Milan, which in 1930 set up a commission headed by Guido Ucelli di Nemi to study a plan for documenting and narrating technical progress. From this point onwards, relations and contacts between Ucelli and Marconi became increasingly frequent, resulting in a close collaboration.

Ucelli explained to Marconi his idea of creating a national museum of science and industry in Milan, which was immediately welcomed by the *CNR* President with enthusiasm and constantly supported. The agreement between them to bring such a project to Milan was fulfilled in 1931 with Marconi's idea to conduct a census of the scientific and technical material in Italy.[270]

[268] The *CNR* is a national public research body with multidisciplinary competences, supervised by the Ministry of Universities and Research. Founded in 1923, its task is to carry out scientific research projects in the main fields of knowledge and to apply the results for the development of the Country, promoting innovation, the internationalisation of the research system and fostering the competitiveness of the industrial system.- CONSIGLIO NAZIONALE DELLE RICERCHE. *Chi siamo*, 2022. https://www.cnr.it/it/chi-siamo.

[269] O. CURTI, *Un museo per Milano*, P.21.

[270] E. CANADELLI, "I musei scientifici", P.885.

Thus, throughout the 1930s, Ucelli devoted himself to the collection of objects and documents to be exhibited, to the visit of the most important museums of this kind in Europe and to fiscal matters, in order to have the future Institution officially recognised as a public institution.[271]

As the years passed and international tensions grew, the bureaucratic process of creation advanced slowly. One of the last events in this regard, before the forced stop due to the World War II, was the June 1942 resolution of the Minister of Education Giuseppe Bottai, which established the creation of a committee for the construction of the Museum and proposed the allocation of a site of over 50.000 square metres in the area of the *Fiera Campionaria*[272] for the construction of the Museum.[273]

In October of the same year, the notarial document for the establishment of the National Museum of Technology and Industry Foundation was drawn up, allowing for the assignment of funds from the Ministry of Education.[274]

Although Ucelli's idea to create the Museum was beginning to take shape, the conflicts and atrocities of War were becoming more and more rampant. In this context of suffering, Ucelli and his wife Carla did not back down, but rather offered to help some Jewish friends, favouring their expatriation. For this action, they were denounced anonymously and in 1944 the couple was captured and imprisoned in San Vittore. Fortunately, this detention ended that same year with their release.[275]

When the War was finally over, the creation of the Museum could be reconsidered. In 1946 the Foundation's Statute was revised and updated, and in 1947 the Foundation was renamed as *Museo Nazionale della Scienza e della Tecnica*. However, it was still necessary to find a location for the Institution. The years following the end of the War were devoted to the creation of the Museum's library, specialising in the history of science and technology, as well as the search for an appropriate location. The place that most caught Ucelli's attention was the old Olivetan monastery in Via San Vittore, which was half-destroyed by the wartime attacks.[276]

Thus, the large complex of the convent of San Vittore, after having been designated as the building for the Museum, was completely renovated according to the plans of architects Piero Portalupi, Ferdinando Reggiori and Enrico Griffini. On 15 February 1953, more than twenty years after the idea of founding an Italian museum dedicated to science and technology, the *Leonardo da Vinci* Museum in Milan was finally inaugurated.

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[271] P. UCELLI GNESUTTA, "Guido e Carla: Una vita", P.16.
[272] This is the name of the exhibition structure in Rho, near Milan.
[273] O. CURTI, *Un museo per Milano*, P.24.
[274] P. UCELLI GNESUTTA, "Guido e Carla: Una vita", P.17.
[275] G. BIGATTI, "Storia di un imprenditore", P.108.
[276] P. REDEMAGNI, "La nascita del museo", in ASSOCIAZIONE GUIDO UCELLI AMICI DEL MUSEO DELLA SCIENZA E DELLA TECNOLOGIA/ MUSEO NAZIONALE DELLA SCIENZA E DELLA TECNOLOGIA LEONARDO DA VINCI/ CENTRO PER LA CULTURA D'IMPRESA (Eds.): *Guido Ucelli di Nemi- Industriale, Umanista, Innovatore* (Milano: Editore Ulrico Hoepli, 2011), P.150.

Fig. 2F-1. ARCHIVIO STORICO FOTOGRAFICO DEL MUSEO. *San Vittore cloisters in 1945-1*.[277]

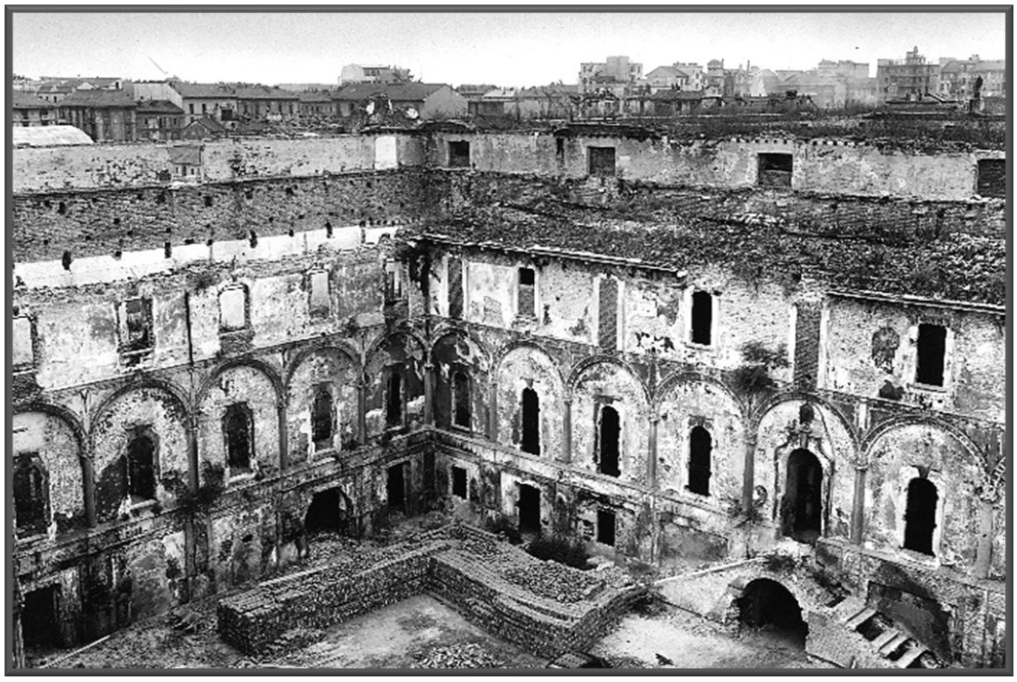

Fig. 2F-2. ARCHIVIO STORICO FOTOGRAFICO DEL MUSEO. *San Vittore cloisters in 1945-2*.[278]

[277] ARCHIVIO STORICO FOTOGRAFICO DEL MUSEO, "*I Chiostri di San Vittore nel 1945-1*", Photograph.
[278] ARCHIVIO STORICO FOTOGRAFICO DEL MUSEO, "*I Chiostri di San Vittore nel 1945-2*", Photograph.

Fig. 2G-1. ARCHIVIO STORICO FOTOGRAFICO DEL MUSEO. *Monastery of San Vittore al Corpo after war damage, before the reconstruction*.[279]

Fig. 2G-2. ARCHIVIO STORICO FOTOGRAFICO DEL MUSEO. *View of the San Vittore's square during a congress*.[280]

[279] ARCHIVIO STORICO FOTOGRAFICO DEL MUSEO, "*L'ex Monastero di San Vittore al Corpo dopo i danni di guerra, prima della ristrutturazione*", Photograph.
[280] ARCHIVIO STORICO FOTOGRAFICO DEL MUSEO, "*Veduta della piazza di San Vittore in occasione di un congresso, aprile 1959*", Photograph.

1.4 The Museum of Milan: a dedication to Leonardo da Vinci

1953, one year after the 500th anniversary of Leonardo da Vinci's birth, was the year in which both the *Museo Nazionale della Scienza e della Tecnica* and the Leonardo Exhibition were inaugurated. The tribute to Leonardo's Genius was due to the fact that Leonardo da Vinci spent several years in the city of Milan, where he gained international acclaim for his artistic and engineering skills[281], and because he -more than any other man ever- best represented the idea of mastermind in the field of science and technology.

A few years before the Museum's opening, two exhibitions in honour of Leonardo da Vinci were already held in Milan: one in 1934 by the Ministry of Aeronautics and one in 1939 by the City of Milan.[282]

In addition, to fully understand the reason for naming a museum in honour of Leonardo, it is necessary to recall Ucelli's deepest inclinations. In the preceding pages, indeed, it has been pointed out that he had a predilection not only for the engineering sciences, but also for culture in the absolute sense. The Engineer was a great lover of art as well as a passionate connoisseur of history and technology.[283]

With this information in mind, it is understandable how the figure of Leonardo da Vinci perfectly summed up these realities within himself, proving to be the perfect synthesis of science and culture. Hence, such a tribute in reference to a museum of this significance was intended to symbolise the need for a new point of contact between humanistic and scientific knowledge.[284] An explicit dedication to the Genius of Leonardo added to the fact that the former convent housing the Museum was physically close to the *Last Supper* perfectly crowned the combination of art with science and its most modern technical applications.[285]

The tribute to him was materialised with the creation of an exhibition entirely dedicated to him, 110 metres long, within the gallery of the ancient monastery and the two adjacent minor galleries. This space, the beating heart of the Museum, was designed by architect Mario Soldatini and professor Vittorio Somenzi.[286] Today, this space covers an area of more than 1300 square metres and contains 170 historical models, works of art, ancient books and installations, being the largest exhibition dedicated to him in the world.[287]

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[281] BBC. *Leonardo da Vinci (1452-1519)*, . https://www.bbc.co.uk/history/historic_figures/da_vinci_leonardo.shtml
[282] MUSEO "LEONARDO DA VINCI", *Cinque anni del museo*, P.10.
[283] E. CANADELLI, "Le Macchine dell' «Ingegnere Umanista»: Il Progetto Museale di Guido Ucelli tra Fascimo e Dopoguerra", in *PHYSIS- Rivista Internazionale di Storia della Scienza* 2016 1/2 ~a.51, P.94.
[284] G. BIGATTI, "Storia di un imprenditore", P.111.
[285] E. CANADELLI, "L'Eredità di Leonardo. Dalla Leonardesca al Museo Nazionale della Scienza e della Tecnica di Milano", in M. BERETTA/ E. CANADELLI/ C. GIORGIONE (Eds.): *Leonardo 1939: La costruzione del mito* (Milano: Editrice Bibliografica, 2019), P. 215.
[286] MUSEO "LEONARDO DA VINCI", *Cinque anni del museo*, P.105.
[287] MUSEO SCIENZA, *Gallerie Leonardo da Vinci*, https://www.museoscienza.org/it/leonardo/gallerie

The contained materials include over a hundred models illustrating Leonardo's engineering, scientific and artistic achievements, all of which are provided with a reproduction of the original drawings, with precise bibliographical references to the manuscripts or codices containing the cited sheets, so as to facilitate visitors' understanding of the object on display.[288]

Most of these models were made for an exhibition organised by the National Committee for the Honouring of Leonardo a year before the Museum opened, in 1952, to celebrate the fifth century from his birth. The work and studies carried out for the 1939 exhibition in Milan, mentioned above, also contributed.[289]

In addition to the exhibition of various instruments, machines and other works of art, some of which were specially produced on a small scale, so that they could be operated by the public[290], along the gallery it is also possible to admire photographic enlargements of particular Leonardesque paintings, which are not only very scenic and pleasant to admire, but also contribute to provide a further image of Leonardo as a great artist.[291]

The care and attention paid to the exhibitions in the Milanese Museum were by no means accidental, but on the contrary were the result of long studies and research. For the creation and arrangement of the Museum, Ucelli made great reference to the major European technoscientific museums, which had already been dominating the international scene for several years. First and foremost, the *Deutsches Museum* in Munich, whose size, vastness of the exhibition sections and organicity of the entire structure deeply impressed the Founder of the *Leonardo da Vinci*.[292] However, even the *Science Museum* in London had impressed and fascinated him with great intensity.[293]

When the Italian museum opened, the German one already had fifty years of history and had developed museological criteria that were innovative for the time: collections did not only explain concepts and phenomena of a certain difficulty in a clear and simple way, but also managed to interest and involve the public, offering the possibility to interact directly with the objects. The educational experience was complemented by captions, illustrations, models and reproductions, as well as an extensive library containing patents, documents and technical drawings- available to the public- and even a building for conferences.[294] Over the years, even after the opening, visits to foreign museums continued in order to keep abreast of the latest trends, get contacts and take inspiration.[295]

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[288] MUSEO "LEONARDO DA VINCI", *Cinque anni del museo*, P.106.
[289] D. LINI/ S. SUTERA. *Museo Nazionale della Scienza e della Tecnica Leonardo da Vinci* (Milano: Skira Editore, 1997), P.29.
[290] *Ivi*, P.30.
[291] MUSEO "LEONARDO DA VINCI", *Cinque anni del museo*, P.106.
[292] P. REDEMAGNI, "La nascita del museo", P.134.
[293] E. CANADELLI, "L'Eredità di Leonardo", P. 211.
[294] P. REDEMAGNI, "La nascita del museo", P.134.
[295] O. CURTI, *Un museo per Milano*, P.75.

Fig. 2H. ARCHIVIO STORICO FOTOGRAFICO DEL MUSEO. *View of the technical press room from the entrance*.[296]

1.5 The never-ending display of the *Leonardo da Vinci*

Since its inauguration in 1953, with the participation of Prime Minister Alcide de Gasperi, the Museum has constantly hosted a variety of permanent and temporary exhibitions. In addition to the Da Vinci Gallery, which was the main attraction, the Museum began to organise exhibits of various kinds. Among the first, there was the exhibition of ships' models and the inauguration of the cinema, at which the President of the Republic Luigi Einaudi took part.[297] In the following years, sections dedicated to the automobile world -with the support of *Fiat* and *Alfa Romeo*- metallurgy, computer science, television, physics, and even watchmaking, music and jewellery were added.[298] Then it was the turn of the transport exhibition, which was divided into land and rail transport, as well as the section on graphic arts and metallurgy.[299]

Especially during the first years, when the Museum was taking shape, the average was one transport of objects for new collections per week. The objects were placed and mounted with hand hoists by the Museum staff.[300] A lorry owned by the *Riva* company was used to transport the various objects that were sought or offered.

[296] ARCHIVIO STORICO FOTOGRAFICO DEL MUSEO, "*Veduta della sala stampa tecnica dall'ingresso*", 1953, Photograph.
[297] O. CURTI, *Un museo per Milano*, P.35.
[298] *Ivi*, P.43.
[299] *Ivi*, P.49.
[300] *Ivi*, P.57.

Certainly, the fact that the Founder of the Museum had held a managerial position for several years in a company like *Riva*, entailed advantages that were anything but insignificant.[301]

Although the various sections differed in terms of the themes they dealt with, there was one point in common between them: the arrangement and methodology used to display the objects.

For the Founder it was important that the focus was primarily on original pieces, which were to be the main attraction of the section, and that these were complemented by models and dioramas.

This thought about the great value of an original object is very interesting and curious. By considering the reasoning made earlier, according to which science centres do mainly defend the validity of copies, Ucelli's thought further confirms the belief by technoscientific museums about the superior scientific validity of originals.

Both the original objects and the models were supposed to be in motion, so that visitors could understand their function and importance. In this case, it is easily conceivable that the inspiration came from the visit of foreign museums, which had already been offering this kind of attraction for quite a long time.

Apart from the sources of inspiration, it was important to Ucelli that the Museum was a place of learning, where the emotional impact was certainly different from a site for theoretical teaching. To complete this didactic service, it was decided to provide complete captions for each object on display, as well as documenting their provenance through photographic reproductions.[302] For Ucelli, the *Leonardo da Vinci* Museum was meant to be a means of documenting and popularising the achievements of science, technology and labour, to present the machines as an instrument of civilisation and social progress, and to highlight the creative capacity of human kind.[303] One of the aspects that interested him most was that the Museum's communication addressed to the public - made up almost exclusively of non-professionals- was easily understandable.[304]

[301] *Ivi*, P.55.
[302] *Ivi*, P.45.
[303] E. CANADELLI, "Le Macchine dell' «Ingegnere Umanista»", P. 95.
[304] *Ivi*, P. 97.

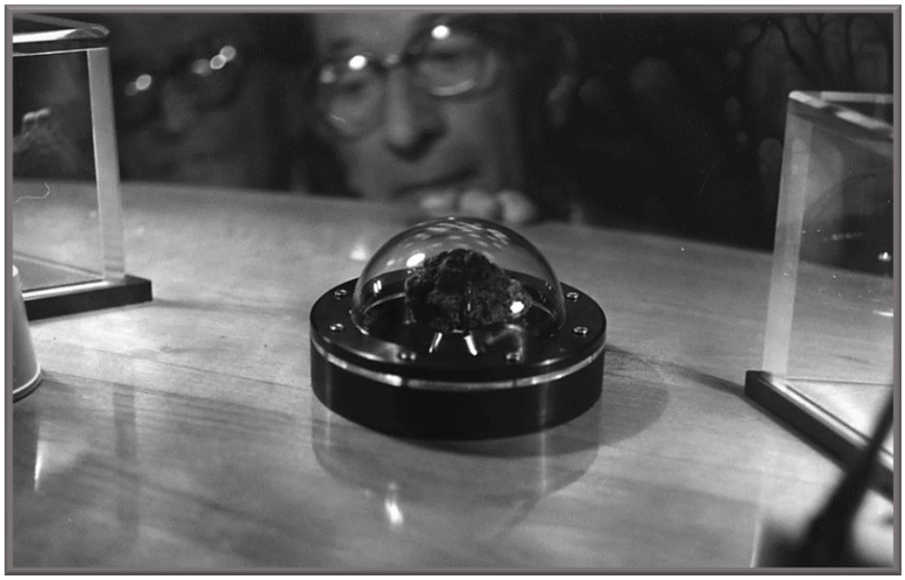

Fig. 2I. ARCHIVIO STORICO FOTOGRAFICO DEL MUSEO. *Fragment of Goodwill Rock on display*.[305]

In the almost seventy years of its existence, the Museum has undergone several transformations with regard to the exhibition areas. Many have been modified, updated and modernised, others have been moved and replaced, and others have been relocated to storage spaces to make room for educational laboratories. Over the course of time, the Museum changed management several times and the number of staff grew as the Institution gained in importance. However, the true nature of the Museum has never wavered, despite all the changes.

Today, the Museum is not so much perceived as a place for the preservation of memory and historical material culture but rather as a place for documentation. This is a theme that the Museum's Head of Collections, Laura Ronzon, emphasised with great conviction during the interview with the undersigned. For L. Ronzon, this is a key aspect to correctly understand the value of history, above all for the possibility it offers to continuously interpret facts in different manners, always starting from the present reality.

This freedom of interpretation of history is also reflected in the Museum's open approach to objects. In this place there is no object par excellence; the museum object does not necessarily have to be material and concrete, but can also be immaterial and digital. Due to the heterogeneous typologies of museum objects, none of them is more important than another only because of the form in which it appears and manifests itself.

[305]ARCHIVIO STORICO FOTOGRAFICO DEL MUSEO, *Fragment of Goodwill Rock collected by the Apollo 17 astronauts and donated to Italy in 1973 by US President Richard Nixon*. Photograph.

In fact, the purpose of the *Leonardo da Vinci* Museum is not to display to visitors a range of objects in order of importance. On the contrary, the aim is to tell a series of stories -all meticulously studied and documented-, related to the theme of science and technology. Clearly, as this museum was born in the context of the industrial revolutions and universal exhibitions, one of the wishes of this institution is also to exalt progress and emphasise how this has been a very powerful and effective means of political, economic and social confrontation between different nations over the years.[306]

At present, the permanent exhibitions, which best represent the spirit of the Museum and are constantly maintained and updated by the staff, cover the following topics[307]:

- **Leonardo da Vinci Galleries**: A space entirely dedicated to the Genius of the Renaissance and his talent in science, art, technology and thought.
- **Air Transport**: Located on the upper floor of the Aeronautical Pavilion, it contains helicopters, civil aircraft, rotorcraft, gyroplanes and tiltrotors.
- **Aluminium**: History of this material and its possible uses.
- **Basic chemical industry**: The basic chemical industry in today's world, and its relationship with individual and social habits.
- **Black and "white" coal**: History of (black) coal and the advent of electricity ("white" coal) in Italy.
- **Energy and materials**: The addressed topics are "matter and energy", "raw materials, energy sources, transformations and derivatives", "consumption and classifications", "environment".
- **Energy system**: Historical objects, multimedia stations, video installations and interactive activities on renewable and non-renewable energies.
- **Food- #FoodPeople**: Exhibition space of over 700 square metres on the relationship between science, technology and innovation within the agricultural and food sector.
- **"Fragility and Beauty"**: Exhibition of images of the Earth taken by satellites in collaboration with the European Space Agency (ESA).
- **Industrial foundry**: Reconstruction of a 20th century cast iron foundry in its original environment.
- **Iron and steel processing**: Reconstruction of two working environments typical of the steel industry: the forge and the industrial plant.
- **Naval Transport**: Located on the lower floor of the Aeronautical Pavilion, it contains one of the most important naval collections in Italy. Among the most interesting items are the sailing ship *Nave Scuola Ebe*, the transatlantic *Conte Biancamano* and the *Luna Rossa AC72* catamaran for the 2013 America's Cup.
- **Particle Physics-EXTREME**: Area dedicated to the large laboratories of the European Organization for Nuclear Research (CERN) and the National Institute of Nuclear Physics (INFN) for the study of particles.
- **Photovoltaics**: Explanation of this topic and how the Museum makes use of this renewable energy through a plant.
- **Plastics and rubber**: Historical evolution of plastics and use and consumption of objects made of it.

[306] L. MERY, *Interview with Laura Ronzon*, 13.04.2022, Audio, 25:18.
[307] MUSEO SCIENZA, *Esposizioni permanenti*, https://www.museoscienza.org/it/offerta/esposizioni-permanenti

- **Product life cycle**: Exploration of the four phases that form the product's life cycle: production, distribution, use and disposal.
- **Rail Transport**: Pavilion containing several locomotives, a train, the first urban public transport vehicles, such as the *OMNIBUS* and the *Gamba de Legn*, railway signals and the communication equipment needed to regulate traffic.
- ***Regina Margherita* Thermoelectric Power Station**: Exhibited at the entrance of the Museum, the *Regina Margherita* was used in the Gavazzi silk factory in Desio to power 1800 looms and light the rooms.
- ***S506 Enrico Toti* Submarine**: Exhibited in the outside areas of the Museum due to its size, the *Toti* was the first submarine built in Italy after the World War II. Its task was to monitor the waters of the Mediterranean Sea to detect the passage of Soviet submarines.
- **Space**: Structured according to the principles of space study and space missions. Here there is the only fragment of moon rock present in Italy.
- **Steel**: Objects of any type and for any use in this material.
- **Technological Mosaic**: More than 200 objects that contributed to the modernisation of Italy in the second half of the 20th century, including the Synoptic Framework by SNAM for the management of natural gas transport in Italy.
- **Telecommunications**: Journey through the major inventions in communication, between telegraphs, telephones, radios and networks.
- **"The Seven Saviours"**: Seven stone sculptures made in 1961 by artist Fausto Melotti. They are displayed in one of the two cloisters.
- **Vega Launcher**: Exhibited in the outside areas of the Museum due to its size, the Museum houses the 1:1 scale model of the first Vega, a vector developed by ESA. The original is used to carry several loads into space by placing them on different orbits.

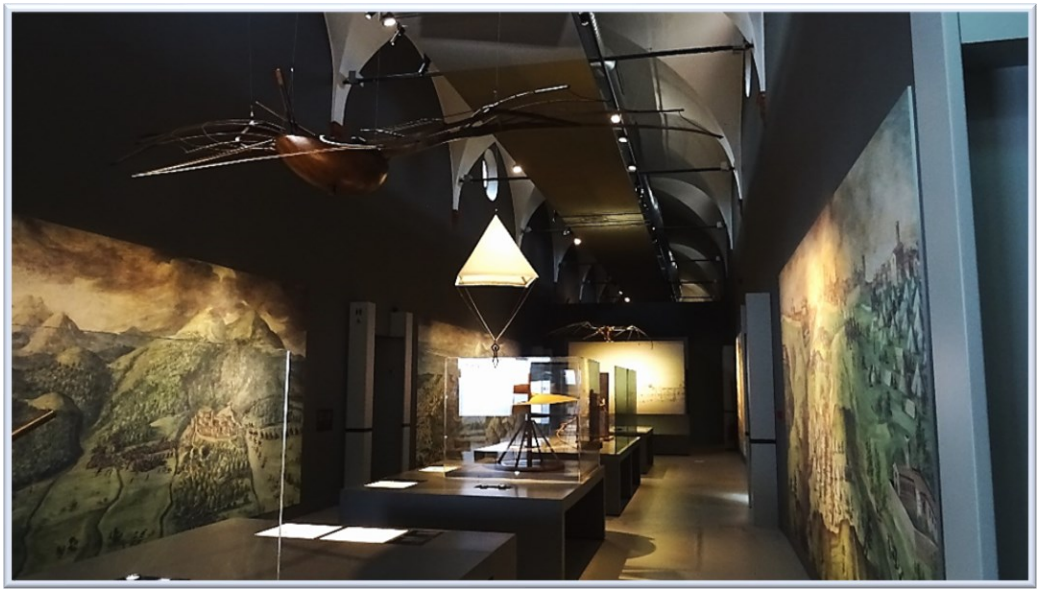

Fig. 2J-1. *Leonardo da Vinci Galleries- 1*. Photo by L. MERY.

Fig. 2J-2. *Leonardo da Vinci Galleries- 2*. Photo by L. MERY.

Fig. 2J-3. *Leonardo da Vinci Galleries- 3.* Photo by L. MERY.

Fig. 2K. *Aeronaval Section.* Photo by L. MERY.

Fig. 2L. *#FoodPeople Section.* Photo by L. MERY.

Fig. 2M. *Sailing ship "Nave Scuola Ebe".* Photo by L. MERY.

Fig. 2N. *Rail Transport Pavilion*. Photo by L. MERY.

Fig. 2O.
Regina Margherita. Photo by L. MERY.

Fig. 2P.
S506 Enrico Toti Submarine. Photo by L. MERY.

Fig. 2Q.
Space section. Photo by L. MERY.

Fig. 2R.
Vega Launcher. Photo by L. MERY.

To conclude, the collections within the Museum can be divided into macro-categories so as to provide a general overview. Exhibits belonging to the category of materials amount to 19.3% of the collection, those of telecommunications to 11.9%, those of science and technology to 19%, those relating to Leonardo da Vinci and more generally to the world of art to 17.6% and objects belonging to mixed categories to 6.3%. However, many of the exhibition spaces have to do with the means of transport, whose presence amounts to 25.9% of the collections.

This is due to the fact that vehicles are one of the highest manifestations of scientific and technological achievement. Their presence, therefore, has the task of bearing witness to the accomplishment of important milestones in these fields, highlighting the differences between the various models according to the historical period in which they were produced.

This last consideration is of great importance because the analysis of diverse means of transport - produced in different historical periods- provides valuable information on the history of a certain social reality. This occurred in the *Leonardo da Vinci* Museum, where the presence of three *Breda* vehicles created the conditions to discover the first half of the 20th century in Italy from a new perspective.

Actually, the following chapter focuses on these three exhibits and deals with their history, their utilisation and their arrival at the Museum.

Chapter Five: The case study: the *Breda* company

1. A different way of understanding mobility

The aim of this chapter is to present an Italian enterprise which, throughout the last century, represented a point of reference in the international industrial panorama: The Breda company.
The effort is to analyse the history and development of this company from a historical perspective, by keeping always in mind the concept of mobility. In order to make clear the concept of mobility and its various facets, a number of archive images and interesting metaphors will be used, with reference to the telling of an industrial story. It is also worth mentioning the presence of some of Breda's items in the exhibition spaces of the National Museum *Leonardo da Vinci*, as evidence of the concept of mobility and the success of a company that profoundly influenced Italy throughout the 20th century.
The reason why this research work is so interested in highlighting the aspect of mobility, especially in reference to museums and the industrial reality, is due to the fact that these kinds of topic are often approached with other interests, and therefore with a different focus.
To better conceive this concept, it is very useful to make reference to the Kantian-inspired dilemma posed by the poet and playwright Heinrich von Kleist:

> "If all men had green glasses instead of eyes, they would have to judge the objects they see through them and say they are green. As such, they would never be able to decide whether their eyes show them things as they are, or whether they do add something to them, that does not really belong to them, but to their eyes".[308]

When confronted with any topic, one is completely blind and in order to deal with the problem of "refractive errors", specific glasses must be used. As in the field of optics, where certain types of lens are applied according to each visual defect, so too, when dealing with a topic of any nature, one wears -metaphorically speaking- certain glasses, depending on what and how one wants to see.
Therefore, seeing a phenomenon through a certain type of lens can shed light on aspects that have never been considered, or given little consideration, but which prove to be of great importance and relevance.

[308] *Wenn alle Menschen statt der Augen grüne Gläser hätten, so würden sie urteilen müssen, die Gegenstände, welche sie dadurch erblicken, sind grün und nie würden sie entscheiden können, ob ihr Auge ihnen die Dinge zeigt, wie sie sind, oder ob es nicht etwas zu ihnen hinzutut, was nicht ihnen, sondern dem Auge gehört* – BR, *Heinrich von Kleist*, 2011, https://www.br.de/radio/bayern2/sendungen/radiowissen/deutsch-und-literatur/kleist-Lebensspruenge100.html#:~:text=Wenn%20alle%20Menschen%20statt%20der,ihnen%2C%20sondern%20dem%20Auge%20geh%C3%B6rt

With reference to the interview with M. Moraglio, a very interesting clue emerged regarding what could be called the "green glasses" of this situation.

Actually, the professor -by arguing that the history of mobility has been approached and studied in terms of economic history and business history for about eighty years, until the arrival of sociologists, anthropologists and geographers- has in a certain sense suggested the path one should take when faced with the crossroads posed by any topic, which has been apparently already dealt with and debated.[309]

The action to be taken is to become aware and conscious of the available "glasses" and decide whether to wear them once again, delving into a terrain that has already been explored, or to try the more impervious route and thus decide to wear glasses with other lenses.

In the case of the research conducted by the undersigned, mobility is not only the object of study, as emerged from the discussion with M. Moraglio[310], but also the key to comprehend some essential aspects of museums, thus becoming a unique mindset and a pair of "glasses" with different coloured lenses.

In practice, this does not mean dealing with the simple succession of historical events and their mutual influence, as an encyclopaedia would explain, but rather to put pressure on the already discussed concept of mobility and seeing how this can be used to gain unexpected knowledge.

Furthermore, the case of the *Breda* company is of great interest, since it is not only about physical mobility in the most common sense -with reference to the production of vehicles of various kinds- but also about the mobility of ideas and of its intrinsic nature, with regard to the change of production according to the different times. This is a relevant aspect of the present work, as it further confirms the presence of the wide spectrum of mobility, under which there are several versions and forms of manifestation.

2. From the origins

Like all successful industrial histories, *Breda* was the result of the ideas and visions of a man who can be considered as an innovator: Ernesto Breda.

Ernesto Breda was born in the province of Padua in 1852 and graduated from the University of Padua with a degree in civil engineering. He was always attentive to novelties and the latest trends, without ever neglecting what was on offer in foreign countries.[311]

[309] L. MERY, *Interview with Massimo Moraglio*.
[310] *Ibidem*.
[311] A. CURAMI/ P. FERRARI/ A. RASTELLI, *Alle origini della Breda Meccanica Bresciana* (Brescia: Edizioni Negri, 2009), P.11.

In this regard, his international training experience for *Società Veneta per Imprese e Costruzioni Pubbliche* in Holland, Germany and Denmark greatly influenced his personality and understanding of enterprise.

It was during this experience that E. Breda was able to see directly how industrial and organisational processes took place in the other countries. This turned out to be very fruitful when he returned to Italy.[312]

To this knowledge, it is important to mention the communication skills he possessed, which allowed him to weave a dense and rich network of relations with representatives of the main financial groups active in Italy and even with government circles.[313]

So, benefiting from his expertise and contacts, E. Breda founded the *Accomandita Ing. Ernesto Breda & C.* in 1886 with a capital of 1.2 million lire and the purchase of the plant of *Elvetica*, located in Milan.[314]

When he arrived in Milan, the situation he found was anything but easy.

In terms of work, the mechanical plants used products that did not require the use of special machines and the degree of specialisation of the workers was almost non-existent. The Milanese mechanical industry of the 1880s was therefore strongly characterised by very disparate and irregular production activities, which hindered the process of concentration and effective division of labour. It was the complete opposite of what E. Breda had seen abroad.[315] This was further compounded by social difficulties, as when he arrived in Lombardy's capital city, he was an unknown figure among the local industrialists. The fact that he came from another city and had spent a long period abroad did not play in his favour in terms of social relations with his Milanese colleagues.[316]

In view of these obstacles, the commitment and efforts that E. Breda had to make to get his business running were very considerable.

2.1 The beginning of the entrepreneurial adventure

Ernesto Breda was able to understand intelligently the situation he was facing and decided to concentrate on a narrow range of specialised production, giving great importance to specialisation and diversification.

[312] F. MARCOALDI, "L'avventura della Breda nel mondo", in MARCOALDI, Franco/ CATALUCCIO, Francesco M. (Eds.): *La Breda all'estero: Un secolo di lavoro nel mondo* (Milano: A. Pizzi Editore, 1990), P.7.
[313] A. CURAMI/ P. FERRARI/ A. RASTELLI, *Alle origini della Breda*, P.11.
[314] *Ivi*, P.10.
[315] V. CASTRONOVO, "La Breda nella storia dell'industria italiana", in Finanziaria Ernesto Breda (Ed.): *La Breda: Dalla società italiana Ernesto Breda alla Finanziaria Ernesto Breda, 1886-1986* (Milano: A. Pizzi Editore, 1986), P.9.
[316] *Ivi*, P.10.

The experience abroad influenced him greatly, because as he had seen in the factories in Northern Europe, E. Breda decided to concentrate mainly on the railway sector, without neglecting the cross-sectoral side of the company.[317]

Moreover, the period in which the Company began to operate was particularly favourable, as in 1885 the Italian Parliament decided to improve the national rail transport system, and one of the measures was that the contracting railway companies should give priority to Italian enterprises, under the condition that their rates were not 5% higher than the cheapest foreign offers.[318]

So, between 1887 and 1904 *Breda* built almost five hundred locomotives[319] and Ernesto's intuitions and choices made that the Company became an advanced complex on the Italian industrial scene in the early 20th century.[320]

As early as the 1890s, *Breda* entered the international circuit, receiving orders for the production of locomotives from countries other than Italy. The Company's first foreign customer was the Romanian State Railways, which ordered twenty-two locomotives for freight trains in 1891.

Subsequently they commissioned ten more locomotives of the same model and two for mining service in 1897 and one year later they asked for another twenty-four.[321] At the same time, *Breda* was also recruited by the Danish State Railways and produced sixty locomotives for them. In 1908, the 1.000th locomotive was built[322]; of these 137 were exported.[323]

As already mentioned, although the Company's main focus was on production in the railway branch, its Founder wanted to keep the production open to other sectors as well. In fact, as early as 1893 the Company was also involved in the production of tractors, threshing machines and agricultural machinery in general. This type of fabrication was the inheritance of an industrial activity that had already been started by its predecessor *Elvetica*.[324]

In less than twenty years, Ernesto Breda's company had become a reference point on the international industrial scene as well as a flagship of Italian mechanics. *Breda*'s growth was demonstrated by the opening of a new plants in Sesto San Giovanni and Niguarda -in the province of Milan- which, with the increase in production, made the Company the main supplier to the Italian State Railways between 1905 and 1922.[325]

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[317] A. CURAMI/ P. FERRARI/ A. RASTELLI, *Alle origini della Breda*, P.11.
[318] V. CASTRONOVO, "La Breda nella storia", P.9.
[319] *Ivi*, P.10.
[320] *Ivi*, P.11.
[321] F. MARCOALDI, "L'avventura della Breda nel mondo", P.8.
[322] A. CURAMI/ P. FERRARI/ A. RASTELLI, *Alle origini della Breda*, P.12.
[323] F. MARCOALDI, "L'avventura della Breda nel mondo", P.9.
[324] A. CURAMI/ P. FERRARI/ A. RASTELLI, *Alle origini della Breda*, P.12.
[325] *Ibidem*.

Ernesto Breda's talent for social relations bore fruit, as the Company's continuous growth was made possible not only by the quality and specialisation of its productions but also by a strategic alliance with *Banca Commerciale Italiana*, one of the leading Italian banking institutions of the time. From this partnership derived an important economic support based on the guarantee of substantial capital needed for production and investments.

One of the major consequences of this was the transformation of the Company, which in 1899 took on the name of *Società Italiana Ernesto Breda per Costruzioni Meccaniche*.

With this economic support, *Breda* could continue the development of its production in various sectors. One of these was related to the military field, which began as early as 1887 with the first manufacture of bullets. One year later, the company specialised in that sector too, to the extent that it also made field guns.[326]

The foresight of its Founder, the diversification of production and the important political and economic support it enjoyed, created the favourable conditions for *Breda* to establish itself on the national and international level in the production of both the railway and military sector.[327]

2.1.2 The arrival of the world conflict

With the arrival of the First World War, *Breda*, as a company specialised in the production of transport vehicles and above all armaments, was one of the first entities to be caught up by this wave. Unlike many companies and industries that suffered serious losses and damage due to the conflict, the War represented an opportunity for *Breda* to develop in an exceptional way. The Italian State was in urgent need of arms and bullets, and *Breda* was one of the few companies that could meet this demand. The conditions offered by the State to maintain the war machine and the prices it was willing to pay represented one of the most profitable and positive moments for Ernesto Breda's company.[328]

In order to meet the countless demands of the State, *Breda* had to undergo an internal transformation, whereby each of its plants -Milan, Sesto San Giovanni and Niguarda- had to specialise in particular productions. The main plant -the one in Milan- was engaged in the production of steam and electric locomotives, boilers, machine tools, bullets, cannon barrels and other products used in warfare. Sesto San Giovanni was committed to producing vehicles of all classes, freight cars and forgings of all sizes. Niguarda, for its part, was devoted to the production of locomotives, road compressors, irrigation pumps, tractors and agricultural machinery of all kinds.

A total of 3.300 workers were employed in the three plants.[329]

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[326] *Ivi*, P.14.
[327] *Ibidem*.
[328] *Ibidem*.
[329] V. CASTRONOVO, "La Breda nella storia", P.13.

During the conflict, *Breda* became a real war machine at the disposal of the State. As well as continuing its railway production, a field in which it achieved total national supremacy, it went on to make items far different from this sector, such as cannons, howitzers, mortars and even torpedoes.[330]

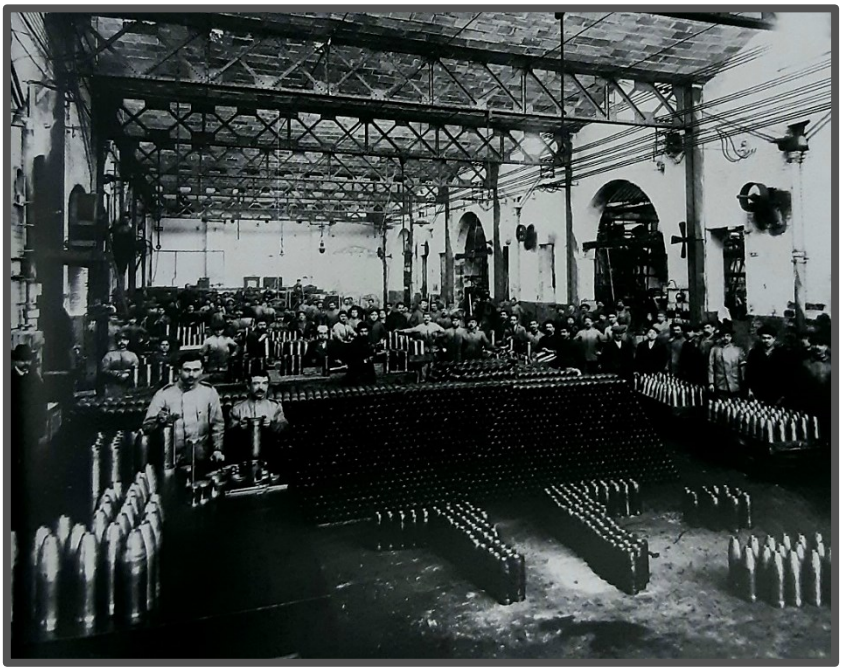

Fig. 3A. ARCHIVIO STORICO FINANZIARIA ERNESTO BREDA. *Bullet control department*.[331]

In the same period, the Company also planned to build a shipyard in Marghera, in the province of Venice; another sector that *Breda* wanted to expand into.

With such a wide range of sectors and production significance, during the War years -and even afterwards- *Breda* became one of the four most important industrial centres in Italy, together with *Ilva*, *Ansaldo* and *FIAT*.[332]

Throughout Italy's participation in the First World War, 1915-1918, *Breda* produced an impressive amount of armaments: 3 million small-calibre, 2.7 million medium-calibre and 300.000 large-calibre projectiles, 100.000 aviation bombs, 687 mortars with 210 mm calibre, 480 howitzers with 149 mm calibre, 688 torpedoes, 700 aviation engines and 1600 air accumulators for the navy.

To this was added a considerable number of gun barrels, platforms and engine spare parts.[333] Only in the last year of the conflict -between 1917 and 1918- it produced more than 40.000 tons of steel for war purposes.[334]

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[330] *Ivi*, P.14.
[331] P. SPARTI, "Un itinerario per immagini", in MARCOALDI, Franco/ CATALUCCIO, Francesco M. (Eds.): *La Breda all'estero: Un secolo di lavoro nel mondo* (Milano: A. Pizzi Editore, 1990), P.41.
[332] V. CASTRONOVO, "La Breda nella storia", P.14.
[333] A. CURAMI/ P. FERRARI/ A. RASTELLI, *Alle origini della Breda*, P.16.
[334] *Ivi*, P.15.

However, *Breda*'s period of great industrial and economic growth came to an abrupt halt with the end of the War. Paradoxically, it experienced more unstable and uncertain times in the post-War period than during the Conflict, as the reorganisation of the industry for civilian purposes and the lack of military orders from the State led to a major slowdown in production.

So, the Milanese Company had to find a solution to support and continue the large-scale production started in previous years. The turning point came in the 1920s, when international negotiations countries began again and *Breda* received more and more orders from different countries.

Among the most emblematic cases it is worth mentioning the following orders: Thirty locomotives for Egypt (Fig. 3B), forty cars for the Lima tramways (Fig. 3C), ten locomotives for South Africa and two for Norway, fifty wagons for the Society for Electrical Enterprises of Latin America, and ninety freight wagons for the Belgian-English *Ferry Boats* company, some of which were to be used for transporting fruit and vegetables and others for refrigerated wagons.

Fig. 3B. ARCHIVIO STORICO FINANZIARIA ERNESTO BREDA. *Boarding of locomotives destined to Egypt*.[335]

Fig. 3C. ARCHIVIO STORICO FINANZIARIA ERNESTO BREDA. *Tramways for Lima's suburban lines.*[336]

[335] P. SPARTI, "Un itinerario per immagini", P.66.
[336] *Ivi*, P.60.

However, *Breda*' s biggest customer was Poland, with three different contracts: the first for an order of munitions for the Ministry of War, the second for fifteen city tram cars, and the third for the supply of 110 vehicles of different classes and twenty-five baggage cars. However, despite the great success of the Milanese Company abroad, the 1920s were still marked by great losses and slowdowns in terms of earnings. The effects of the War were becoming more and more evident and this was compounded by the fascist government's revaluation of the lira, which made Italian productivity less competitive compared to its foreign counterparts.[337]

The worst crisis that *Breda* had to face lasted from 1927 to 1932, a period during which the Company accepted any commission in order not to go bankrupt. It is worth mentioning some of the most important works carried out during this period: The complex negotiations with the Soviet Union for the construction of four large fishing vessels -worth a total of 18 million lire-, the construction of the ship *Pleias* for the Greek Ministry of the Navy (Fig. 3D) and four patrol boats for its Ministry of Finance to combat smuggling, and the yacht called *Yildirim* for the Prince of Alexandria Ali Bey Emine Yehia.[338]

The Company even specialised in the production of brakes, which, because of their high quality, were applied to more than 60.000 freight cars for the Italian State Railways as well as to Polish, Yugoslav and Czechoslovakian cars.[339]

Breda also achieved important successes in arms production. In fact, the Rome plant was involved in the construction of 100.000 *Männlicher Schoenauer* rifles for the Greek government, while the Brescia plant produced *Model 30* machine guns used by the Italian, Finnish, Portuguese and Mexican armies (Fig. 3E). This success led the Company to start producing armaments for third parties, such as the French company *Hotchkiss*, for which it manufactured machine guns and submarine barrels, and the Austrian company *Mauser* and the German one *BKIW*, for which it built shotguns.[340]

With regard to naval aircraft production, *Breda* received important commissions from the fascist government at a national level, while at an international level it produced twenty *BR 25* and nine *BR 27* school aircraft for China, fifteen *Breda 65* units for Iraq and twenty-five aeroplanes of the same model for Chile.[341]

[337] *Ivi*, P.11.
[338] *Ivi*, P.12
[339] *Ivi*, P.13.
[340] *Ibidem*.
[341] *Ivi*, P.14.

2.1.3 New difficulties: The Second World War

With the outbreak of the Second World War, a situation very similar to that of the First Conflict occurred. *Breda* indeed received a large number of commissions for the production of weapons and ammunition during the War, but again the real problems arose at the end of it.

To cope with the huge losses and the drastic slowdown in production, it was decided to carry out a radical restructuring of the Company. This involved cutting staff, turning *Breda* into a holding company called *Finanziaria Ernesto Breda*, closing the *Breda Aeronautica* and *Cantiere Navale Mestre* sections and transforming the other sections into separated companies: *Breda Elettromeccanica e Locomotive*, *Breda Ferroviaria*, *Breda Motori*, *Breda Siderurgica*, *Breda Fonderia Forgia e Macchine Industriali*, *Breda Meccanica Bresciana* and *Breda Meccanica Romana*.[342]

Of all these sections, the most successful was *Breda Meccanica Bresciana*, which received major commissions for the production of war armaments from NATO and the German government, and even specialised in the production of hunting weapons (Fig. 3G). Later, at the end of the 1950s, *Breda Fucine* was also born. With a large cement plant in Brazil, it received important commissions to produce materials for the oil industry for the United States, Europe, Africa, South America and Asia.[343]

At the turn of the 1950s and 1960s there were also some important new developments that gave *Breda* a boost: Italy's entry into the European Common Market and the new policy of industrialising the *Mezzogiorno*. As a direct consequence of these two events, there was an adoption of technological processes and work organisation that led to a strong growth in productivity and commissions from abroad.[344]

However, although the Group grew steadily, especially in the field of war material production, from the end of the 1950s onwards its administrative turmoil began.

A series of sectoral disposals and divisions, together with some significant crises, such as the mechanical, steel and nuclear ones during the 1980s, led *Finanziaria Ernesto Breda* to see the sale of companies and plants as the only way out.

In 1994, the history of one of Italy's most important industrial enterprises came to an end when it went into receivership.[345]

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[342] *Ibidem*.
[343] *Ivi*, P.15.
[344] *Ivi*, P.16.
[345] A. DE CRISTOFARO/ P. FERRARI, *Finanziaria Ernesto Breda* (FEB, 2010), https://siusa.archivi.beniculturali.it/cgi-bin/siusa/pagina.pl?TipoPag=prodente&Chiave=52099

Fig. 3D. ALLE ORIGINI DELLA BREDA MECCANICA BRESCIANA. *Pleias ship for the Greek Navy*.[346]

For over a century, *Breda* manufactured products of all kinds: steel, mechanical components, trains, locomotives, trams, cars, motorbikes, carriages, agricultural machinery, tractors, boats, aeroplanes, weapons of all types, bullets and gun mounts, tanks, armoured cars and even fridges (Fig. 3H).

Fig. 3E. ALLE ORIGINI DELLA BREDA MECCANICA BRESCIANA. *Model 30 machine gun*.[347]

[346] A. CURAMI/ P. FERRARI/ A. RASTELLI, *Alle origini della Breda*, P.53.
[347] *Ivi*, P.70.

Fig. 3F. ALLE ORIGINI DELLA BREDA MECCANICA BRESCIANA. *Hand grenade model 35*.[348]

Fig. 3G. BREDA FUCILI. *Shotgun advertising*.[349]

Fig. 3H. ARCHIVIO STORICO FINANZIARIA ERNESTO BREDA. *Fridge advertising in the 1950s*.[350]

[348] *Ivi*, P.25.
[349] BREDA FUCILI, *L'azienda*, https://www.bredafucili.com/lazienda/
[350] P. SPARTI, "Un itinerario per immagini", P.151.

3. The “mobility glasses”

By wearing the “mobility glasses”, the case of *Breda* turns out to be particularly interesting for several reasons.

As mentioned above, the mobility affecting this company is not only limited to the physical reality. If, on a purely concrete level, *Breda*’ s mobile nature is strongly accentuated by the circulation of industrial products shipped from its various plants all over the world -in the same way that the history of its Founder is also deeply marked by it, given his training period abroad- on a conceptual level the Company’s mobility is even stronger and more evident.

Over the years, the Company has always demonstrated its ability to adapt to the times and needs of each historical context and period. This continuous flexibility, in stark contrast to any immovable attitude, perfectly embodies the spirit of dynamism and mobility. The fact that a company founded primarily for the production of trains and locomotives was rapidly transformed into one of the main suppliers of war armaments to the Italian State is a clear sign of a strong propensity for industrial conversion and therefore for mutation.

Although the concept of mobility is usually seen in its physical dimension, i.e. the movement of a body -inanimate or inanimate- from one point to another, its immaterial dimension -that inherent in the incessant circulation of ideas, thoughts and opinions- is far more relevant, as without it the aforesaid physical one could not exist at all.

With reference to the industrial reality -to stay on the topic- the mobility of thought turns out to be the gasoline that sets in motion the machine represented by physical mobility.

However, beyond the way it manifests itself, the observation of this notion results to be very important in the study of any historical and social phenomenon, as it allows a deep and precise understanding of issues, whose relevance would not be fully appreciated otherwise.

Indeed, if the chronicle of events were to be limited to a simple narration of facts in chronological order and without any particular focus of study, the result would appear dull and lacking in identity, even if correct. To prevent this from happening and, on the contrary, to ensure that the conducted study takes on its own nature and incessantly creates interdisciplinary links, thus enabling new knowledge to be made, it is necessary to have a large collection of “glasses”, to wear depending on what is to be seen.

Actually, everything about the surrounding reality is defined by a mobile nature. Therefore, from a metaphysical perspective, mobility by being intended as a phase of constant mutation and movement -both physical and spiritual- is an essential and indispensable feature of everything that occupies a concrete or figurative space in reality.

Just think of the well-known Heraclitean expression "Panta rei" (πάντα ῥεῖ), which -by referring to the impossibility of descending twice into the same river and being swept away both times by the same current, since by its mobile nature water flows endlessly- explains how reality is likewise driven by an eternal internal movement that will never end.[351]

This reflection becomes meaningful if accompanied by the thought made earlier, according to which movement is the detonator of everything, while mobility is what gives meaning and provides a context for different developments and interpretations.

In the case of this research, moreover, the effort is even greater, since it is not only referred about the intrinsic mobile nature of everything, but it is also attempted to explain certain phenomena -such as that of museum realities and industrial history- through the point of view of mobility in its entirety.

So, taking these lofty philosophical reflections into account, it becomes clear that it is indeed not possible -and not even scientifically correct- to think of any conceivable reality as lacking a mobile nature.

Hence, in order to understand how the "mobility glasses" permit the consideration of apparently hidden factors, the research in question finds interesting to examine and investigate some items made by *Breda* and now contained and exhibited in the *Leonardo da Vinci* Museum.

Before proceeding with the presentation of the selected objects, it should be specified that the items produced by this company, currently present in the Museum, number around thirty. The interesting aspect is their variety, as they range from means of transport by air and land, locomotives, engines, various mock-ups and even weapons.

4. Between local and global: luxury and speed on the *Breda 552*

Following the chronological order of production of the different examined objects, the first to be analysed is the Breda steam locomotive model *552-036* (Fig. 3I-1).

This item, built between 1900 and 1901, is now on display at the *Leonardo da Vinci* Museum, where together with other locomotives it majestically fills the large railway exhibition space. The importance of this vehicle is due to a number of special features that have made it an important relic, both within and outside the realm of railway enthusiasts.

[351] TRECCANI, *Panta rei*, 2009, https://www.treccani.it/enciclopedia/panta-rei_%28Dizionario-di-filosofia%29/

First of all, it must be stressed that this model was made in a fairly limited series, as only thirty-six units of the *552* were produced. Its production took place in two phases: the first twenty-four units were produced in 1890, one half by the Genoa engineering company *Ansaldo* and the other half by *Breda*, while the other 12 units were produced between 1900 and 1901 by *Breda* alone. The model on display at the *Leonardo da Vinci* Museum, the number 36, is the last ever model of the *552*, therefore made in the second phase.

The difference between the two production series was the increased capacity of the tender, as it went from 10.5m^3 of water in the first series to 12m^3 in the second one.[352] The tender was basically a wagon that was inseparable from the car, acting as a tank containing water and coal.[353]

The special features of this locomotive were not only restricted to its limited production, but also consisted of its remarkable performance. It was able to develop a power of 650 hp, which made it possible to reach and maintain a constant speed of 100 km/h.[354]

Although the official designation of this vehicle is now *GR. 552-036 FS*, where *GR.* stands for *Gruppo* ("Group") and *FS* for *Ferrovie dello Stato* ("State Railways") -here simply abbreviated as *Breda 552*- for several years it belonged to the railway complex *Rete Adriatica* (*RA*) as group *180 bis*, with numbering from 1865 to 1900.[355] With law number 3048 passed on 27 April 1885, the newly formed Italian state entrusted the private management of the railways to the three largest administrations of the time. These included *Società Italiana per le Strade Ferrate del Mediterraneo* ("Italian Society for Mediterranean Railways"), *Società Italiana per le Strade Ferrate Meridionali* ("Italian Society for Southern Railways") -known for operating the *Rete Adriatica*- and finally *Strade Ferrate della Sicilia* ("Railways of Sicily").[356]

These concessions to private administrations only lasted for twenty years, as the law 137 of 22 April 1905 established that the direct management and operation of the railways became the responsibility of the State. As a result, on the 15th of June of the same year, *Ferrovie Italiane dello Stato* ("Italian State Railways") (abbreviated as *FS*) was born.[357] The consequence of this legislative change was that the locomotives in use before the State monopoly underwent a renaming.

[352] G. CORNOLÓ, *Locomotive a vapore* (Parma: E. Albertelli Editore, 1989), P.208.
[353] LONGMAN, *Tender*, https://www.ldoceonline.com/Trains%2B%26%2Brailways-topic/tender_3
[354] G. CORNOLÓ, *Locomotive a vapore*, P.208.
[355] *Ibidem*.
[356] *Ivi*, P.34.
[357] *Ivi*, P.38.

This was the case of the locomotive analysed in this research, which from a vehicle belonging to group *180 bis*, with numbering from 1865 to 1900, during the administration of *Società Italiana per le Strade Ferrate Meridionali*, became part of the *FS* group with initial numbering from 5521 to 5556, which then became 552.001 to 552.036.[358]

Back to the historical period in which this vehicle was used and its characteristics, it is evident that this locomotive represented an important technological and engineering advancement. For this reason, the *Breda 552* was used to cover the entire stretch on Italian territory of the *India Mail* intercontinental journey from London to Bombay -under the control of *FS*, by which it was owned. It was its use on the route from France via Turin, Alexandria, Piacenza, Bologna, Ancona and finally Brindisi (Fig. 3I-2) that made the *Breda 552* internationally famous.[359]

India Mail was an international route mainly travelled by train, but with some sections covered by steamship, linking the two main centres of England in colonial times: London and Bombay.

Not only people, but also -and above all- goods and messages for the exchange of mail were moved along this route. From the 1870s onwards, this important route also crossed into Italy, having first passed through England and France.[360]

Italy acted as a bridge between two worlds that were geographically distant but politically close.

The *Breda 552* was the vehicle chosen for the journey through the Italian peninsula, and because of the important route it had to cover and the relevant context in which it was located, it represented an interesting point of contact between the local and the global reality.

Because of its technical features, through which it could to reach considerable speeds for the time, and an elegant and attractive appearance, this vehicle was the most suitable means of transport for such a journey.

[358] *Ivi*, P.208.
[359] *Ivi*, P.209.
[360] BRINDISIWEB, *La Valigia delle Indie*, http://www.brindisiweb.it/storia/valigia_delle_indie.asp

Fig. 3I-1. *Breda 552 036 at the Leonardo da Vinci Museum*. Photo by L. MERY.

With a glossy black paint in contrast to the red of the sides and the wheel spokes, with even the rim in white, the *Breda 552* looked like a luxury locomotive. This impression of elegance and exclusivity was further confirmed by the fact that it consisted of a mail coach, two sleeping cars and a restaurant wagon.[361] These on board services were absolutely necessary, as the journey time from London to Brindisi was estimated at forty-five hours, as the advertising at the time indicated. This means of transport was not available to everyone, but only to the wealthiest people. As much as today it is absolutely conceivable to travel at high speeds and with a long list of comforts, such a situation appeared to be extremely extraordinary between the end of the 19th and the beginning of the 20th century.

Up to this point, it has been referred to the commercial and logistical importance of this transport, without mentioning the political dimension. Actually, the fact that the *552* crossed the entire Italian peninsula was exclusively due to political reasons. The Italian state, as it is known today, was born a few decades earlier, after having been fully united. The construction of a railway network capable of carrying an international convoy was the perfect showcase for the new-born state to display itself politically at an international level.

This information is fully confirmed by the Curator responsible for the Transport Section of the *Leonardo da Vinci* Museum, Marco Iezzi, who claims that for this kind of active participation of Italy in the London-Bombay route, very large sums of money were invested.[362]

In the light of these data, therefore, it is possible to understand how the political component was actually the driving force behind the Italian involvement in this international mobility.

[361] MUSEO SCIENZA, *Locomotiva a vapore. GR. 552-036 FS*, http://www.museoscienza.it/dipartimenti/catalogo_collezioni/scheda_oggetto.asp?idk_in=ST120-00410&arg=breda
[362] L. MERY, *Interview with Marco Iezzi*, 14.04.2022, Audio, 28:06.

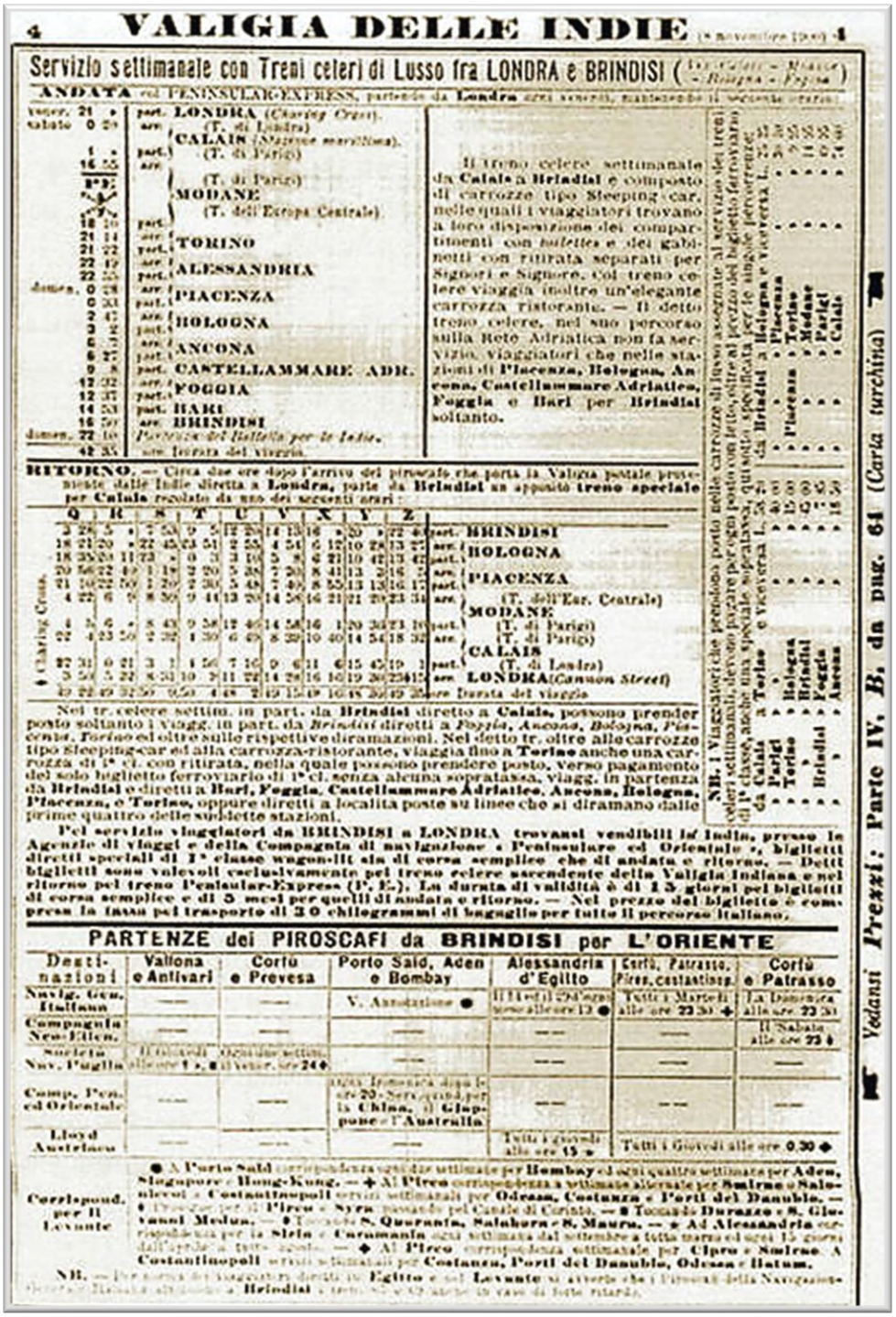


Fig. 3I-2. BRUNDARTE. *Timetable of India Mail*.[363]

[363] BRUNDARTE, *Timetable of India Mail*, https://i2.wp.com/c2.staticflickr.com/4/3888/14425090068_295db73b68_b.jpg?zoom=1.5&resize=500%2C732&ssl=1

Fig. 3I-3. CLAMFER. *Advertising of India Mail*.[364]

Despite the important role played by the *Breda 552* and the portion of the journey on Italian territory, the London-Bombay route had already existed for several years. In fact, prior to the transit through Italy, the voyage included, as proposed in 1829 by the former Royal Navy officer Thomas Waghorn, the passage through Egypt and the Red Sea, for a duration of about sixty days. This route was later modified so that ships coming from India stopped at Suez -at that time the construction of the present Canal was not considered- and from there it was necessary to cross the desert to Alexandria of Egypt, from where the steamers of the *Peninsular and Oriental Steam Navigation Company*, better known as *P&O*, set sail for Europe.

In the year 1861, with the Unification of Italy, a proposal was made to the British government to run locomotives through the Italian territory, as an alternative to the French one. This offer was initially rejected because Italian railway and port conditions were not up to standards.

However, works on the Suez Canal began at this time -1859- and were completed a few years later -1869.[365] This incredible feat of engineering, together with the improved conditions of Italy's mobility networks, created favourable conditions for the railway convoy to travel from the North to the South of Italy.

[364] CLAMFER, *Advertising of India Mail*, https://drinkfromlife.it/la-valigia-delle-indie-indian-mail/
[365] SUEZ CANAL AUTHORITY, *Canal History*, https://www.suezcanal.gov.eg/English/About/SuezCanal/Pages/CanalHistory.aspx

Thus from 1870 the *India Mail* passed through it, but the Breda *552-036* operated only from 1900, the year in which it was produced. At that time, with the transit of this locomotive, Brindisi, which was the city from which steamships departed for the Egyptian coast, became a point of great importance.

This was confirmed by the existence of the hotel *Grand Hotel International*, now known as *Grande Albergo Internazionale* (Fig. 3I-4), which propelled the Apulian city onto the international circuit. Here, in fact, came to stay and rest renowned personalities like the French literati Charles Yriarte, Arthur Rimbaud and Jules Verne, Greeks such as Konstantinos Kavafis and key figures of Indian culture such as Rabindranath Tagore and Mahatma Gandhi.[366] From here, rulers, nobles and wealthy merchants passed by as well.[367]

Fig. 3I-4. BRUNDARTE. *Grande Albergo Internazionale*.[368]

With its ups and downs, the Italian route was travelled for more than forty years, when in 1914 it was decided to break off this collaboration permanently. On the eve of the First World War, it was felt that Brindisi was too exposed to risks and it was decided to transfer the port of call to Marseille.[369] When the service for the *India Mail* terminated, the international experience of the *Breda 552* came to an end, but its employment continued at national level. Indeed, it was assigned to regional transport along the plain lines in the south of Verona and later in the Treviso area.

[366] FAI, *Grande Albergo Internazionale*, https://fondoambiente.it/luoghi/grande-albergo-internazionale
[367] CITTÁ DI BRINDISI, *Hotel Internazionale*, https://www.comune.brindisi.it/brindisi/zf/index.php/musei-monumenti/index/dettaglio-museo/museo/16
[368] BRUNDARTE, *Grande Albergo Internazionale*, https://i2.wp.com/c1.staticflickr.com/5/4598/39188982771_ffc1c97dcf_c.jpg?zoom=1.5&w=640&ssl=1
[369] BRINDISIWEB, *La Valigia delle Indie*, http://www.brindisiweb.it/storia/valigia_delle_indie.asp

The quality of construction of this locomotive assured its long-term use, even after the Second World War. The date of their decommissioning is uncertain, but it is generally believed that the last surviving examples were removed between 1946 and 1953.[370]

4.1 The arrival of the locomotive at the Museum in Milan

Starting from this last chronological information and taking into account the fact that the locomotive in question was presented at the public opening of the *Leonardo da Vinci* Museum's railway pavilion in 1969, there is a time gap of more than fifteen years. This interval can be explained by analysing the Museum's internal archive documents, which contain correspondence with *FS* regarding the transfer of material for the railway section.

The investigation was carried out by going back in time, starting with documents proving that the railway pavilion was opened to the public in 1969. In this way, the identification of one of the main temporal poles, here the conclusive one, made it possible to obtain important information about the object under analysis, thus facilitating the reconstruction of what happened previously. In this regard, the document that marked an important point of departure, although paradoxically a point of arrival, is a clipping from a magazine article, signed by Renzo Marini, reporting on the opening of the aforementioned Museum section and how and when the locomotives were moved into it (Fig. 3I-5).

Among the most relevant information is that the section was inaugurated on 14 June 1969 with already fourteen machines in place and that all of these came from the Rome marshalling yard, where they have been exposed to the ravages of time for long periods. Before arriving in Milan, they had been overhauled and/or repaired in various Italian cities, such as Rome, Cassino, Verona, Novi San Boco and Merano.

The selected and exhibited locomotives in the Museum are those that have had a particular significance for the Italian railway network, enabling the mobility of thousands of people over the years.

There is also a list summarising the situation of the various locomotives, specifying whether they have already been moved into the pavilion or are still located in the workshops of the depots mentioned above. The first model on this list is *Breda 552.036*, which was already housed in the Museum.

[370] G. CORNOLÓ, *Locomotive a vapore*, P.209.

In a way, their presence within the pavilion ensured that their mobile nature was never completely faded. In fact, while their implementation of mobility was initially possible on a practical level, from the moment they were disused and exhibited as historical objects they continued to make the Museum visitors travel through history with the minds.

LE LOCOMOTIVE DA SALVARE

Il 14 giugno 1969 veniva inaugurata a Milano, presso il Museo della Scienza e della Tecnica, una nuova sezione destinata ai Trasporti, che accoglie in maniera degna le locomotive più rappresentative della storia ferroviaria italiana.

Si tratta di macchine che hanno cessato di correre sui binari della rete da lungo tempo, e che hanno trascorso anni oscuri accantonate nei depositi o raccolte su un binario ad esse provvisoriamente destinato a Roma-Smistamento, esposte spesso alle ingiurie del tempo.

Al momento della costituzione di questa nuova sezione del Museo milanese, che rappresenta un'esposizione storico-didattica del treno e delle sue più significative conquiste, si è posto il problema della riparazione di queste macchine, che dovevano essere messe in condizione di raggiungere, trainate, la loro nuova destinazione, e di apparire in pubblico.

Un primo gruppo di 14 macchine, già sistemate al Museo, è stato riparato presso le Officine di Verona, Novi S. Bovo e Roma Smistamento. Altre 7 unità, riparate presso i Depositi di Roma Trastevere e Cassino, sono state trasferite nella Rimessa Locomotive di Merano, ricoverate in un ambiente coperto. Tre locomotive sono ancora a Roma Smistamento in attesa di essere inviate a Trastevere o a Cassino, appena la disponibilità di manodopera di quegli impianti lo consentirà, per i necessari lavori di « restauro ». Altre 6 macchine, infine, tra cui un'automotrice termica, di cui è stata decisa la conservazione, si trovano presso vari impianti della rete in attesa di definitiva sistemazione.

	552.036	Già sistemata al Museo
	835.186	Già sistemata al Museo
	470.092	Già sistemata al Museo
	880.159	Già sistemata al Museo
S	685.600	Già sistemata al Museo
	940.001	Già sistemata al Museo
	745.031	Già sistemata al Museo
	691.022	Già sistemata al Museo
E	430.001	Già sistemata al Museo
E	550.030	Già sistemata al Museo
E	321.012	Già sistemata al Museo
E	330.008	Già sistemata al Museo
BC	34 (carr. Tran. Int. Milano)	Già sistemata al Museo
R	301.002 (scart. ridotto Sicilia)	Già sistemata al Museo
P	7 (sc. rid. Ferr. Parenzina)	Già sistemata al Museo
	680.037	Provvis. sistem. nel DL di Merano
	830.035	Provvis. sistem. nel DL di Merano
	290.319	Provvis. sistem. nel DL di Merano
	910.001	Provvis. sistem. nel DL di Merano
	477.011	Provvis. sistem. nel DL di Merano
	905.032	Provvis. sistem. nel DL di Merano
MM	22 (Ferr. Monza-Molteno)	Provvis. sistem. nel DL di Merano
	980.002	A Roma Sm. in att. di rip. e trasf.
R	302.023 (scart. ridotto Sicilia)	A Roma Sm. in att. di rip. e trasf.
R	410.004 (sc. rid. Val Gardena)	A Roma Sm. in att. di rip. e trasf.
	800.098	A Torino Sm. in att. di rip. e trasf.
	480.017	A Milano Sm. in att. di rip. e trasf.
	741.115	A Verona Sm. in att. di rip. e trasf.
E	333.026	A Novi S. Bovo in att. di rip. e trasf.
E	551.001	A Voghera in att. di trasferimento
AIn	56.185	A Foggia in attesa di trasferimento

Allorché ogni pezzo ha ripreso il suo posto la locomotiva viene posta sul binario d'uscita, come ai bei tempi, allorché finita una « grande » era pronta a divorare altre decine di migliaia di chilometri. Questa volta però essa non viene « restituita all'esercizio », ma inviata nel silenzioso salone di un Museo, dove testimonierà insieme ad altre consorelle più giovani e più anziane un momento della storia di quel sistema di trasporto, ormai ultracentenario ma sempre validissimo, che si chiama « Ferrovia ».

Renzo MARINI

12

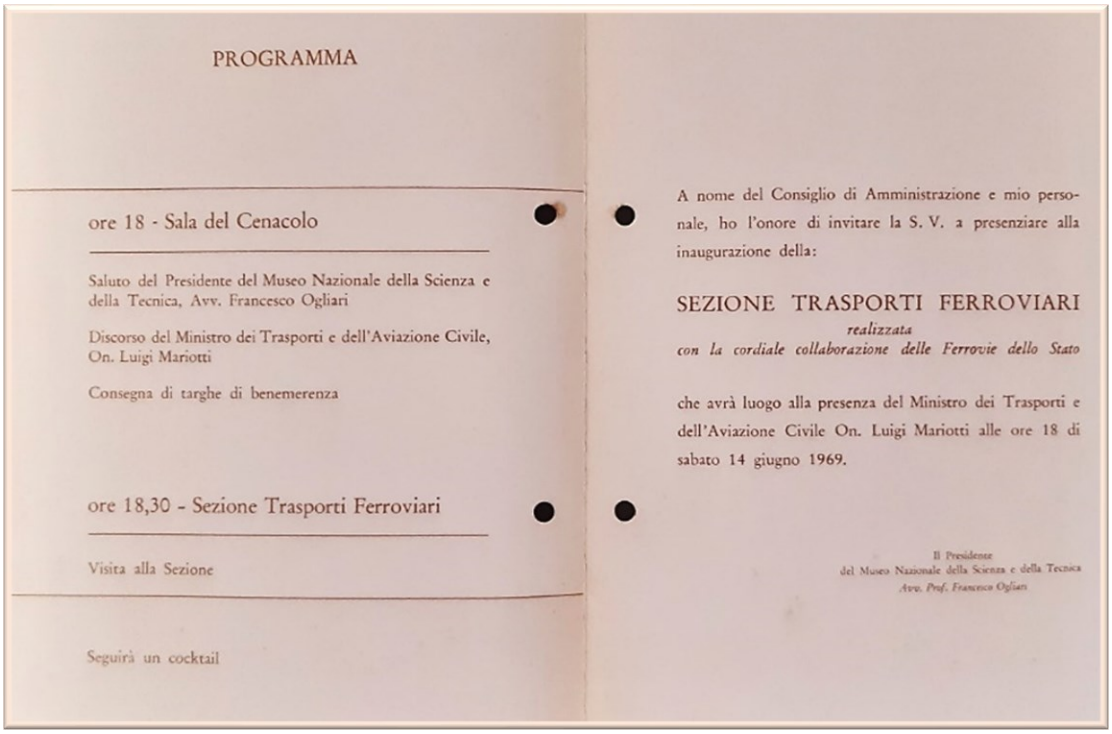
Fig. 3I-5 . ASMUST. *Locomotives to be saved*.[371]

[371] ASMUST, SERIE ALLESTIMENTO SEZIONI MUSEALI, TRASPORTI FERROVIARI 02, ALLESTIMENTO SEZIONE FERROVIARIA 1967-1974.

Following the "backward approach", the second document analysed is the one referring to the opening of the railway pavilion. As already mentioned, this section was opened to the public on 14 June 1969. This event is fully confirmed by the official invitation sent to a small circle of friends, collaborators and personalities who contributed to the development of the Museum.

The invitation, with an interesting photo of the pavilion on the cover, set out the programme, making reference to institutional greetings from the then President Francesco Ogliari and the Minister of Transport and Civil Aviation Luigi Mariotti.

Below are both the invitation (Fig. 3I-6) and one of the invitation lists (Fig. 3I-7) addressed to important figures in the major companies of the time, including *Breda*.



PROGRAMMA

ore 18 - Sala del Cenacolo

Saluto del Presidente del Museo Nazionale della Scienza e della Tecnica, Avv. Francesco Ogliari

Discorso del Ministro dei Trasporti e dell'Aviazione Civile, On. Luigi Mariotti

Consegna di targhe di benemerenza

ore 18,30 - Sezione Trasporti Ferroviari

Visita alla Sezione

Seguirà un cocktail

A nome del Consiglio di Amministrazione e mio personale, ho l'onore di invitare la S. V. a presenziare alla inaugurazione della:

SEZIONE TRASPORTI FERROVIARI

realizzata

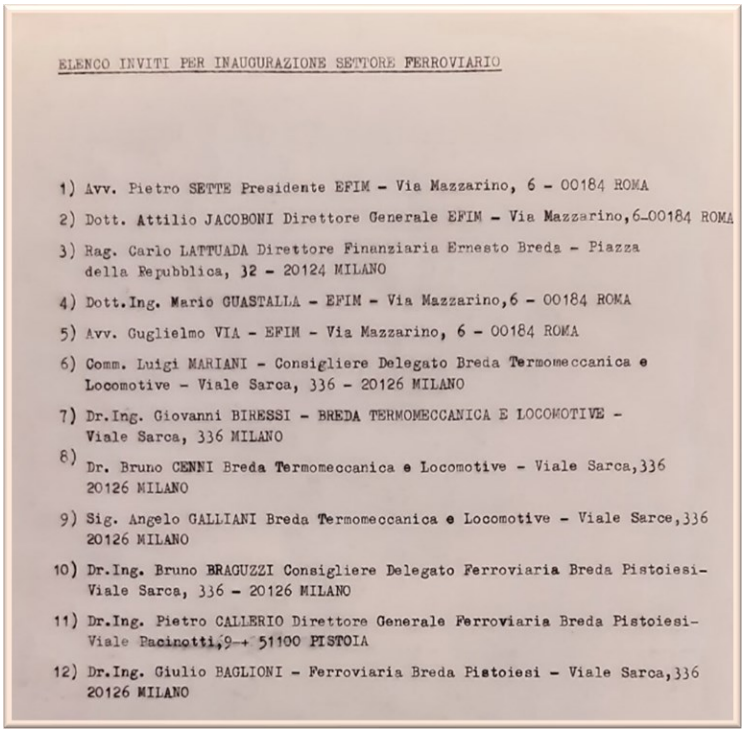
con la cordiale collaborazione delle Ferrovie dello Stato

che avrà luogo alla presenza del Ministro dei Trasporti e dell'Aviazione Civile On. Luigi Mariotti alle ore 18 di sabato 14 giugno 1969.

Il Presidente
del Museo Nazionale della Scienza e della Tecnica
Avv. Prof. Francesco Ogliari

Fig. 3I-6. ASMUST. *Invitation for the opening of the railway pavilion*.[372]

[372] *Ibidem*.



ELENCO INVITI PER INAUGURAZIONE SETTORE FERROVIARIO

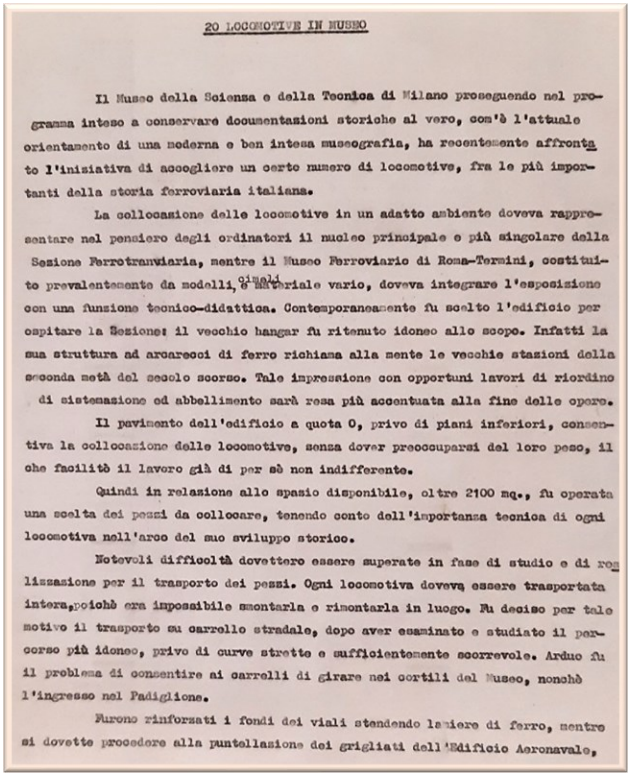
1) Avv. Pietro SETTE Presidente EFIM - Via Mazzarino, 6 - 00184 ROMA
2) Dott. Attilio JACOBONI Direttore Generale EFIM - Via Mazzarino,6-00184 ROMA
3) Rag. Carlo LATTUADA Direttore Finanziaria Ernesto Breda - Piazza della Repubblica, 32 - 20124 MILANO
4) Dott.Ing. Mario GUASTALLA - EFIM - Via Mazzarino,6 - 00184 ROMA
5) Avv. Guglielmo VIA - EFIM - Via Mazzarino, 6 - 00184 ROMA
6) Comm. Luigi MARIANI - Consigliere Delegato Breda Termomeccanica e Locomotive - Viale Sarca, 336 - 20126 MILANO
7) Dr.Ing. Giovanni BIRESSI - BREDA TERMOMECCANICA E LOCOMOTIVE - Viale Sarca, 336 MILANO
8) Dr. Bruno CENNI Breda Termomeccanica e Locomotive - Viale Sarca,336 20126 MILANO
9) Sig. Angelo GALLIANI Breda Termomeccanica e Locomotive - Viale Sarce,336 20126 MILANO
10) Dr.Ing. Bruno BRAGUZZI Consigliere Delegato Ferroviaria Breda Pistoiesi- Viale Sarca, 336 - 20126 MILANO
11) Dr.Ing. Pietro CALLERIO Direttore Generale Ferroviaria Breda Pistoiesi- Viale Pacinotti,9 - 51100 PISTOIA
12) Dr.Ing. Giulio BAGLIONI - Ferroviaria Breda Pistoiesi - Viale Sarca,336 20126 MILANO

Fig. 3I-7. ASMUST. *List of guests at the opening of the railway pavilion*.[373]

A document that is essential for understanding how and when the locomotive was moved into the pavilion is the three-page report compiled by F. Ogliari (Fig. 3I-8/ Fig. 3I-9/ Fig. 3I-10). From this document it can be seen that the *Breda 552.036*, just like all the other locomotives, was transported in its entirety inside the hangar, because its disassembly and successful reassembly would have been too complex. Therefore, in order to carry out the operation as safely as possible, avoiding traffic and create dangerous situations, the transport was arranged at night.

The first item to be introduced was actually the *Breda 552*, on the night of 24 May 1967. All other twenty locomotives were subsequently introduced and within five months they were all installed.

[373] *Ibidem*.



20 LOCOMOTIVE IN MUSEO

Il Museo della Scienza e della Tecnica di Milano proseguendo nel programma inteso a conservare documentazioni storiche al vero, com'è l'attuale orientamento di una moderna e ben intesa museografia, ha recentemente affrontato l'iniziativa di accogliere un certo numero di locomotive, fra le più importanti della storia ferroviaria italiana.

La collocazione delle locomotive in un adatto ambiente doveva rappresentare nel pensiero degli ordinatori il nucleo principale e più singolare della Sezione Ferrotranviaria, mentre il Museo Ferroviario di Roma-Termini, costituito prevalentemente da modelli, cimeli e materiale vario, doveva integrare l'esposizione con una funzione tecnico-didattica. Contemporaneamente fu scelto l'edificio per ospitare la Sezione: il vecchio hangar fu ritenuto idoneo allo scopo. Infatti la sua struttura ad archarecci di ferro richiama alla mente le vecchie stazioni della seconda metà del secolo scorso. Tale impressione con opportuni lavori di riordino di sistemazione ed abbellimento sarà resa più accentuata alla fine delle opere.

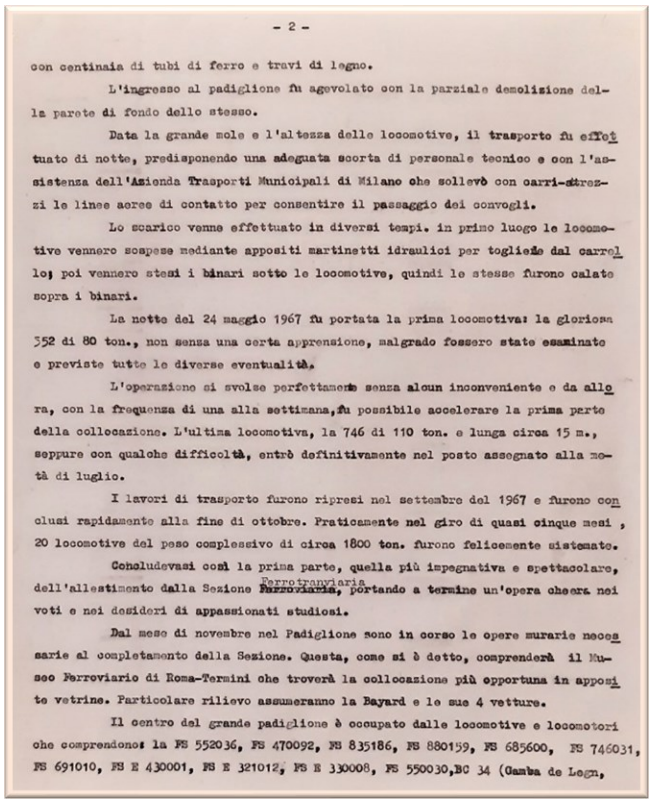
Il pavimento dell'edificio a quota 0, privo di piani inferiori, consentiva la collocazione delle locomotive, senza dover preoccuparsi del loro peso, il che facilitò il lavoro già di per sè non indifferente.

Quindi in relazione allo spazio disponibile, oltre 2100 mq., fu operata una scelta dei pezzi da collocare, tenendo conto dell'importanza tecnica di ogni locomotiva nell'arco del suo sviluppo storico.

Notevoli difficoltà dovettero essere superate in fase di studio e di realizzazione per il trasporto dei pezzi. Ogni locomotiva doveva essere trasportata intera,poichè era impossibile smontarla e rimontarla in luogo. Fu deciso per tale motivo il trasporto su carrello stradale, dopo aver esaminato e studiato il percorso più idoneo, privo di curve strette e sufficientemente scorrevole. Arduo fu il problema di consentire ai carrelli di girare nei cortili del Museo, nonchè l'ingresso nel Padiglione.

Furono rinforzati i fondi dei viali stendendo lamiere di ferro, mentre si dovette procedere alla puntellazione dei grigliati dell'Edificio Aeronavale,

Fig. 3I-8. ASMUST. *Document on the setting up of the railway pavilion (Page 1)*.[374]



- 2 -

con centinaia di tubi di ferro e travi di legno.

L'ingresso al padiglione fu agevolato con la parziale demolizione della parete di fondo dello stesso.

Data la grande mole e l'altezza delle locomotive, il trasporto fu effettuato di notte, predisponendo una adeguata scorta di personale tecnico e con l'assistenza dell'Azienda Trasporti Municipali di Milano che sollevò con carri-attrezzi le linee aeree di contatto per consentire il passaggio dei convogli.

Lo scarico venne effettuato in diversi tempi. in primo luogo le locomotive vennero sospese mediante appositi martinetti idraulici per toglierle dal carrello; poi vennero stesi i binari sotto le locomotive, quindi le stesse furono calate sopra i binari.

La notte del 24 maggio 1967 fu portata la prima locomotiva: la gloriosa 352 di 80 ton., non senza una certa apprensione, malgrado fossero state esaminate e previste tutte le diverse eventualità.

L'operazione si svolse perfettamente senza alcun inconveniente e da allora, con la frequenza di una alla settimana,fu possibile accelerare la prima parte della collocazione. L'ultima locomotiva, la 746 di 110 ton. e lunga circa 15 m., seppure con qualche difficoltà, entrò definitivamente nel posto assegnato alla metà di luglio.

I lavori di trasporto furono ripresi nel settembre del 1967 e furono conclusi rapidamente alla fine di ottobre. Praticamente nel giro di quasi cinque mesi , 20 locomotive del peso complessivo di circa 1800 ton. furono felicemente sistemate.

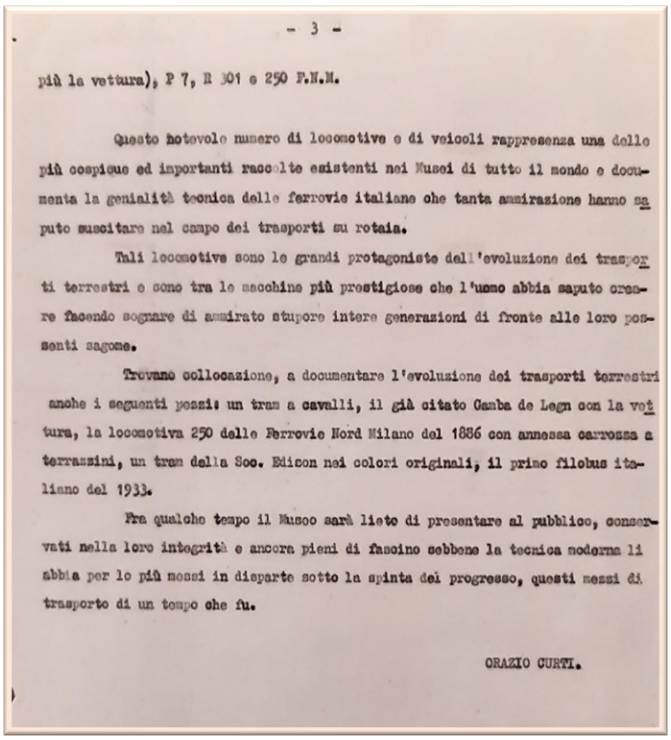
Concludevasi così la prima parte, quella più impegnativa e spettacolare, dell'allestimento dalla Sezione Ferrotranviaria, portando a termine un'opera chesra nei voti e nei desideri di appassionati studiosi.

Dal mese di novembre nel Padiglione sono in corso le opere murarie necessarie al completamento della Sezione. Questa, come si è detto, comprenderà il Museo Ferroviario di Roma-Termini che troverà la collocazione più opportuna in apposite vetrine. Particolare rilievo assumeranno la Bayard e le sue 4 vetture.

Il centro del grande padiglione è occupato dalle locomotive e locomotori che comprendono: la FS 552036, FS 470092, FS 835186, FS 880159, FS 685600, FS 746031, FS 691010, FS E 430001, FS E 321012, FS E 330008, FS 550030,BC 34 (Gamba de Legn,

Fig. 3I-9. ASMUST. *Document on the setting up of the railway pavilion (Page 2)*.[375]

[374] *Ibidem*.
[375] *Ibidem*.



- 3 -

più la vettura), P 7, R 301 e 250 F.N.M.

Questo notevole numero di locomotive e di veicoli rappresenza una delle più cospicue ed importanti raccolte esistenti nei Musei di tutto il mondo e documenta la genialità tecnica delle ferrovie italiane che tanta ammirazione hanno saputo suscitare nel campo dei trasporti su rotaia.

Tali locomotive sono le grandi protagoniste dell'evoluzione dei trasporti terrestri e sono tra le macchine più prestigiose che l'uomo abbia saputo creare facendo sognare di ammirato stupore intere generazioni di fronte alle loro possenti sagome.

Trovano collocazione, a documentare l'evoluzione dei trasporti terrestri anche i seguenti pezzi: un tram a cavalli, il già citato Gamba de Legn con la vettura, la locomotiva 250 delle Ferrovie Nord Milano del 1886 con annessa carrozza a terrazzini, un tram della Soc. Edison nei colori originali, il primo filobus italiano del 1933.

Fra qualche tempo il Museo sarà lieto di presentare al pubblico, conservati nella loro integrità e ancora pieni di fascino sebbene la tecnica moderna li abbia per lo più messi in disparte sotto la spinta del progresso, questi mezzi di trasporto di un tempo che fu.

ORAZIO CURTI.

Fig. 3I-10. ASMUST. *Document on the setting up of the railway pavilion (Page 3)*.[376]

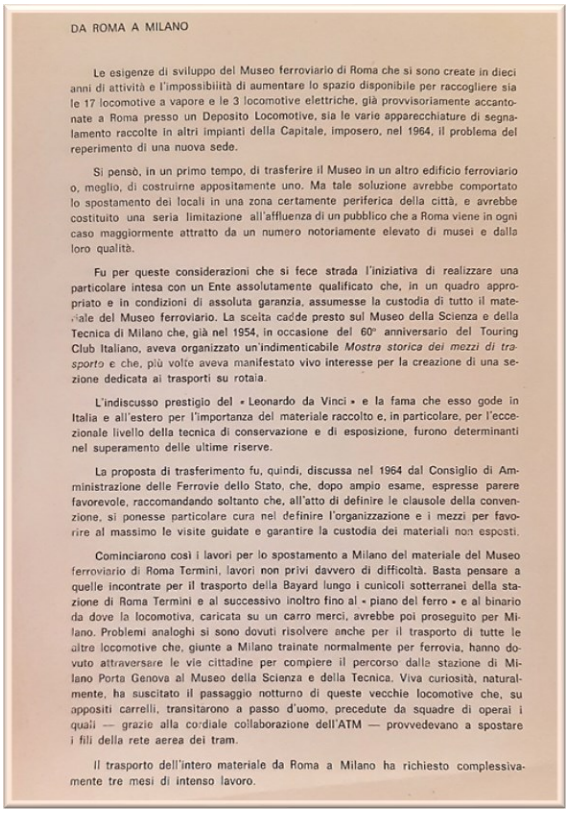
As has already been pointed out earlier, owning and exhibiting some of the most important and famous locomotives in Italian railway history has represented an incredible asset for the Museum. The historical and cultural significance derived from the didactic service is outstanding and acquires even greater significance due to the fact that it was handed over directly by the national body responsible for the railways. The decision to use a disused hangar to contain the locomotives inside is also of great importance. In this way, indeed, the visitors can fully enter the railway world, taking an interesting journey through Italian history by viewing some of the major locomotives that have marked its development.

Finally, there are two archive documents that complete the picture of the arrival of the *Breda 552* at the Museum. The first document (Fig. 3I-12) is a sort of report drawn up in Rome and certainly dating back to after the transportation of the railway materials, i.e. 1967. It is particularly interesting because it mentions the various contacts between Milan (Museum) and Rome (*FS*) over the years. First of all in 1954, when on the occasion of the sixtieth anniversary of the *Touring Club Italiano* the Museum organised the historical exhibition of means of transport and showed great interest in the creation of a section for rail transport.

[376] *Ibidem*.

Ten years after this event, in 1964, the Railway Museum of Rome, owned by *FS*, faced the problem of finding new space for further development. This led to the need for a prestigious and up-to-date location to house some of its most important items. From here the idea of entrusting the responsibility to the *Leonardo da Vinci* Museum. The second document (Fig. 3I-13), which is the point in time that defines the beginning of this affair, is dated 14 July 1964. In addition to presenting the above-mentioned issue, it informed the Museum that the material made available by *FS* was also much sought after by other cities such as Turin and Naples. Indeed, the collection that *FS* was willing to hand over and make available was very interesting for several cultural institutions.

From 1969 - when the transport section was opened at the *Leonardo da Vinci* Museum- to the present day, the locomotive *GR. 552-036 FS* has always been on display in the railway pavilion. The reason for this uninterrupted presence is due not only to its technological value -which for the time in which it was used represented the pinnacle of innovation- but also to its political value, as it allowed the newly formed Italian state to participate in an international affair of great importance.



DA ROMA A MILANO

Le esigenze di sviluppo del Museo ferroviario di Roma che si sono create in dieci anni di attività e l'impossibiiità di aumentare lo spazio disponibile per raccogliere sia le 17 locomotive a vapore e le 3 locomotive elettriche, già provvisoriamente accantonate a Roma presso un Deposito Locomotive, sia le varie apparecchiature di segnalamento raccolte in altri impianti della Capitale, imposero, nel 1964, il problema del reperimento di una nuova sede.

Si pensò, in un primo tempo, di trasferire il Museo in un altro edificio ferroviario o, meglio, di costruirne appositamente uno. Ma tale soluzione avrebbe comportato lo spostamento dei locali in una zona certamente periferica della città, e avrebbe costituito una seria limitazione all'affluenza di un pubblico che a Roma viene in ogni caso maggiormente attratto da un numero notoriamente elevato di musei e dalla loro qualità.

Fu per queste considerazioni che si fece strada l'iniziativa di realizzare una particolare intesa con un Ente assolutamente qualificato che, in un quadro appropriato e in condizioni di assoluta garanzia, assumesse la custodia di tutto il materiale del Museo ferroviario. La scelta cadde presto sul Museo della Scienza e della Tecnica di Milano che, già nel 1954, in occasione del 60° anniversario del Touring Club Italiano, aveva organizzato un'indimenticabile *Mostra storica dei mezzi di trasporto* e che, più volte aveva manifestato vivo interesse per la creazione di una sezione dedicata ai trasporti su rotaia.

L'indiscusso prestigio del « Leonardo da Vinci » e la fama che esso gode in Italia e all'estero per l'importanza del materiale raccolto e, in particolare, per l'eccezionale livello della tecnica di conservazione e di esposizione, furono determinanti nel superamento delle ultime riserve.

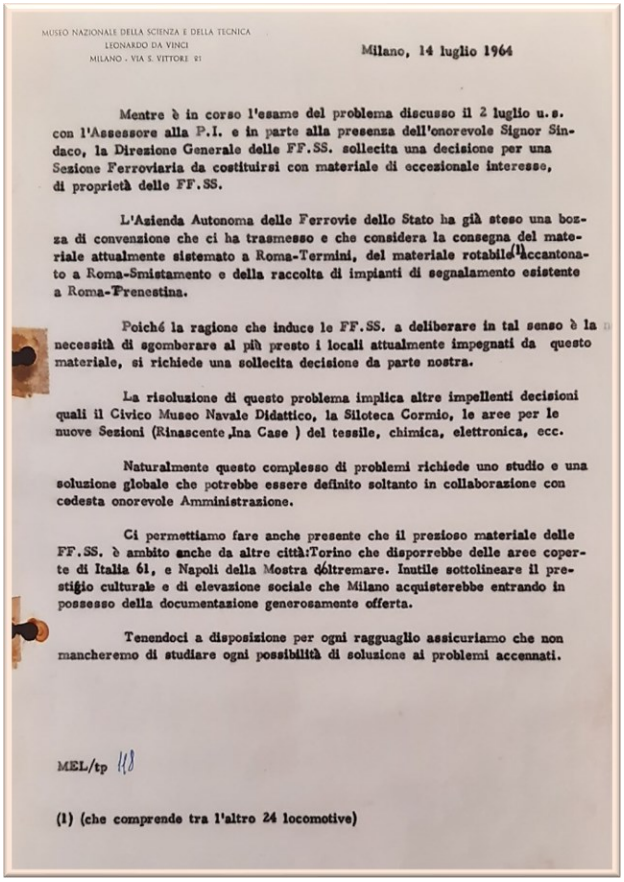
La proposta di trasferimento fu, quindi, discussa nel 1964 dal Consiglio di Amministrazione delle Ferrovie dello Stato, che, dopo ampio esame, espresse parere favorevole, raccomandando soltanto che, all'atto di definire le clausole della convenzione, si ponesse particolare cura nel definire l'organizzazione e i mezzi per favorire al massimo le visite guidate e garantire la custodia dei materiali non esposti.

Cominciarono così i lavori per lo spostamento a Milano del materiale del Museo ferroviario di Roma Termini, lavori non privi davvero di difficoltà. Basta pensare a quelle incontrate per il trasporto della Bayard lungo i cunicoli sotterranei della stazione di Roma Termini e al successivo inoltro fino al « piano del ferro » e al binario da dove la locomotiva, caricata su un carro merci, avrebbe poi proseguito per Milano. Problemi analoghi si sono dovuti risolvere anche per il trasporto di tutte le altre locomotive che, giunte a Milano trainate normalmente per ferrovia, hanno dovuto attraversare le vie cittadine per compiere il percorso dalle stazione di Milano Porta Genova al Museo della Scienza e della Tecnica. Viva curiosità, naturalmente, ha suscitato il passaggio notturno di queste vecchie locomotive che, su appositi carrelli, transitarono a passo d'uomo, precedute da squadre di operai i quali — grazie alla cordiale collaborazione dell'ATM — provvedevano a spostare i fili della rete aerea dei tram.

Il trasporto dell'intero materiale da Roma a Milano ha richiesto complessivamente tre mesi di intenso lavoro.

Fig. 3I-11. ASMUST. *Summary of railway pavilion set-up*.[377]

[377] *Ibidem*.



MUSEO NAZIONALE DELLA SCIENZA E DELLA TECNICA
LEONARDO DA VINCI
MILANO - VIA S. VITTORE 21

Milano, 14 luglio 1964

Mentre è in corso l'esame del problema discusso il 2 luglio u.s. con l'Assessore alla P.I. e in parte alla presenza dell'onorevole Signor Sindaco, la Direzione Generale delle FF.SS. sollecita una decisione per una Sezione Ferroviaria da costituirsi con materiale di eccezionale interesse, di proprietà delle FF.SS.

L'Azienda Autonoma delle Ferrovie dello Stato ha già steso una bozza di convenzione che ci ha trasmesso e che considera la consegna del materiale attualmente sistemato a Roma-Termini, del materiale rotabile (1) accantonato a Roma-Smistamento e della raccolta di impianti di segnalamento esistente a Roma-Prenestina.

Poiché la ragione che induce le FF.SS. a deliberare in tal senso è la necessità di sgomberare al più presto i locali attualmente impegnati da questo materiale, si richiede una sollecita decisione da parte nostra.

La risoluzione di questo problema implica altre impellenti decisioni quali il Civico Museo Navale Didattico, la Siloteca Cormio, le aree per le nuove Sezioni (Rinascente,Ina Case) del tessile, chimica, elettronica, ecc.

Naturalmente questo complesso di problemi richiede uno studio e una soluzione globale che potrebbe essere definito soltanto in collaborazione con cedesta onorevole Amministrazione.

Ci permettiamo fare anche presente che il prezioso materiale delle FF.SS. è ambito anche da altre città:Torino che disporrebbe delle aree coperte di Italia 61, e Napoli della Mostra d'oltremare. Inutile sottolineare il prestigio culturale e di elevazione sociale che Milano acquisterebbe entrando in possesso della documentazione generosamente offerta.

Tenendoci a disposizione per ogni ragguaglio assicuriamo che non mancheremo di studiare ogni possibilità di soluzione ai problemi accennati.

MEL/tp

(1) (che comprende tra l'altro 24 locomotive)

Fig. 3I-12. ASMUST. *Correspondence between the Museum and the FS*.[378]

5. Flying over the borders: the *Breda 15* aircraft

The second vehicle produced by *Breda* to be analysed in this work by chronological order is the airplane *Breda 15*. Thanks to its technical characteristics, this vehicle was one of the Company's most successful products.

It was built in 1928 on a project by the Roman engineer Cesare Pallavicino, who became a well-known name on the international scene over the years.[379] He also worked for other important companies such as *Caproni Aeronautica Bergamasca* (*CAB*), where he produced the aircraft *AP 1*, *CP 3*, *PL 3*, *PS 1*, *Ca 135*, the series from *Ca 310* to *316*, *Ca 331*, *Ca 335*, *Ca 355* and the *Ca 380*. His skills were not limited to the aeronautical sector, but also extended to the motorcycle one, as in 1946 he designed the famous *Lambretta* together with engineer Ferdinando Innocenti.[380]

[378] *Ibidem*.
[379] G. DORATI, *Breda 15*, 2010, https://web.archive.org/web/20101206230153/http://www.giemmesesto.org/Documentazione/Aerei/Breda15.html
[380] S.E.A, *Ali Lombarde* (Milano: Società p.a. Esercizi Aeroportuali, 1993), P.206.

The reason why the *Breda 15* was produced was to participate in the Ministry of Aeronautics's call for tenders for the presentation of school, training and tourist aircrafts. All the Italian aeronautics companies of the time were involved in this initiative. Of the nine models designed and presented, five were from Lombardy, these were: *Breda 15*, *Caproni CA 100*, *Macchi C 70*, *C-4* by *Cantieri Aeronautici Bergamaschi* and *Bonomi B-2* by entrepreneur Vittorio Bonomi.[381] Of these, only two were followed by a successful industrial production, namely the *Breda 15* and the *Caproni CA 100*, while the other three remained prototypes.[382] The other models presented were *CNT* (*Cantieri Navali Triestini*) *CANT 26*, *FIAT AS. 1*, *IMAM* (*Industrie Meccaniche Aeronautiche Meridionali*) *Ro. 5* and *Piaggio P9*.[383]

The competition was won by the *Caproni CA 100* and the *Breda 15* came in second place. However, this event was very important for the company founded by Ernesto Breda, as it marked the beginning of a flourishing period with regard to the production of the model *15* on an industrial scale.[384] In fact, the first two winners of this competition were employed both in civilian flying schools of the *RUNA* (*Reale Unione Nazionale Aeronautica*) and in military flying in the service of the *Regia Aeronautica Italiana* (Royal Italian Air Force). In addition, these two models, together with *FIAT AS. 1* and *IMAM Ro. 5*, also produced on industrial scale, were used by touring squadrons (*Squadriglie da Turismo*) at aeroclubs for the training of the air force reserve.[385]

The success of the *Breda 15* was mainly due to its structure and components. The aircraft had two tandem seats in a large windowed cabin and was made of balsa, wood, metal, canvas and glass.[386] With regard to the engine, this was dependent on the model. The power of the *Breda 15* varied from 85 to 130 horsepower and the engines used were *Walter Venus*, *FIAT A. 50*, *Isotta Fraschini Asso 80 R*, *Colombo S. 63* and *de Havilland Gipsy I*.[387]

There were basically two versions of this aircraft: the model *15* and the *15S* (Fig. 3L-1). While the former was the standard model with 85 horsepower and was used for training, the latter enabled higher performances, up to 130 horsepower, with a more solid and robust structure and was used for long trips and competitions.[388]

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[381] *Ivi*, P.88.
[382] S.E.A, *Ali Lombarde*, P.90.
[383] G. DORATI, *Breda 15*.
[384] O. CURTI, *Museoscienza*, P.562.
[385] S.E.A, *Ali Lombarde*, P.90.
[386] MUSEO SCIENZA, *Aeroplano Breda 15*, http://www.museoscienza.it/dipartimenti/catalogo_collezioni/scheda_oggetto.asp?idk_in=ST120-00369&arg=breda
[387] G. DORATI, *Breda 15*.
[388] *Ibidem*.

Fig. 3L-1. LA LEGGENDA DI LITTLE GABY. *Advertising for Breda aircraft*.[389]

A third model of the *Breda 15* was also produced, although less successful, which was the seaplane version. This was called *Breda 15 Idro* (Fig. 3L-2) and the only difference it showed from the standard model was the possession of floats attached to the undercarriage attachments.

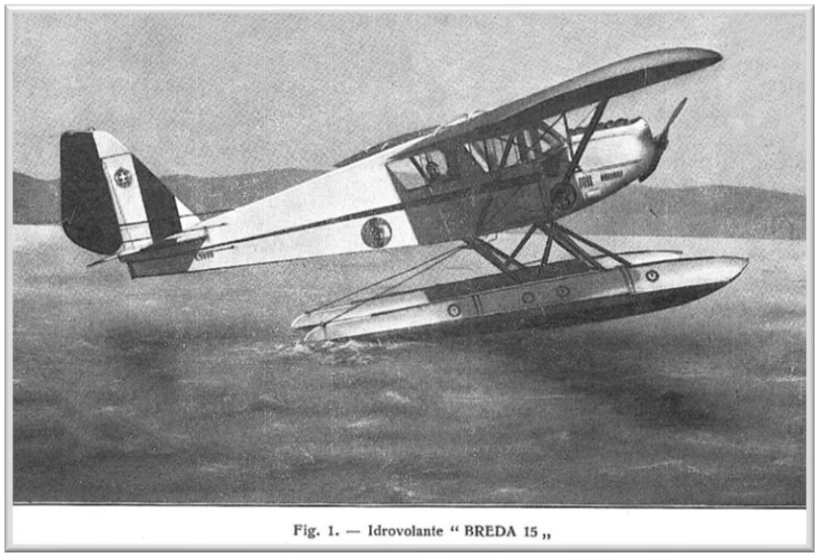

Fig. 3L-2. MINISTERO DELL'AERONAUTICA. *Breda 15 Idro*.[390]

[389] R. PIANO, *La leggenda di Little Gaby*, P.30.
[390] MINISTERO DELL'AERONAUTICA- DIREZIONE GENERALE DELLE COSTRUZIONI E DEGLI APPROVIGIONAMENTI, *Aeroplano da Turismo e Scuola* "*Breda 15 Idro"*, https://www.cmpr.it/MN%20-%20Manuale%20Ba.15%20Idro%20-%20I.F.%2080%20R%20-%20FC/Breda_15_Idro_(IF_Asso_80R)_1931_(CA37)_MI_-_Ministero_dell'-4.jpg

Over the years, the *Breda 15s* was used in several prestigious competitions, such as the *Giro Aereo d'Italia*, the *Trofeo Rebosio* and the *Giro Aereo di Lombardia*, often achieving remarkable results.[391] However, among the many pilots who flew it, there is one figure above all who is remembered for accomplishing extraordinary feats aboard this aircraft: Gabriella -better known as Gaby- Angelini.

5.1 Gaby Angelini: a life in the air

An extremely energetic, lively, curious and dreamy girl, born in 1911[392] in a wealthy family with three sisters.[393] These are just some of the characteristics of a woman who dedicated her life to flying and who found in aerial adventures a form of freedom and emancipation. This was Gaby Angelini.

Gaby's life took a definite direction at the end of March 1931, when at the age of 19, she decided to enrol in the *Breda* tourist flight school in Sesto San Giovanni. Her intention was to obtain the pilot's licence. This was not only because of her strong attraction to flying, but also to commemorate the recent death of his close aviator friend, lieutenant Fausto Cecconi, who crashed while testing a new aircraft.[394] She was entrusted to Francesco Monti, who taught her the techniques of piloting and who was surprised by her abilities.[395]

In just six months, Gaby obtained her licence and officially became a pilot in September 1931. After several months aboard the *Breda 15*, she could upgrade to the more powerful version, the *Breda 15S*.[396]

Following the winter break, in spring of 1932 the neo-pilot began practising on the powerful airplane in preparation for the *Giro di Lombardia*. The uniqueness of this vehicle is defined by its extreme sensitivity and power, which allows it to exceed 200 km/h.[397] In June of that year, the above-mentioned competition was run, but it was a great disappointment for the girl. Gaby finished the race in seventh place, making her second last. However, there is one interesting fact about her performance; over 371 kilometres of track, her *Breda 15S* was able to maintain an average of 188 kilometres per hour, resulting in the best time. Unfortunately for Gaby, this was not enough to win the competition.[398]

However, the young Milanese girl's strength of spirit did not let this episode get her down. On the contrary, she came out stronger than before. Two months later, indeed, she decided to undertake a tour of Europe on board her plane.

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[391] S.E.A, *Ali Lombarde*, P.91.
[392] TRECCANI, *Gaby Angelini*, https://www.treccani.it/enciclopedia/gaby-angelini/
[393] R. PIANO, *La leggenda di Little Gaby* (Baldissero d'Alba: Umberto Soletti Editore, 2014), P.6.
[394] *Ivi*, P.14.
[395] G. ANGELINI, *Il diario di Gaby* Angelini (Milano: A. Mondadori Editore, 1933), P.9.
[396] R. PIANO, *La leggenda di Little Gaby*, P.22.
[397] G. ANGELINI, *Il diario di Gaby Angelini*, P.15.
[398] R. PIANO, *La leggenda di Little Gaby*, P.28.

The adventure that Gaby wanted to star was described by the press as an admirable and courageous endeavour, because she was not yet 20 years old and had only had her licence for less than a year.[399] What she was planning to do was a unique challenge: to travel for several days through different states entirely on her own. A further complication was that the entire trip was made without a parachute, as there were few available and the ones that were offered were too expensive.[400] It took some time to convince her parents of this choice, who, worried about what might happen, had initially opposed it. But Gaby, on the strength of her tenacity and the Mussolini's motto that moved her every time she repeated it -"To dare, fight, win"[401]- managed to get their approval.[402] For this adventure, she got a new bright red *Breda 15*, called *I-TALY*, and a supply of petrol from *Shell*. The aircraft was then adorned with its name in large letters, the *Shell* logo, and the symbol of the fasces in reference to the fascist ideology, to which Gaby was a proud adherent[403](Fig. 3L-3).

Fig. 3L-3. IL DIARIO DI GABY ANGELINI. *Gaby in front of "I-TALY".*[404]

The journey began at the beginning of September and lasted twenty-three days.[405]
Numerous cities were flown over and reached by Gaby on board *I-TALY*. Specifically, the stops were the following: Milan-Munich-Prague-Berlin-Copenhagen-Stockholm-Bremen-Amsterdam-London-Paris-Chamonix-Marignane-Cannes-Albenga-Milan[406] (Fig. 3L-4).

[399] *Ivi*, P.29.
[400] G. ANGELINI, *Il diario di Gaby Angelini*, P.27.
[401] "*Osare*, *combattere*, *vincere*".
[402] R. PIANO, *La leggenda di Little Gaby*, P.30.
[403] *Ivi*, P.31.
[404] G. ANGELINI, *Il diario di Gaby Angelini*, P.63.
[405] R. PIANO, *La leggenda di Little Gaby*, P.43.
[406] *Ivi*, P.31.

Fig. 3L-4. LA LEGGENDA DI LITTLE GABY. *The European route taken by Gaby*.[407]

During this period of more than three weeks, Gaby had to cope with all kinds of weather conditions and was always greeted with great fanfare, joy and admiration at each stage. The international media continuously spoke about her enterprise and she was renamed "Little Gaby".[408]

The return from the long journey was greeted by the public and high State officials with great joy and pride. Gaby represented the Italian civil aviation abroad and was politically celebrated because of her courage and determination; two characteristics of the perfect fascist woman. She was especially proud of this last aspect, because the idea that the club of winged comrades from Milan, Italo Balbo and Benito Mussolini had carefully followed and supported her adventure was very flattering.[409]

Just one month after his return, Gaby personally met Mussolini on the occasion of the tenth celebration of the regime (Fig. 3L-5). Taking her hands, he congratulated her on the recent achievement. She was moved and replied that she did what any fascist woman would have done. When asked about her future plans, she told him of her intention to go to the East. In response, Mussolini wished her all the best and invited her to pass through Rome to greet him.[410]

With the accomplishment of her enterprise and the demonstration of courage and determination, Gaby was no longer seen as a gentle and innocent young girl, but rather as the icon of the perfect fascist woman who best represented what sporty and technological fascism was looking for.[411]

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[407] *Ibidem*.
[408] G. ANGELINI, *Il diario di Gaby Angelini*, P.67.
[409] R. PIANO, *La leggenda di Little Gaby*, P.47.
[410] G. ANGELINI, *Il diario di Gaby Angelini*, P.94.
[411] R. PIANO, *La leggenda di Little Gaby*, P.50.

Fig. 3L-5. IL DIARIO DI GABY ANGELINI. *Gaby greets Mussolini with comrades*.[412]

Back in Italy, Gaby was offered the London-India trip, which would have earned her a large sum of money. The condition for taking part in this trip, however, was to pilot a *Breda 33*. This condition was not acceptable to Gaby and even I. Balbo advised her to refuse and continue using *I-TALY*.[413]
While rejecting this proposal, the aircraft used for the European tour was taken to *Breda*, where it was dismantled, overhauled and reassembled. In addition, rumours about the new adventure to the East had spread and new sponsors appeared to support Gaby's journey. These were *Salmoiraghi*, *Pirelli*, *Allocchio* and *Bacchini*, who provided all kinds of instruments of the highest quality.[414]
Even I. Balbo contributed actively by providing aeronautical charts and *Shell* again made itself available by providing valuable documents on the airports between Milan and Shanghai. Gaby's training and preparation hours had exceeded two hundred, which made the expedition to the East within his reach.[415]
For Miss Angelini, the trip to the East was not meant to be a demonstration of talent, nor was it an attempt to break a new record. She wanted to open up a new route, joining one of the longest air journeys ever, in order to reach and reunite the largest number of Italians in the world.[416]

[412] G. ANGELINI, *Il diario di Gaby Angelini*, P.97.
[413] G. ANGELINI, *Il diario di Gaby Angelini*, P.97.
[414] *Ivi*, P.99.
[415] *Ivi*, P.101.
[416] R. PIANO, *La leggenda di Little Gaby*, P.51.

The destination of the trip was Delhi, India, but the young aviatrix did not exclude the possibility of continuing to the Far East if she felt up to it. *I-TALY* was planned to fly over the following cities: Milan-Rome-Trapani-Tunis-Tripoli-Benghazi-Tobruk-Cairo-Jerusalem-Baghdad-Bassora-Karachi and finally Delhi.[417]

This new adventure began on Monday, 16 November 1932, and the next day, when she was in Rome, she was received for an audience by her source of inspiration, the Minister of Aeronautics Italo Balbo.[418] During their conversation, I. Balbo was perplexed and doubtful about Gaby's intentions, as he felt that for such a complex and demanding expedition she was not prepared enough, despite her great talent. Actually, she only had her flying licence for a year. Nonetheless, with her enthusiasm and tenacity the young woman managed to convince him and so she continued her journey to the South.[419]

The trip started well and offered Gaby unforgettable landscapes, experiences and meetings. She was greeted with great acclaim at every stage, but this successful adventure came to an end on 3 December 1932.

On that day, the young woman was hit by a sudden sandstorm on her way from Benghazi to Tobruk. In order to find shelter and safety, she attempted an emergency landing, but during the manoeuvre the aircraft crashed into the rock face of a wadi.[420]

Gaby's body was found at the crash site and it was discovered that the motor had suffered so much damage that it was running erratically. The rest of the aircraft was completely destroyed.

This is how the aviatrix's life came to an end when she was only 21 years old (Fig. 3L-6).

[417] *Ivi*, P.60.
[418] *Ivi*, P.61.
[419] G. ANGELINI, *Il diario di Gaby Angelini*, P.108.
[420] *Ivi*, P.135.

Fig. 3L-6. IL SECOLO ILLUSTRATO-10.12.1932. *News on the passing of Gaby Angelini*.[421]

Gaby's case is particularly interesting because her life as an aviatrix has always been associated with the name *Breda*. Also fascinating is the political significance of her adventures, as her every success was associated with the ideal model of a fascist woman. Moreover, the fact that this activity was mainly restricted to a male elite makes her story even more impressive, as it represents a narrative of female emancipation.

Gaby's story, however, was not an isolated case. There are other examples, albeit fewer in number, of female aviators who have contributed with their courage to making this practice associated with the female gender, thus weakening the exclusivity of men. In the first half of the 20th century, Clelia Ferla, Luisa Pagani and Tatiana Fumagalli were known on the Italian panorama[422], while on the international one, the names were Amelia Earhart, Amy Johnson, Winifred Evelyn Spooner, Maryse, Bastié and Maryse Hilsz.[423]

[421] R. PIANO, *La leggenda di Little Gaby*, P.72.
[422] *Ivi*, P.4.
[423] *Ivi*, P.50.

Today, the *Leonardo da Vinci* Museum has in one of its deposits the motor recovered from the airplane in which Gaby lost her life; *de Havilland Gipsy I*.[424] Open to the public - in the aeronautical section of the Museum-, by contrast, is the *Breda 15*, a type of aircraft well known to Gaby (Fig. 3L-7).

However, there is no evidence that the one on display in the aviation section was ever used by her. The only information that is known for certain is that the aircraft on display is not the one used for the flight to the East, because except for the engine, everything else was destroyed.

As with the locomotive mentioned above, the aircraft was exhibited together with other vehicles belonging to the same category. The fact that it was decided to keep it suspended by means of a system of steel cables -as can be seen in the picture (Fig. 3L-7)- is linked not only to a question of space but also to refer to the concept of flight, of which the plane is the highest symbol.

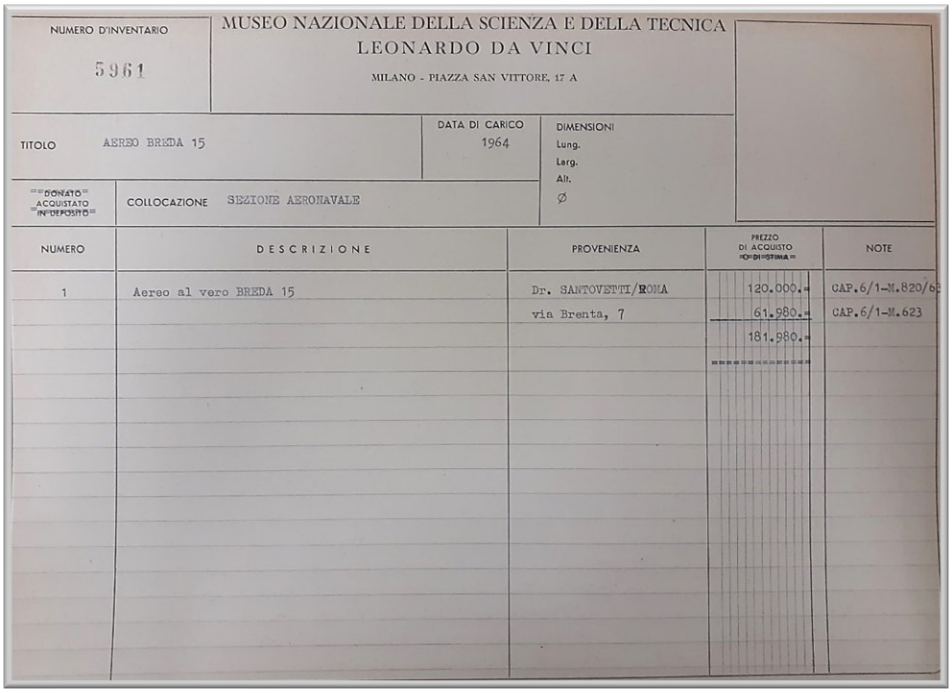
Fig. 3L-7. *Breda 15 in the aeronautical section of the Leonardo da Vinci Museum*. Photo by L. MERY.

5.2 Museum, donation and cinema

As with the locomotive, the strategy adopted by the undersigned to reconstruct the history of how this object came to be in the Museum starts from the end and arrives at the beginning. The reason is the same as in the previous case; for the development of this research, this approach is effective, as it allows to define immediately the conditions under which the events took place.

[424] MUSEO SCIENZA, *De Havilland Gipsy I*, http://www.museoscienza.it/dipartimenti/catalogo_collezioni/scheda_oggetto.asp?idk_in=ST120-00395&arg=de%20havilland

The document from which this investigation process starts is the one concerning the acquisition of the object by the Museum (Fig. 3L-8). The register contains very valuable information, such as the name of the donor -Francesco Santovetti-, when the acquisition took place and the price that was paid for it. It is also reported that the object in question was original and not a copy, as stated in the description "Real aircraft"[425], that it was a purchase and not a donation[426], and that the place of destination of this object was the air force section.[427]



NUMERO D'INVENTARIO 5961

MUSEO NAZIONALE DELLA SCIENZA E DELLA TECNICA
LEONARDO DA VINCI
MILANO - PIAZZA SAN VITTORE, 17 A

TITOLO AEREO BREDA 15

DATA DI CARICO 1964

DIMENSIONI Lung. Larg. Alt. Ø

=DONATO= =ACQUISTATO= =IN DEPOSITO=

COLLOCAZIONE SEZIONE AERONAVALE

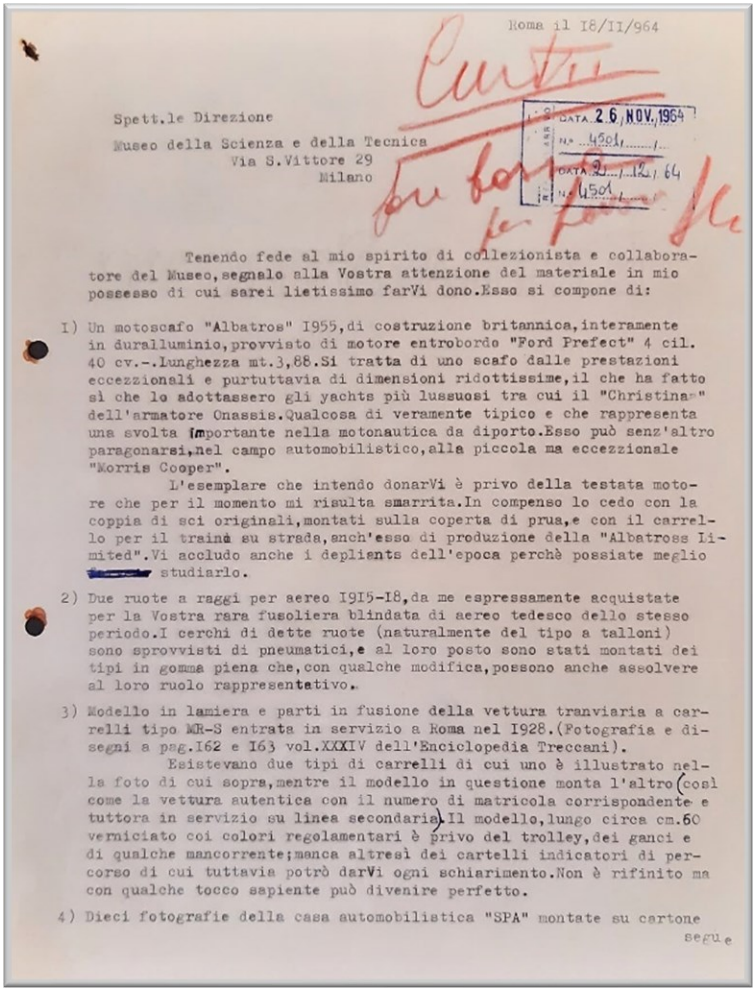
NUMERO	DESCRIZIONE	PROVENIENZA	PREZZO DI ACQUISTO =DI STIMA=	NOTE
1	Aereo al vero BREDA 15	Dr. SANTOVETTI/ROMA	120.000.=	CAP.6/1-M.820/6
		via Brenta, 7	61.980.=	CAP.6/1-M.623
			181.980.=	

Fig. 3L-8. ASMUST. *Load sheet-Breda 15 aircraft*.[428]

The story of the previous owner of the *Breda 15*, F. Santovetti, is as curious as unique. According to the sources, he came from a wealthy Roman family that owned woodlands and vineyards, especially in the areas of Grottaferrata, Velletri and Rocca di Papa.[429] The information about his descent from a high-ranking family is confirmed by the fact that the parish church of the Sacred Heart of Jesus[430] in Grottaferrata was built at the behest of his mother, Maria Santovetti Tanlongo, on more than 3.000 square metres of her own land. In addition, the church is located in the street dedicated to his father, Antonio Santovetti.[431]

[425] *Aereo al vero Breda 15*.
[426] *Acquistato*.
[427] *Collocazione- Sezione Aeronavale*.
[428] ASMUST, ARCHIVIO DEL MUSEO, SERIE ALLESTIMENTO SEZIONI MUSEALI, INVENTARI, SCHEDE INVENTARIALI (PROV.), SEZIONE AERONAVALE, SCHEDA N. 5961.
[429] A. NOBILONI, *La Vermicino*, 2009. http://achillenobilonifrascati.blogspot.com/2009/10/la-vermicino-rocca-di-papa-in-un-libro.html
[430] *Chiesa Parrocchiale del Sacro Cuore di Gesù*.
[431] SACRO CUORE GROTTAFERRATA, *Parrocchia Sacro Cuore di Gesù*, https://www.sacrocuoregrottaferrata.it/

His financial means allowed him to cultivate the passion for motor racing and for collecting vehicles of various kinds. This is clear from a document (Fig. 3L-9/ Fig. 3L-10) indicating a donation he made to the Museum, showing the transfer of a motorboat used on the most luxurious yachts of the time -even Aristotle Onassis owned one-, spoked wheels for aeroplanes and parts for tram cars. Given the importance of these donations and some indications that he was a well-known figure in the Museum, it can be argued that F. Santovetti contributed substantially to the growth of the Institution's collections.



Roma il 18/11/964

Spett.le Direzione
Museo della Scienza e della Tecnica
Via S.Vittore 29
Milano

DATA 26 NOV. 1964 N. 4501
DATA 2/12/64 N. 4501

Tenendo fede al mio spirito di collezionista e collaboratore del Museo, segnalo alla Vostra attenzione del materiale in mio possesso di cui sarei lietissimo farVi dono. Esso si compone di:

1) Un motoscafo "Albatros" 1955, di costruzione britannica, interamente in duralluminio, provvisto di motore entrobordo "Ford Prefect" 4 cil. 40 cv.-. Lunghezza mt.3,88. Si tratta di uno scafo dalle prestazioni eccezionali e purtuttavia di dimensioni ridottissime, il che ha fatto sì che lo adottassero gli yachts più lussuosi tra cui il "Christina" dell'armatore Onassis. Qualcosa di veramente tipico e che rappresenta una svolta importante nella motonautica da diporto. Esso può senz'altro paragonarsi, nel campo automobilistico, alla piccola ma eccezionale "Morris Cooper".
L'esemplare che intendo donarVi è privo della testata motore che per il momento mi risulta smarrita. In compenso lo cedo con la coppia di sci originali, montati sulla coperta di prua, e con il carrello per il traino su strada, anch'esso di produzione della "Albatross Limited". Vi accludo anche i depliants dell'epoca perchè possiate meglio [redacted] studiarlo.

2) Due ruote a raggi per aereo 1915-18, da me espressamente acquistate per la Vostra rara fusoliera blindata di aereo tedesco dello stesso periodo. I cerchi di dette ruote (naturalmente del tipo a talloni) sono sprovvisti di pneumatici, e al loro posto sono stati montati dei tipi in gomma piena che, con qualche modifica, possono anche assolvere al loro ruolo rappresentativo.

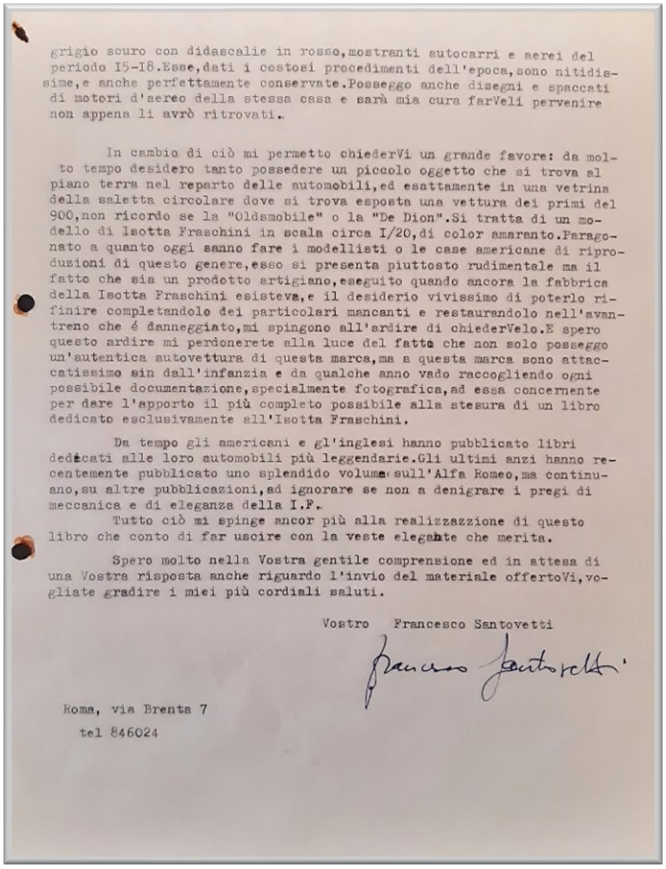
3) Modello in lamiera e parti in fusione della vettura tranviaria a carrelli tipo MR-S entrata in servizio a Roma nel 1928. (Fotografia e disegni a pag.162 e 163 vol.XXXIV dell'Enciclopedia Treccani).
Esistevano due tipi di carrelli di cui uno è illustrato nella foto di cui sopra, mentre il modello in questione monta l'altro (così come la vettura autentica con il numero di matricola corrispondente e tuttora in servizio su linea secondaria). Il modello, lungo circa cm.60 verniciato coi colori regolamentari è privo del trolley, dei ganci e di qualche mancorrente; manca altresì dei cartelli indicatori di percorso di cui tuttavia potrò darVi ogni schiarimento. Non è rifinito ma con qualche tocco sapiente può divenire perfetto.

4) Dieci fotografie della casa automobilistica "SPA" montate su cartone

segue

Fig. 3L-9. ASMUST. *Donations by F. Santovetti to the Museum (Page 1)*.[432]

[432] ASMUST, SERIE CORRISPONDENZA II, BUSTA N. 217, SANTOVETTI FRANCESCO.



grigio scuro con didascalie in rosso, mostranti autocarri e aerei del periodo 15-18. Esse, dati i costosi procedimenti dell'epoca, sono nitidissime, e anche perfettamente conservate. Posseggo anche disegni e spaccati di motori d'aereo della stessa casa e sarà mia cura farVeli pervenire non appena li avrò ritrovati.

In cambio di ciò mi permetto chiederVi un grande favore: da molto tempo desidero tanto possedere un piccolo oggetto che si trova al piano terra nel reparto delle automobili, ed esattamente in una vetrina della saletta circolare dove si trova esposta una vettura dei primi del 900, non ricordo se la "Oldsmobile" o la "De Dion". Si tratta di un modello di Isotta Fraschini in scala circa 1/20, di color amaranto. Paragonato a quanto oggi sanno fare i modellisti o le case americane di riproduzioni di questo genere, esso si presenta piuttosto rudimentale ma il fatto che sia un prodotto artigiano, eseguito quando ancora la fabbrica della Isotta Fraschini esisteva, e il desiderio vivissimo di poterlo rifinire completandolo dei particolari mancanti e restaurandolo nell'avantreno che é danneggiato, mi spingono all'ardire di chiederVelo. E spero questo ardire mi perdonerete alla luce del fatto che non solo posseggo un'autentica autovettura di questa marca, ma a questa marca sono attaccatissimo sin dall'infanzia e da qualche anno vado raccogliendo ogni possibile documentazione, specialmente fotografica, ad essa concernente per dare l'apporto il più completo possibile alla stesura di un libro dedicato esclusivamente all'Isotta Fraschini.

Da tempo gli americani e gl'inglesi hanno pubblicato libri dedicati alle loro automobili più leggendarie. Gli ultimi anzi hanno recentemente pubblicato uno splendido volume sull'Alfa Romeo, ma continuano, su altre pubblicazioni, ad ignorare se non a denigrare i pregi di meccanica e di eleganza della I.F.

Tutto ciò mi spinge ancor più alla realizzazzione di questo libro che conto di far uscire con la veste elegante che merita.

Spero molto nella Vostra gentile comprensione ed in attesa di una Vostra risposta anche riguardo l'invio del materiale offertoVi, vogliate gradire i miei più cordiali saluti.

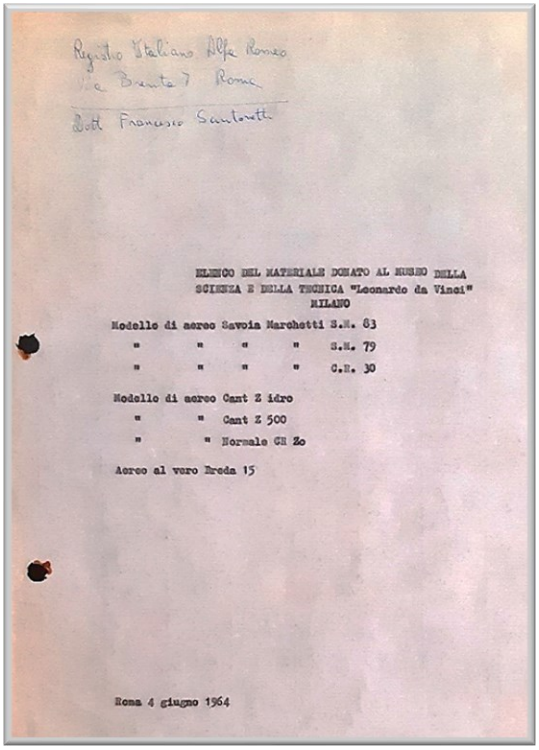
Vostro Francesco Santovetti

Roma, via Brenta 7
tel 846024

Fig. 3L-10. ASMUST. *Donations by F. Santovetti to the Museum (Page 2)*.[433]

Other items donated, or sold, by him were various aircraft models. These are shown in the photo of an archive document below (Fig. 3L-11), where it is also handwritten that F. Santovetti was linked to the Italian Alfa Romeo Register[434] in Rome, of which he was actually the first president.[435]

[433] *Ibidem*.
[434] *Registro Italiano Alfa Romeo* (*R.I.A.R.*).
[435] REGISTRO ITALIANO ALFA ROMEO, *Storia del club*, https://www.registroalfaromeo.com/chi-siamo/



Registro Italiano Alfa Romeo
Via Brenta 7 Roma

Dott. Francesco Santovetti

ELENCO DEL MATERIALE DONATO AL MUSEO DELLA SCIENZA E DELLA TECNICA "Leonardo da Vinci" MILANO

Modello di aereo Savoia Marchetti S.M. 83
" " " " S.M. 79
" " " " C.R. 30

Modello di aereo Cant Z idro
" " Cant Z 500
" " Hornale CH 2o

Aereo al vero Breda 15

Roma 4 giugno 1964

Fig. 3L-11. ASMUST. *List of objects given by F. Santovetti to the Museum*.[436]

However, of the various objects that belonged to him, the most interesting is the *Breda 15*, as this research shows. A really curious and singular aspect is the way in which this object was transferred. In fact, the aircraft was not given directly by F. Santovetti to the Museum, but a mediation phase took place between the two parties, represented by a movie company, as reported on the official object's technical sheet. [437]

Unfortunately, there is no indication of which film company was in charge of this operation, but some information about F. Santovetti's life may offer interesting clues. One of these is related to his experience as actor. In fact, it is reported that the president of the *R.I.A.R.*, besides cultivating an interest in motor racing and collecting vehicles, had actively participated in a 1968 western movie called *All'ultimo sangue*. This was directed by Paolo Moffa, distributed by Warner Bros and produced by the Italian *Società Ambrosiana Cinematografica* (*SAC*).[438] Although there is little information on this subject, the fact that F. Santovetti was involved in this movie suggests that the company responsible for this transfer to the Museum was *SAC*. Regrettably, the absence of official documents on the matter does not allow the certain assertion that this was the case, but the various indications collected do permit the formulation of this hypothesis.

[436] ASMUST, SERIE CORRISPONDENZA II, BUSTA N. 217, SANTOVETTI FRANCESCO.
[437] MUSEO SCIENZA, *Aeroplano Breda 15*.
[438] COMING SOON, *All'ultimo sangue*, https://www.comingsoon.it/film/all-ultimo-sangue/9279/scheda/

So, although the process of the aircraft's transfer to the Institution is difficult to trace, F. Santovetti's great contribution is undoubted, as is that of the many enthusiasts and collectors who have supported the Museum's growth.

6. Italy's recovery at low speed: the *Breda 65* motoped

Among the many involved in this process, there was the engineer Federico Bianchi, whose figure was closely linked to the third object analysed in this work: the moped *Breda 65* (Fig. 3M-1).

Of the three objects produced by *Breda*, this is the one that has been the most difficult. The reason for this is the limited amount of information available, which made its examination anything but easy. However, some compelling and research-relevant findings have emerged, and this section is concerned with their exposition.

The first element which is essential to provide is the category of this vehicle. Unlike the other two, this is an object on wheels, since it is a moped with a low cylinder capacity: 65 cm^3. A hint of its low power is the presence of pedals.

Just like a bicycle, this vehicle can move by means of mechanical energy. It serves mainly to provide it with additional power to that which is already released by the engine.

In fact, if the engine had a significant, or at least sufficient, performance, there would be no need for a support like pedals to provide additional power.

In a somewhat affectionate way, due to its low power and small size, the *Breda 65* was also known as *Bredino*.

The production of *Bredino* began immediately after the War, in 1946, a date that is crucial for a full understanding of its symbolic and cultural value. The preceding pages have outlined the extent to which *Breda* was involved in wartime activities and how its industrial contribution was of fundamental importance to the Country. However, despite the fact that the War had been the Company's most prosperous period in terms of orders and therefore earnings, after the conflict there was a need to reconvert its production. With its manufacture, *Breda* was not aiming to introduce a high-performance vehicle onto the market. On the contrary, the intention was to convert industrial production from war purposes, as it had been until then, to civilian use.[439]

[439] FONDAZIONE ISEC, *1945-1959*, http://www.associazioni.milano.it/isec/mostra%20Breda/pagine/1945-59/p45-59A.htm

Fig. 3M-1. MUSEO SCIENZA. *Motocicletta Breda 65*.[440]

Like many other companies, even *Breda* faced great difficulties in the post-War period. Italy had suffered tremendously from the effects of the Conflict, and this was reflected not only in the economy, but also in the poor state of the infrastructures.

The Country needed to recover and the only way to do this was through the mobility of its citizens.[441] A way had to be found in order to allow the movement of people, who -through their work and production- would have made Italy flourish again.

Railway lines and main roads had been damaged during the Conflict and companies needed to find a solution on how to make people moving, especially the working classes. The vehicles to be designed had to be cheap, easy to use and with mechanics that could endure.

It was with these considerations in mind that numerous companies began to produce vehicles with a shape and mechanics similar, if not identical in some cases, to that of a bicycle, but equipped with a small internal combustion engine. These small motors enabled long distances to be covered with low fuel consumption and speeds of up to 30 km/h. Among the many models on the market, there was also the one manufactured by *Breda*.[442]

[440] MUSEO SCIENZA, *Motocicletta Breda 65*, http://www.museoscienza.it/dipartimenti/catalogo_collezioni/scheda_oggetto.asp?idk_in=ST120-00221&arg=breda
[441] *Ibidem*.
[442] E. FRITTOLI, *I micromotori che rimisero in moto l'Italia nel dopoguerra*, 2021, https://www.panorama.it/bici-motore-dopoguerra?rebelltitem=2#rebelltitem2

In the case of *Bredino*, the shape of the frame is not complex, but on the contrary is very similar to that of a bicycle. The main difference with a bike without an engine is the thickness of the structure, which was designed to contain the small motor that served to make the vehicle move. This model was also equipped with a three-speed gearbox, which was controlled by a lever on the right side of the tank, and a fork with central spring suspension. Some mechanical solutions, however, were evidently similar, if not identical, to those adopted for bicycles. The *Breda 65*, indeed, had a front light powered by a dynamo on the wheel, and since it was designed for one person only, those who wanted to carry a passenger had to install a self-made support on the back, similar to a luggage rack, with a small seat.[443] The picture of the vehicle above (Fig. 3M-1) shows exactly this additional element. Despite the fact that the technical features seemed interesting and that the vehicle was an affordable one, its success was limited. The main reasons were the unreliability of the three-speed engine and the impossibility of carrying a passenger, which could only be overcome by the installation of an additional support, as described above. In addition to the above-mentioned difficulties that hindered the success of the *Bredino*, there was also the problem of strong competition from other historic brands that had introduced similar solutions to the market.

Among these, it is important to remember some, such as the auxiliary engine *Mosquito* produced by *Garelli*, and the micromotors *Cucciolo* by *Ducati* and *Aquilotto* by *Bianchi*. It is fascinating, that these diminutives clearly alluded to the small volume of both the dimensions and the engine. Moreover, the period in which the *Breda 65* was produced was the same as that of two of the most admired and well-known Italian vehicles in the world: *Vespa* and *Lambretta*.[444]

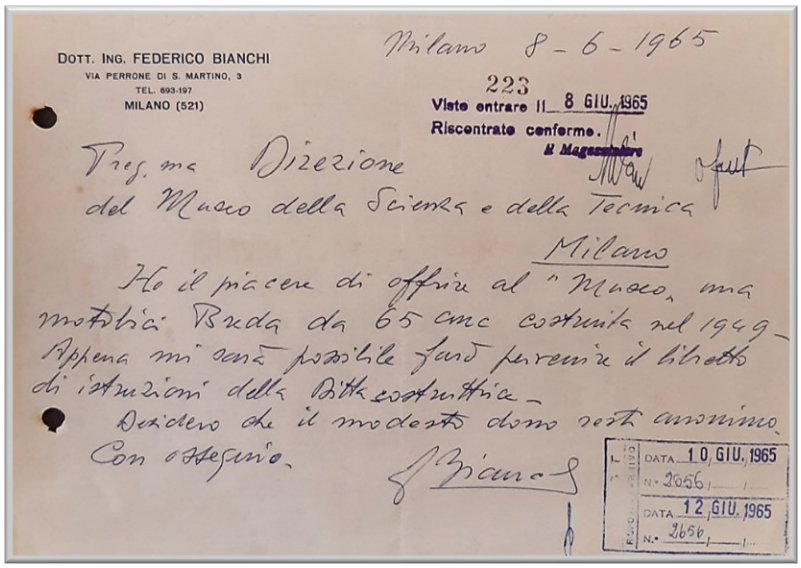
Although the model produced by *Breda* did not achieve enormous success, its contribution to the increase in mobility of Italians after the War was undoubtedly significant. In 1946, the year the *Bredino* was manufactured, 2.500 mopeds were produced in Italy, rising to 11.200 in 1947, 31.000 in 1948 and 70.000 in 1949.[445]

6.1 The model in the Museum in Milan

The model of *Breda 65* displayed in the *Leonardo da Vinci* Museum is not one of the earliest examples, as it was produced in 1949. This can be deduced from a document written by the then owner (Fig. 3M-2), engineer Federico Bianchi from Milan, who gave his vehicle to the Museum in 1965.

[443] L. MERONI, *Breda 65*, 2008, https://www.lombardiabeniculturali.it/scienza-tecnologia/schede/ST120-00221/
[444] E. FRITTOLI, *I micromotori*.
[445] MOTODILOMBARDIA.IT, *La storia- Sintesi dell'evoluzione industriale delle motociclette lombarde*, https://www.motodilombardia.it/la-storia/

Of this donation, F. Bianchi not only described the vehicle as "motobici", which highlights its hybrid nature halfway between a motorbike and a bicycle, but also claimed to remain totally anonymous.



DOTT. ING. FEDERICO BIANCHI
VIA PERRONE DI S. MARTINO, 3
TEL. 693-197
MILANO (521)

Milano 8-6-1965

223

Viste entrare il 8 GIU. 1965
Riscontrate conferme.
Il Magazziniere

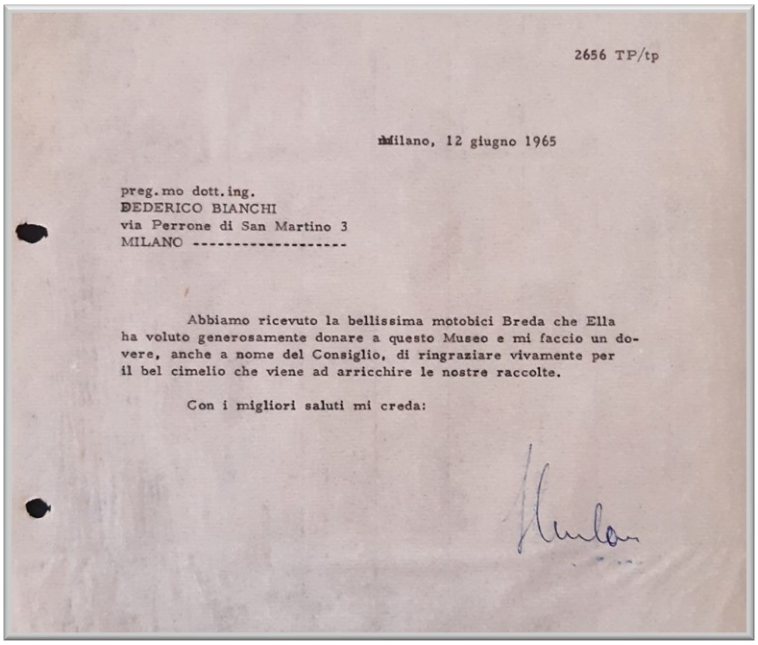
Preg.mo Direzione
del Museo della Scienza e della Tecnica
Milano

Ho il piacere di offrire al "Museo" una motobici Breda da 65 cmc costruita nel 1949.
Appena mi sarà possibile farò pervenire il libretto di istruzioni della Ditta costruttrice.
Desidero che il modesto dono resti anonimo.
Con ossequio.

F. Bianchi

DATA 10 GIU. 1965 N. 2656
DATA 12 GIU. 1965 N. 2656

Fig. 3M-2. ASMUST. *Document by F. Bianchi on his donation of the Breda 65.*[446]



2656 TP/tp

Milano, 12 giugno 1965

preg.mo dott.ing.
FEDERICO BIANCHI
via Perrone di San Martino 3
MILANO ----------

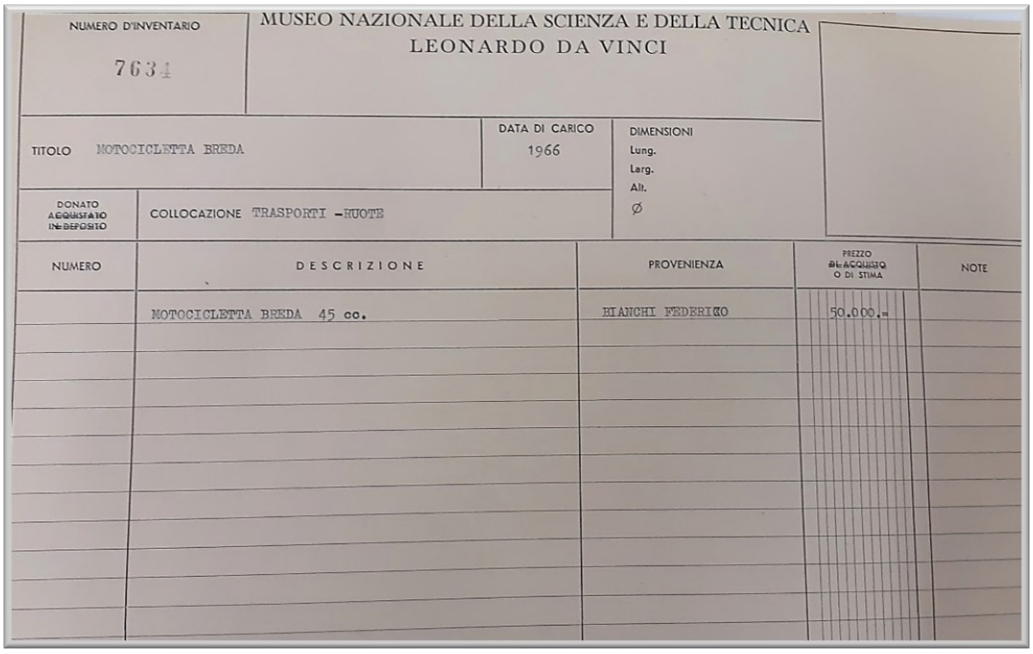
Abbiamo ricevuto la bellissima motobici Breda che Ella ha voluto generosamente donare a questo Museo e mi faccio un dovere, anche a nome del Consiglio, di ringraziare vivamente per il bel cimelio che viene ad arricchire le nostre raccolte.

Con i migliori saluti mi creda:

Fig. 3M-3. ASMUST. *Museum's response to F. Bianchi's donation.*[447]

This was followed by a prompt reply from the Museum (Fig. 3M-3), in which F. Bianchi was solemnly thanked for the importance and significance of the donated object. Nonetheless, despite the great enthusiasm on the part of the Institution for receiving this object, on the loading form completed the following year (Fig. 3M-4), it was indicated in the description that the displacement was 45 cm^3 and not 65.

[446] ASMUST, SERIE CORRISPONDENZA II, BUSTA N. 30, FEDERICO BIANCHI.
[447] *Ibidem*.



NUMERO D'INVENTARIO 7634

MUSEO NAZIONALE DELLA SCIENZA E DELLA TECNICA
LEONARDO DA VINCI

TITOLO MOTOCICLETTA BREDA

DATA DI CARICO 1966

DIMENSIONI
Lung.
Larg.
Alt.
Ø

DONATO ~~ACQUISTATO IN DEPOSITO~~

COLLOCAZIONE TRASPORTI -RUOTE

NUMERO	DESCRIZIONE	PROVENIENZA	PREZZO ~~DI ACQUISTO~~ O DI STIMA	NOTE
	MOTOCICLETTA BREDA 45 cc.	BIANCHI FEDERICO	50.000.=	

Fig. 3M-4. ASMUST. *Load sheet-Breda 65 moped*. [448]

Unlike the other two instances, in which the documents on the contributors were sufficient to reconstruct part of the history of the vehicles that had been donated or sold, in this case, there is very little information on the donor. It is likely that he was a particularly reserved person, as can be inferred from his explicit request that the donation to the Museum be anonymous and therefore make no reference to his name.

To the present day, the *Breda 65* moped is not open to the great public, as it is kept in the Museum's storerooms -called *Collezioni di Studio*- which can only be visited in the company of specialised personnel. The reason why many objects are stored here, including the *Breda 65* moped, is due not only to matters of space but also conservation. Here, in fact, there is a careful control of temperature and humidity, so that the objects do not deteriorate and -on the contrary- are preserved in the best possible way.

In any case, although the details about the donors of the objects are more or less extensive, through a series of documented information it is possible to reconstruct the history of the three vehicles' arrival at the Museum. A lot of knowledge has emerged about the history of these three exhibits and the resulting mobility histories are all very different, making each item even more unique.

These considerations will be discussed in detail in the next section, the one dedicated to conclusions.

[448] ASMUST, ARCHIVIO DEL MUSEO, SERIE ALLESTIMENTO SEZIONI MUSEALI, INVENTARI, SCHEDE INVENTARIALI (PROV.), SEZIONE TRASPORTI-RUOTE, SCHEDA N. 7634.

7. Observations: One brand, three different mobility stories

Up to this point, it has been possible to comprehend how each vehicle portrayed a particular historical period, thus conveying a range of information about the technologies of the past, the historical, political and social contexts, and even making arise some themes, which are apparently distant from mobility.

In the time span of less than fifty years, *Breda* has demonstrated its ability to construct means of transport of all kinds, designed for both the wealthy classes and the less affluent, even building extreme vehicles destined for the most arduous adventures. This Company's versatility is especially interesting for its ability to convert its production from military to civil purposes. Indeed, it should be remembered that *Breda* played a leading role for years in the production of military equipment, both arms and ammunition, for the Italian State.

What makes this aspect even more interesting is the consideration of the fact that the production for civil use was paradoxically almost richer in political significance than the military one. The reasons for this assertion are many and are the result of intense reflection.

Following a chronological order, and thus focusing on the locomotive *GR. 552-036 FS*, it was pointed out that this means of transport was important not only because of the section it covered -linking an intercontinental route-, but also because of the various managements under which it passed, thus becoming one of the flagships of the newly founded state railway company -*Ferrovie dello Stato*. The significance of having such a locomotive under its own management represented a great honour and above all visibility on the international scene. As previously reported, this is confirmed by the Curator of the Museum's Transport Section, Marco Iezzi, who in an interview with the undersigned recalled that one of the main reasons why the Italian state invested huge amounts of capital in the construction of the line -that was later to be covered by the *552*- was political. Italy was recently born -1846- and the *India Mail* convoy began to pass through it in 1871. This was a unique opportunity to establish and show itself internationally to the other states. Hence the reason for the high level of investment.[449]

If it is also considered that the number of people transported per week on this locomotive amounted to eighty-five people, it becomes even clearer how strong its political connotation was. However, if this *Breda* locomotive, capable even of maintaining an average speed of 100 km/h and offering great comfort and convenience to its passengers, had not travelled the route from Turin to Brindisi to connect a much wider route -from London to Bombay- its significance and political force would probably never have been revealed.

[449] L. MERY, *Interview with Marco Iezzi*.

The same can be said for the railway line, because if it had been run by another, less important and technologically less advanced locomotive, its fame would probably have been minor.[450]

The combination of transport and infrastructure turned out to be successful, as the *India Mail* passed through Italy for over forty years, only fourteen on board the *552*. This raised Italy's international profile and generated a significant amount of business, to the extent that, as it has been highlighted in the preceding pages, a hotel was built in Brindisi that over the years became very famous, the *Grand Hotel International*. The opportunity to stay in a dedicated facility was not only an important source of income for the city of Brindisi - and consequently for the Italian state - but also represented the availability of a network of accommodation specifically designed for travellers. In this way they could enjoy a safe place to rest and stay, thus avoiding part of the danger of mobility, an ever-present element in the history of human travel.

The element of the importance of hospitality networks designed for travellers emerged during the interview with the Professor of Early Modern History at the *University of Padua*, Lucio Biasiori, who answered the undersigned's question -"*With regard to physical and psychological fatigue from travelling , is there any information on remedies to cope with this problem?*"- by referring to the accommodation services already present in the Middle Ages[451], citing the writing of the Swiss medieval historian Hans Conrad Peyer "*Von der Gastfreundschaft zum Gasthaus. Studien zur Gastlichkeit im Mittelalter*".[452] The reference to the hospitality offered to travellers shows how travel has always represented both a political and economic opportunity as well as a series of dangers, which had to be constantly faced, even in the 19th and 20th centuries. In the case of *552*, the attempt to remedy the dangers of travel is represented not only by a high-level hospitality network, but also by a means of transport capable of making the duration of the journey shorter than usual and offering elevated standards of comfort and convenience.

In this regard, it is worth recalling what M. Moraglio said during the interview about the word *travel*.[453] Its etymology derives from the old French word *travail*, which was subsequently adopted in Middle English. However, the primary word -which properly provided the meaning of this term- was *tripalium*, from Latin. In ancient times was an instrument of torture consisting of three (*tria*) stakes (*palus*) on which the condemned person was placed and then beaten.[454]

In the light of such an etymological insight, it is understandable how any form of movement has always represented a moment of danger and suffering.

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[450] *Ibidem*.
[451] L. MERY, *Interview with Lucio Biasiori*, 15.04.2022, Audio, 22:19.
[452] "From Hospitality to the Inn. Studies on hospitality in the Middle Ages".
[453] L. MERY, *Interview with Massimo Moraglio*.
[454] M. LIBERMAN, *Annals of Exoticism*, 2007, http://itre.cis.upenn.edu/~myl/languagelog/archives/004709.html

This concept is also reiterated by another academic, L. Biasiori, who confirms how the origin of the term *travel*, which today is usually associated with concepts such as "freedom", "joy" and "pleasure", was perceived in the past as the exact opposite.[455] Although such a consideration may be difficult today, it is necessary to think about the conditions under which people travelled in the past. It is only by making this effort that it is possible to truly understand that the current positive conception of travel is a product of modernity and a privilege not for everybody. Even today, many people experience travel as a time of fear, anxiety and frustration for social, political, economic, religious and gender reasons. So what is necessary to do when considering this issue is to keep in mind the path that it took over the years and the context in which this is -and has been- practised.

An apparently different case from the locomotive, but in reality very similar, is that of the aircraft *Breda 15*.

As with the rail vehicle, if not to a greater extent, this *Breda* product was conceived and designed for a very small part of society, i.e. the more affluent. In this respect, the case presented in this research, namely the story of Gaby Angelini, is exactly the emblem of exclusive mobility. The aviation sector has always been -today as in the past- a very exclusive category, accessible only to people with large budgets. This aura of uniqueness was made even more intense by the presence of the aforementioned Gaby Angelini, who, although very young, managed to bring out her qualities and thus make herself known in an almost exclusively male environment.

Like the *552*, the *Breda 15*, in all its three variants, represented Italian industrial work in the rest of the world. The various competitions and the journeys, but also its remarkable performances have made this aircraft a well-known vehicle on the international scene.

The context in which this item was used certainly contributed profoundly to the growth of its celebrity. This aircraft was the product of a competition in which *Breda* enthusiastically participated to show the quality of its products and to compete with some of the most important industrial groups of the time.

Gaby's enterprises and adventures contributed to the construction of a myth and his overt affiliation with the fascist movement meant that the *Breda 15* went from being a simple aircraft used for civilian purposes to a vehicle that allowed Italian fascism to celebrate the achievements of one of its affiliates around the world. This case is therefore an interesting example of how an object can take on a political connotation, without this being its main goal.

However, as curious as this may seem, it is important to bear in mind what has been written in the preceding pages about *Breda*'s history.

[455] L. MERY, *Interview with Lucio Biasiori*.

In fact, by recalling the great commitment that the Company showed during the War period through the industrial production of weapons and bullets, it is clear that it has always been strongly involved in politics. The case of the *Breda 15* is just one more example of this implication.

While the important observations made by academics M. Moraglio and L. Biasiori -related to the journey- proved to be essential in highlighting the difficulties and the importance of accommodation during the analysis of the locomotive *552*, in the case of the *Breda 15* their considerations are precious in stressing the themes of danger and risk. Effectively, the fate of Gaby Angelini, whose life perished during the journey, is a case in point.

The high risk involved in any journey, however, makes it clear that this element is "part of the game". If there were not this obstacle to overcome, the completion of a journey would not be celebrated as it normally is. Risk is therefore a necessary condition of travel, regardless of its type. Even if it is made with the most appropriate and safest means, a minimum level of risk is always involved.

This is expressed directly by L. Biasiori, who claims that a slight degree of travel anxiety is always present.[456] Indeed, from the moment a person does leave a context to which he/she is accustomed and which represents a form of security, the danger factor takes over. This is one of the elements that most characterises the "mobility-immobility dualism": the interruption of a state of safety and security -linked to immobility- due to a moment of uncertainty and risk -linked to mobility. However, as much as the elements of risk and danger frighten and even create a feeling of upset and fear, the human being has always been -and will continue to be- inclined to move and not to remain in the same place forever. History teaches us that movement is not only physical -i.e. a movement of bodies or objects from point A to point B- but also conceptual, referring to ideas, beliefs and opinions.

Relying on this last statement, it is possible to understand Gaby's adventure as an example of physical and ideal mobility. She represented the emancipation of women in a purely male-dominated sector -that of aviation- and showed that women are capable of achieving the same results as men. If this is considered with reference to what L. Biasiori says about women's freedom of movement in Ancient European civilisations, her case becomes even more important. The professor, in fact, states that women's sphere of mobility was highly restricted, either by their families or their husbands.

The belief was that their place was in the house and that any alteration of this imposition could entail a risk for the family unit and consequently for the whole society. Travelling -in whatever form- would have allowed women to see new realities and contexts different from those they were used to growing up and living in every day. If this had happened, the risk of their emancipation would have increased enormously and consequently also their desire for freedom.[457]

[456] *Ibidem*.
[457] *Ibidem*.

Therefore, the prohibition of mobility imposed on women turned out to be the best solution to maintain what was believed to be the optimal balance for society. This is a clear example of how travel was understood as a risk, not so much by those who took it, but rather by those who would have to pay for the consequences. Such considerations are necessary to fully understand how any form of mobility represents a moment of rupture, which necessarily implies an alteration of the state to which one is accustomed.

The case of the third vehicle analysed in this work -*Breda 65*- is different: the mobility's concepts of risk and danger have nothing to do with it. This item, unlike the other two, had very low power and therefore the speed that could be reached was all but high. As a result, the risk and danger that travellers faced on board locomotive *552* -capable of maintaining an average speed of 100 km/h- and the *Breda* aircraft -capable of reaching speeds of over 200 km/h- were very unlikely to be experienced on this motorbike. However, the modest power of this means of transport provides valuable information on the type of mobility it offered its users.

The theme of speed and the meanings associated with it have already been discussed in the initial pages of this research, in the chapter *Mobility*. As it has been written, depending on the speed -high or low- that a vehicle manages to reach, it is possible to define the typology of its users. But, this must be always accompanied by considerations of the context in which it takes place. In the case of *Bredino*, for instance, the low displacement and very simple frame suggest that the target audience was not particularly affluent. Another element that provides interesting information is the single-seater. *Breda* probably opted for this solution because it was well aware that with a low engine capacity it would have been difficult to transport more than one person. To overcome this "one-seat problem", many opted for a self-made solution, adding a seat on a support at the back, as shown in the photo on the previous pages (Fig. 3M-1). This idea suggests that the owner of this vehicle needed to carry a passenger -maybe family members or friends- and did not have enough money to buy a car. Actually, such a consideration makes sense because, as previously mentioned, this vehicle was produced in the period immediately after the Second World War, when Italians -by contributing to the Country's recovery- had to face with severe economic difficulties.

Italians needed a means of transport to get to work that was cheap and with a simple mechanics in case of problems. According to the considerations made up to this point about the mechanics and the document compiled by the *Leonardo da Vinci* Museum, which estimated the vehicle at 50.000 Italian lire (Fig. 3M-4), it turns out that the *Breda 65* responded perfectly to the needs of the time.

Unfortunately, as it has been pointed out above, the success of this vehicle was not like that of some rivals.[458] However, this does not diminish the fact that *Breda 65*, together with the locomotive *552* and *Breda 15*, represents a very interesting example of industrial conversion, which *Breda* managed to put into practice.

Indeed, what defines the symbolic value of these three vehicles -apart from their unique stories- is a twofold factor; on the one hand, the fact that all three bear witness to different forms of mobility, and on the other hand that their presence in the Museum tells these stories.

As it has been reiterated many times, *Breda* has demonstrated rare industrial intelligence, by managing to adapt to market needs according to historical periods and by accommodating different social, political and economic conditions.

With regard to the analysed means of transport, what has emerged is a multitude of several forms of mobility, which enable the understanding of different facets of reality in its deepest nature. This has also been made possible by the Museum, where they are housed and exhibited. By developing and providing accurate narratives as well as deciding to keep them in their original state, without restoring them, the Institution has enabled them to tell their own story and to be read through the "mobility glasses" by anyone who is interested.

Mobility is not just a concept to be grasped, as it serves also to understand.

If for the presentation of the above mentioned means of transport their mobile nature had not been emphasised, barren stories would have emerged, with no apparent connection between them. Mobility, instead, acted as a connecting link, giving voice to vehicles that would otherwise have had great difficulty speaking and putting them in strong relation to each other.

[458] E. FRITTOLI, *I micromotori*.

Chapter Six: Conclusion & Personal Reflection

At this point in the research, the amount of data collected is sufficient to draw a general picture of the relationship between the notions of "mobility" and "museum". In this way it is possible to highlight some aspects that would probably remain hidden if not investigated in depth.

One of the most striking issues is the strong union between these two notions. Hence, the answer to the research question posed in the introduction of this paper: "Does any direct relationship exist between mobility and technoscientific museums?" -is "Absolutely yes".

Actually, the most interesting aspect is the way in which this relationship manifests itself.

As repeatedly stressed in the chapter "Mobility: an apparently simple notion", the one of mobility is a concept that cannot be shied away from or avoided. It is especially worth bearing in mind that this notion only comes into its entirety when coupled with the complementary ideas of "movement" and "transport". Therefore, it is necessary to recognise its complexity and to understand the extent to which it reveals itself according to circumstances and situations.

In this respect, *ST* museums and science centres, due to their scientific predisposition and cultural responsibility, have the burden and the honour to represent -as they consider best- this concept and to show some -if not all- of its possible manifestations. It is clear that this is not an easy task. The difficulty lies not only in identifying the mobility-related aspects that one cultural institution is interested in analysing and bringing out, but also in the way it wants to expose them to the public, by presenting a certain narrative -which constantly changes depending on the historical period. However, this difficulty is at the same time a point of strength. Indeed, the fact that there are so many possibilities to narrate and present mobility, gives the different museums a practically unlimited range of opportunities to deal with this topic.

The reason why the institutions most affected in this phenomenon are *ST* museums and science centres is due to their nature. Despite the fact that the human being is mobile by essence, and therefore capable of both physical and mental mobility, the channel through which this phenomenon comes to life to the greatest extent, making itself manifest and visible to all, is that of science and technology. The human ability to move with body and mind is certainly a very important theme for other types of institutions as well, such as ethnographic, historical and natural science museums, but it is clear that the place where this phenomenon is most emphasised -through the display of more or less advanced means, vehicles and devices- is the one totally dedicated to the study and exaltation of science and technology.

These in turn -even though they belong to the same category- are very different from each other, as highlighted in the chapter "*STS* and the institutions that represent them".

What changes, indeed, besides the objects on display, is above all the narrative line that they decide to offer to the public and the approach of study and research devoted to the exhibits. This is due to the context in which each institution is located, because as emerged several times in this work, the true meaning that a phenomenon possesses -or more simply an item- is often linked to the cultural, social, political and economic context in which it is embedded.

By using this key of interpretation, it is possible to fully understand why the analysed institutions -like the British, German, American, Swiss and Japanese ones- differ so much from each other, even though they all fall into the same museum category. Each of them presents a series of objects and phenomena related to science and technology, reflecting in a more or less accentuated way the reality to which they belong and within which they are inserted.

The result is a highly heterogeneous *ST* panorama, which makes it possible to realise that sciences are not monodirectional in their approach and study, but on the contrary, offer a practically infinite range of possibilities.

From the most classic and rigorous cases of museology in the technoscientific field, such as the *Science Museum* in London and the *Deutsches Museum* in Munich, moving on to more specific examples in a given sector, such as the *London Transport Museum* -in reference to means of transport- or to more futuristic cases such as the *Miraikan* in Tokyo, up to another category of cultural institution different from the usual museum -namely science centres- with the *Exploratorium* in San Francisco and the *Technorama* in Winterthur, the cases of research, study and communication of science are practically unlimited. Those presented in this paper are only a small part of a much larger scenario, focused on the topic of transport. However, in spite of the great differences between these cultural institutions -which have been highlighted in the dedicated chapters- the most common feature is their desire to communicate the phenomena, achievements and even mysteries of science and technology to the great audience.

This aspect was explored not only through the analysis and study of different sources, but also through the interview with the *Leonardo da Vinci* Museum's Director of Educational, Maria Xanthoudaki. From her words, it emerged the desire of the museum she works with -but this can be extended to the whole museum scene- to offer the visitors a memorable experience that leaves a mark in their memory.

Indeed, as it should be for any cultural institution, including those where formal education takes place, such as schools or universities, the greatest challenge museums have to face is the stimulation of people's interest and curiosity.

Managing to sow the seeds of curiosity and enthuse an inexperienced audience about a topic is a very difficult and far from obvious task. Paradoxically, the complexity increases when the theme to be presented is already known to visitors, such as mobility. In this case, the challenge consists in presenting a series of objects and/or phenomena related to this theme, together with a narrative that is capable of capturing people's attention and which is able to highlight unconsidered aspects. It must be borne in mind that the perception of these objects today is not the same as it was when they were first presented to the general public. Any item is a victim of time and its transformations, and the greatest consequence is its continuous change of meaning over the years. Therefore, even the way they are intended by visitors is never the same. As it has already been mentioned, cultural institutions must constantly demonstrate that they are capable of keeping up with the times. To do so, they need to be able to offer an interpretation of an object that is consistent with the current historical period.

In the case of transport, for example, it is possible to move from a narrative focused on the glorification of a nation's technological development to the need to implement the ecological transition. This does not mean in any way that one standpoint is more important or interesting than another, but that each stance must reflect its own time.

Only in this way it is possible to create a situation of enrichment and maybe even of mutual exchange between the institution and visitors.

As written in the first pages of this work, mobility is a phenomenon that everyone practices in their own way every day, but which is extremely difficult to describe and encapsulate in a definition.

For this reason, succeeding in engaging visitors on a topic that is already well known requires intensive teamwork, continuous research and discussion.

It was this challenge that gave rise to my interest in this topic, which led me to constantly question myself about it to the point of writing these words.

The ways in which the concept of mobility is represented differ a lot between the different cultural institutions mentioned above -as the underlying interest and questions are themselves different- reflecting the social and cultural realities in which they find themselves. A case in point is the *London Transport Museum*, which, as its name suggests, deals exclusively with mobility in its entirety -i.e. transport, infrastructure and topics related to such a theme- in the English capital.

This is a clear example of a reflection of the context within which the cultural institution finds itself and consequently is led to represent and narrate to the visiting public.

The observations made by the Senior Researcher and Professor at the *Technische Universität Berlin*, Massimo Moraglio, suggested that the museum does not only have a social and cultural function, but also a political one. In fact, this place -especially if it is a technoscientific one- due to the large quantity of objects on display -whether material or immaterial- and its function as a place of documentation -as accurately suggested by the Head of Collections of the *Leonardo da Vinci* Museum, Laura Ronzon - can be transformed into a political arena, through which specific messages can be conveyed and a series of thoughts and opinions promoted to the public.

This can also happen with the topic of mobility, representing -also in this case- a moment of surprise. The reason for this wonder is that such an obvious and usual topic is hardly considered in its political dimension, since those who practice it are more interested in its practical function. However, if analysed in depth, this -among the countless topics related to the sphere of science and technology- can even turn out to be the emblem of politics. To bring this to the surface, a considerable amount of research has to be done. Just like a gold hunt, it is necessary to find the right place where to carry out the excavation, which in the case of this study has been the Museum of Science and Technology in Milan, *Leonardo da Vinci*.

Here, in more than two months spent for the completion of my curricular internship, I had the opportunity to see at first hand the work behind the scenes -i.e. the study of a collection and the considerations experts make in preparation for an exhibition. Undoubtedly, the opportunity to handle archive documents first-hand gave me access to information that could not have been retrieved otherwise. As explained in the pages of the chapter dedicated to *Breda*, the "gold" of this museum - to continue the abovesaid metaphor- is embodied in the three products manufactured by the Italian company, which narrate a unique story of mobility.

These, indeed, tell fifty years of Italian history, in three different forms, highlighting interesting political, social and economic aspects. Such combination of meanings has led this study to focus on them and to trace a *trait d'union* among them.

Although this concept has already been explicitly underlined, it is important to reiterate it so that the reader can fully comprehend the different sides and interpretations related to the topic of mobility. As it has been said many times, the full understanding of an object must always be accompanied by the context. This therefore has a fundamental function, because depending on the various historical periods, it casts a different light on the object, making some sides more evident than others.

The result of this continual change of perspective is the changing message conveyed to the visitor, and this is an incredible phenomenon, as it once again emphasises the dynamic and mobile character within the objects, which manifests itself by altering its meaning while not physically moving. Particularly in the case of the *Leonardo da Vinci* Museum, the study of the three vehicles has made it possible to bring to light certain aspects that had been little considered until now, which -in reality- conceal a potential through which it is possible to arrive at a totally new reading of them.

Breda was a brand that meant a lot to Italy because it represented the values of the industry of the 19th and 20th centuries, demonstrating a great ability to adapt to different contexts, always managing to respond significantly to the needs of each period. For this reason, the focus of this research has fallen on three of its many products, which -in the undersigned's opinion- best express the different manifestations and interpretations of mobility. The presence of these objects in the *Leonardo da Vinci* Museum offered a unique opportunity to investigate them closely. The result was an unexpected mosaic representing the sphere of mobility, whose different pieces -if taken separately- tell unique stories. Indeed, the narratives that emerged proved to contain interesting anecdotes of social, political and cultural character, which -once put together- made up the complex mosaic of mobility in *Breda*'s terms. Even topics apparently distant from mobility were addressed, like the feeling of frustration and danger associated with travelling.

This theme, first introduced by Prof. M. Moraglio and then explored by the Professor of Early Modern History at the *University of Padua*, Lucio Biasiori, made it possible to emphasise a characteristic aspect of mobility, which has always been present in any form of movement and will always be as such. Such a mixed and various result practically represented the purpose of this research, which -with great wonder and irony -culminated in the expression coined specifically for this work "mobility glasses".

What this term seeks to signify is the potential of a concept -as complex and vast as that of mobility- to work as a tool for looking at certain objects or phenomena from a different perspective, thus grasping some aspects that would not otherwise have emerged. Concretely, this was the case with the three *Breda* vehicles on display at the *Leonardo da Vinci* Museum.

If they had not been observed with this particular lens, they would have been considered as mere witnesses of their time, without their innermost, deep-rooted core being revealed.

The vision offered by the "mobility glasses", by contrast, not only made it possible to detect their various implications in different fields, but also to place them within a broad industrial context that marked the history of a country.

The innovation of this tool, then -if it is correct to use the term "innovation"- simply consists in looking at a given phenomenon from a different angle, by adopting a spirit that is not restricted to the acceptance of an apparent reality. The risk, indeed, could be to relate to illusory facts, that show themselves in a limiting way, thus making their understanding very limited.

The first to be confronted with these "glasses", having to decide which "lens" -i.e. the approach- to use according to the "frame" -i.e. the aspects to be revealed- are the museum curators. As it turned out during the conversation with the responsible for the Transport Section of the *Leonardo da Vinci* Museum, Marco Iezzi, a large part of the work of this professional figure depends on the direct interaction with the object. The museum curator, therefore, not only has the task of providing the right interpretation of the object according to the historical and social context, but must also be able to translate this understanding concretely to the visitor. It can thus happen that the same object is understood, perceived and seen in different ways over the years. Just like a "reader-writer contract" in the case of books, so too must the visitor be willing to accept the vision and perception of an object provided by the curator. In this respect, therefore, the question of mobility may prove to be fertile ground for new considerations on objects -of different natures- in museums, which have always been seen and analysed from one way perspectives. Perhaps the greatest challenge is to find the point of contact between the museum object that is to be studied and given a new voice and the realm of mobility. If the former was a big door and the latter a key that opens it, the common point between them would be a lock that would let the key in without difficulty to allow an easy opening.

In light of this, it is possible to provide an answer to the second part of the research question, which asks how the link between mobility and technoscientific museums does emerge.

From what has been gathered and analysed, it is clear that there is no single way to explain this phenomenon, but that on the contrary there is a plurality of forms in which it can occur. Nevertheless, although this diversity, there is one element that is always common in the treatment of mobility by technoscientific museums. This element consists in their ability to go beyond the surface, perceiving mobility not as a simple shift from one point to another, but by emphasising its most hidden aspects. Thereby, reference is made to conceptual, ideological and social mobility. All aspects that are very often overlooked, as they live in the shadow of the more popular physical mobility. However, if the cultural institutions analysed in this research were limited to the most celebrated -and taken for granted- aspect, the result would be sterile and lacking in character.

On the contrary, their consideration and analysis allows for in-depth, original and historically and culturally valuable knowledge of mobility-related objects, phenomena and personalities. Moreover, such an approach is particularly important in museums of this kind, as institutions devoted to *ST* research -by their very nature- are always inclined to the study of what is beyond the boundaries of already-known knowledge.

It took me some time to come to this conclusion. It was not an immediate process.

The reason was that for this research, what the knowledge of physical mobility offered me was not sufficient; it was limited and limiting. To understand the true peculiarity of the *ST* cultural institutions, it was necessary to go deeper and grasp the more hidden nuances of mobility. If I had not done so, I would not have been able to comprehend the essence of the three *Breda* objects and the result of this work would have been dull and lacking in substance.

What enabled these results to be drawn was certainly the adopted *modus operandi*. The combination of theoretical and practical activities, mixing research work -through the consultation of books, publications, articles and various other types of documents- with direct and transcribed interviews as well as the analysis of unique archival materials, enabled me to formulate conclusions that could not have been attained in any other way.

The reason for this methodology is closely linked to the training of the undersigned, as there are certain methodological influences of anthropological character -such as interviews, with their recording and transcription- and of historical type- like historical research and archival work.

Conducting interviews with different experts and integrating them into this work made it possible to highlight and address important issues related to the topics of “mobility” and “museum” that would probably never have emerged. In addition, it was very interesting and useful to connect the results of these accounts, thus creating a kind of structure on which to support the theoretical and research work conducted at the same time.

Issues such as the difficulty and danger of the travel, the aims and daily challenges of cultural institutions and the relationship between an object and a museum curator would have been difficult to bring to the surface if they had not been highlighted by the different experts consulted in this work.

Therefore, despite the fact that this type of work and approach required more effort than a mere consultative study, the results that emerged are certainly of considerable value, as they greatly enrich the rest of the more theoretical research. The effort behind this method -identifiable in the formulation of precise questions relevant to the interviewee’s profile, in the recording and transcription of the conversation- was amply repaid by the collected outcomes, useful for the completion of the research.

In conclusion, it is important to keep in mind that this work does not claim in any way to be a point of arrival in the study of concepts such as “mobility” and “museum realities” -and their related relationship- but rather a point of departure. In fact, it is the wish of this research -and clearly of the undersigned as well- that this work be the first in a series on this subject.

It has become clear how vast this issue is and how it can be seen and understood from many different perspectives. Other investigations in this field could be carried out by analysing other types of museums -such as the ethnographic, historical or even artistic ones-, by always focusing on the concept of “mobility” and its different nuances. A certain sense of humility and common sense leads the undersigned to support the need for further investigations in this field, as only a plurality of voices -and “lenses” through which to see- can enable the creation of a framework for a real understanding of the phenomenon.

Actually, as this study has emphasised some points in a fresh way -by shedding light on curious and stimulating facts- the conduction of other works in this field would allow a decisive deepening and knowledge of the topics discussed here.

It is therefore hoped that more and more studies and research will be completed, so that knowledge and learning in this field will be further extended, eventually reaching seemingly distant branches that hide unique keys of interpretation.

Interviews Appendix

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1. Interview by Ludovico Mery (**LM**) with Maria Xanthoudaki (**MX**), Director of Education and the Centre for Research in Informal Education (*CREI*) at the *Museo Nazionale Scienza e Tecnologia* "Leonardo da Vinci", Milan. 28.02.2022- Audio, 23:35.

LM: *Education - how can this term be explained in relation to a museum?*

MX: Well, it can be explained by talking about a pathway that first of all does not only concern the period of schooling, i.e. school or university, but is rather a process of building of knowledge and skills that can concern any visitor of any age, background or expertise.
There are two terms that have been used for decades, often causing a bit of debate, by specialists in the field, that are “formal education”, which basically refers to the institutional education, i.e. school, and “informal education”, which regards a series of activities, situations and experiences that a person chooses to attend, do, and participate in. In this case the characteristic is the free choice. The informal educational contexts, in which experiences are constructed and offered, can be museums, botanical gardens, but also television and different media. Therefore, there are many more informal educational contexts than just museums.

LM: *What competences should a museum educator be familiar with?*

MX: If we put aside those that concern the themes and contents that a museum institution deals with, which are indispensable for people working there, the main competences are those that allow the creation of a learning context that puts visitors at the centre of the experience. Such competences should facilitate the visitors’ process for the development of new knowledge and making of a personal meaning of the museum experience. According to research studies, this knowledge and meaning are very different from person to person, as the subjectivity and personality of visitors in museums is very broad.
Therefore, competences are about how to create the conditions to enjoy the museum in a way that can give something to each visitor.
So, starting from the design and the implementation of services, activities and methods, the aim is to address different types of visitors, helping them to feel part of the museum as protagonists of what is offered to them, and to connect their knowledge with the messages the museum wants to convey.

On the basis of this connection, we try to create something meaningful for each person.
This is a professional profile that is probably not taught in a linear way or through a single training course.
Many of the skills are acquired the field, because each museum has its own identity, its own way of relating to visitors, and therefore there is no single procedure that one can follow to build 100% of the required skills. These would be a mix of professional development and experience in practice.

LM: *With reference to the visitor's education process, is it possible to talk about the museum's responsibility?*

MX: This is a difficult question because the answer could be simply "Yes", but it is more complex than that. The way that educational responsibility of the museum is understood has to do with the fact that very often the messages that the museum aims to transmit through an exhibition, an educational programme or an event might not be the same as what the visitor takes and brings home.
Museum learning is a very complex and diversified cultural process. As such, it is very much based on the subjective and experiential background of the visitors who come to the institution, on their pre-acquired knowledge, interests and motivations, on their personal agenda, so any message or content would be received, interpreted and assimilated by the visitor on the basis- and on the subjectivity- of this agenda.
The museum certainly has an educational responsibility and must work day and night to bring it up to the highest possible level of quality and professionalism, but with the awareness that we are not talking about a linear process "transmitter-medium-receiver". There is a very important negotiation between contents, experiences and prior knowledge that takes place during a museum visit. So what the visitor takes home is much richer, broader and different than what I might expect. This is also the beautiful part of it, because there are so many different things that visitors do receive from the museum.
I have the responsibility to create the conditions so that this experience can be open to this diversity, and to be as memorable as possible. So, the museum experience turns out to be the starting point to ask more questions, fostering the desire to know more or to come back to the institution again.
Hence, the answer is "Yes", there is a very big educational responsibility.

LM: *Regarding the educational approach of the museum, how and in which way has it changed over the years?*

MX: This is another challenging question, because one cannot generalise a process of change that covers all types of museums, because we know how many museums there are in the world and how different they are among them.

We have certainly seen an evolution, and there is a wonderful article by a museologist called Stephen Weil which says "From being about something to being for somebody". For this reason, I see that museum education has evolved from being based on contents and exhibits, which were the centre of the experience, to being based on and for people, even moving to being created together with people. The whole part of participation, co-creation, co-design, and all possible "co-activities", is emerging in the very wake of saying that the museum experience is very rich and built by visitors first and then by the museum. Obviously, this occurs on the basis of the conditions and the contexts that the museum creates.

This awareness, also through research studies, is maturing and gaining ground. So from the *Wunderkammer*, where someone entered, even considering himself ignorant to see the wonders of the world, we have arrived at an experience of museums, as a consequence of an educational approach in which people cooperate, listen to each other and create together. The museum is at the service of people.

More or less, the same happens here, in the National Museum of Science and Technology "Leonardo da Vinci", in the sense that fortunately for us, our Founder put the visitor, especially the young generations, in a very high place in his priorities and objectives when he founded the Museum. In addition to saying that the Museum exhibited the science, technology, industry and innovation in Italy, he also wanted the Museum to be one of the becoming of the world, meant to educate the new generations. He conceived a whole series of resources to do that; in 1955 he created the Centre for Physics, which remained until the 1980s. If you see pictures of it, it becomes clear that it can be considered the predecessor of our laboratories, where experiments were carried out and where teachers and students went to do physics, not to see it just by visiting the exhibitions. The idea of active experience was central already at that time. In the same way, he also came up with the "science bus", a pioneer and unique idea in Italy back then. After the Centre for Physics, the first interactive laboratories were designed and opened, and there are now our active learning spaces, where we continue to pursue the idea that in order to relate to science and technology, you have to experience it first-hand.

On this basis, we conceive and plan a whole series of programmes and resources that give people the opportunity to do things, ask questions and conduct experiments. Our educators are not there to teach anything, but they are there to facilitate a direct experience of various science and technology topics in a very active and participative way.

Obviously there are also situations where we went even further to create opportunities for co-design, few so far, aiming to strengthen the idea that we are at the service of the visitor. We are there to be able to create what is needed for visitors to have their own relationship with science, to own and understand it, and to feel competent and also part of a debate within science and technology, which does not belong only to scientists or insiders. We have been studying educational research for many years now, always looking at the evolution of the sector to understand what methods, tools and trends enable us to evolve our work, constantly reinforcing the idea that the visitor is the centre and everything we do must gravitate around him.

By the way, the word "didactics" is forbidden here. For me, there is no museum didactics, because didactics means that I instruct you, and we do not do that here; we do not have the role of school and we do not want to have it either. So we have chosen to talk about museum education, museum learning, to emphasise the idea of the openness of the museum experience. There is no single solution, nor a desired result that I have to arrive at. Errors and questions are welcomed, because they offer the opportunity to reflect, try again, test new ideas and hypotheses.

LM: *Activities within the museum include research and conservation. As it stands today, how much importance is given to the educational aspect?*

MX: In general, we in Italy are victims of the history of previous laws, which attributed to educational services only an auxiliary and additional role to the main museum functions. In my opinion, this caused a great damage, because it is not so. Even the ICOM definition, which has been valid for decades, says that education is one of the main functions of the museum.

This is something I strongly believe in, precisely because museums were born with this objective and mission. That is why education is at the base, and not added after everything is already decided or completed. Even the way I present myself to the visitors also has an educational dimension in it.

For me, education has a lot of weight. Given my own professional background and stance, I would even push to place it first and above all other functions, because the museum, being at the service of society and its development, is and should always be open to visitors.

If as an institution you do feel you have a responsibility towards education, then this immediately corresponds to a competence, and if it corresponds to a competence, it means that a weight must be put to building it. Education lies in what the museum does and depends on how it is understood and developed. How is learning experienced? How does it manifest itself? How is it created? What kind of professionalism is used to carry it out? It is a matter of choice, surely.

LM: *One last question to conclude: in museums of science and technology, like this one, when is the museum satisfied with its work in education?*

MX: Good question, I like it! For me the museum is satisfied if the experience of the museum manages to make a difference from "before entering" and "after leaving". So it is about a flame that is lit during this experience.

I am not interested in people learning and remembering the names of those who invented things, formulas or how phenomena are called. I am interested in the fact that there has been a moment of connection between what they are, what their background is, their question, and what they have done, seen and experienced within the museum.

So if they take this feeling back home, this could also be a moment of wonder because something unexpected happened, or it could be an emotion, or a big question they could not even answer during the visit, but they might be willing to explore later. If they take it home and this nags at their head, then it means that the museum has left a mark. In that case I am happy and satisfied, because it indicates that I have given "something". This "something" will not necessarily be what I wanted, like when the visitor finds something in the museum that becomes a new knowledge, a new question or a skill.

There are research studies that have looked at the effect that museums have in the long term and we see that it is very interesting. Many studies say that there is an aspect of "deep learning" there. So, what happens in the museum becomes a competence that one uses in other contexts or in totally different situations. This is a great achievement and it proves once more that the museum experience is not linear.

For example, here in the Museum you come and do a tour on Leonardo da Vinci without necessarily becoming an expert, but you can take the many stimuli that this visit has given you, and make use of them in your own way.

2. Interview by Ludovico Mery (**LM**) with Massimo Moraglio (**MM**), Senior Researcher and Professor at the *Technische Universität Berlin*. 03.03.2022- Audio, 23:38.

LM: *Starting from the definition given by TRECCANI, transport is defined as following: "Il trasferimento di persone o cose da un luogo a un altro, attraverso una via di comunicazione o mediante un veicolo"*[459]*. Basing my question on this definition, I would love to ask You what is the role that has the human action and what is the role covered by infrastructures and means of transportation.*

MM: "Transport" is a word that is becoming a bit old-fashioned, because a lot more work is being done on the concept of "mobility", especially in the Anglo-Saxon sphere, which is a pity. Already in 2012 Colin Divall wrote that the term "'transport'" is much richer than the term "mobility'", because in "transport" you have two moments of passage.

"To carry across", this is the Latin root, which has two moments of passage: the first is "to carry" which comes from *portare*, so it is a rite of passage. The very definition of "to carry" is through a crossing of a threshold. Moreover you add the *trans* that gives the power to it, which is also symbolic. If you are outside or inside the walls of a city, there is a very great symbolic, and even legal, dimension; think of crossing the border of a state, for example.

So where the term mobility is becoming much more chic, the term transport is actually much more powerful, in terms of meaning.

And then we have the second part, which the question is about: the infrastructure system of transport. This is another point, where I would like to be a little be playful and provocative. The idea that we have about mobility and transport can only happen when we have set a large sociotechnical system, able to cope with that, which is absolutely true if you think about contemporary mobility. But if you look at the deep history, we left Africa 100.000 years ago, without GPS, without vehicles, without anything or infrastructure.

I would say, we should criticize a short-term view of what is necessary to be implemented to perform mobility and transport, and size the role of infrastructure in this deep history.

[459] "The transfer of persons or goods from one place to another by means of a communication route or by vehicle".- Translation by Ludovico Mery.

This is not just an act of respect for deep history, and a way to say that we can have mobility even without wheeled or motorised transport. But it is also to recognize that we have alternative mobilities done by mobilities, which are performed with low-profile system and infrastructures.
This is a very complex element, but I think it is very important to criticize this mainstream narrative, according to which only with these complex systems we can perform transport.

LM: *Starting from Your answer, You mentioned the difference between mobility and transport. So my question is about the relationship between these two concepts, by asking You if You think that the difference between them is as "fragile" as we are used to think, or if it is more defined.*

MM: This is a very interesting question.
Here we have two different levels. The first level is based on a very popular word: mobility. This is a very popular wording that helps us also to redefine a very scientific paradigm: do not forget the "Mobility Turn", by Sheller and Urry in 2006, and the Zygmunt Baumann's "Liquid Life". There is a wide definition which is often just related to re-use the new term, in order to define a break from the previous dominant term, which is transport. This has been defined also because transport despite the richness of its roots, is actually pinned down to the sociotechnical system allowed by mobility. So this is the overarching point; you have transport- the train, cars, motorways, companies running the transport- and then you have mobility allowed by transport. But there are some semiotics differences.
Another important point, however, is that transport is related mainly- if not only- to physical mobility, while mobility- according to the new paradigm by Sheller and Urry- should encompass also other sort of mobility, including telecommunications, that we have now. Therefore, such mobility realm is made by physical movements and exchanges, through communication and telecommunication. And if you think more closely, actually this is an important point, because an email can trigger mobility, physical mobility- just to mention any invitation to any museum via telecommunication.
There is a strong correlation between communication, even a letter- telecommunication, namely can be a letter or a book- which triggers then a movement. So this is another layer, where the difference is very important. It is not just a matter of wording; it is a matter of what we have.
Then we have a third element, which is not so clear in the "Mobility Turn", but is there. You have physical mobility, but do not forget the term "social mobility", which was dominant in sociology. So, the idea to jump on or down in the social ladder; this is the "social mobility". It was totally underestimated how much physical mobility can trigger social mobility. So, in my case, I moved to Germany where I am very happy.

For me physical mobility meant also a change in the social ladder, to some extent. In this aspect, you cannot speak about social transport, because it makes no sense, but you can speak about social mobility.

So, the difference between these two elements can be reduced to language problems, but I would say it is much more advanced, and therefore, despite what we are losing in terms of the relevance of the words, I would say that mobility is a better term on how to define all this discussion, because it is opening up in terms of what is moving- both communication and telecommunication- the logistics- what we are moving to logistics, which is much bigger than physical mobility passengers- and of course the discussion between social mobility and physical mobility, which is also very important.

LM: *About this relationship, do You think it is correct to state that there is a mutual interdependence between the concepts of transport and mobility? Or do You think that one depends on the other?*

MM: That becomes a discussion like the sex of the angels.

I am not even interested actually, because then we pin down to the point: "Ok, transport is the train and mobility is the experience". No, I do not like that.

I think it is a very basic situation and I think we should elaborate on that too much. And honestly, I do not know what to tell you. What is the real difference between mobility and transport? I mentioned before, that mobility can be largely encompassing other elements, while transport is not able to encompass. Often is just a matter of words. We have parallel universes, where mobility is the train and transport is this enriching situation, because the roots are the same. So the significance is slightly different, but not too much.

So, sorry, but I cannot help you on that.

LM: *And what do You think is the relationship between transport and infrastructure?*

MM: That is a very good question too.

Our point of view is very contemporary. So, I think that we need to assess why we are so interested in to the discussion about mobility, and let's say this is a two-centuries discussion, with the invention of the steam-engine. We need big infrastructures if we go fast, and we go further. We need infrastructures if we want to travel in a comfort way.

As I said, if we have a deep history look, this is an anthropological constant for us, as *homo sapiens*. And not just *homo sapiens*. Plants, animals, everyone is moving quiet a lot around the globe. So, the question of infrastructure is when we put speed, comfort and availability of destinations.

And then you need the large sociotechnical systems to reach these goals. Because then you need a paraphernalia of material and immaterial elements, which help us to do this performative mobility, which is very fast usually, very smooth and very comfortable.
So, this is my too much philosophical answer, but it is really where I would like to go.
It is to say: "If we go slow, if we travel less, then maybe we can have a very lower degree of infrastructure systems, because our performances are pretty much on lower level". So, this is my point.
If we want to be less philosophical, for our life we need an infrastructure system, otherwise we cannot move. We need the materiality and immateriality of infrastructures, even for walking in the city. There is a wonderful paper by Ingoldt on this.
Even walking in the city is something that need a sociotechnical system.
If you read *La Caduta* by Parini, there you understand how walking in the city is risky. There is the question that in order to walk you need a pavement, and if there is no pavement you trip very easily, or if there is mud and you slip, you break your neck. So the problem is that it is only in modernity that we have pushed this need for absolutely fluid and seamless mobility to the extremes.
Previously we travelled badly and dangerously, and by the way *travel* in English, comes from *travail*, which comes from *tripalium*. So travelling is a danger, travelling is suffering.
If you read Chaucer, Canterbury Tales, they say: "We must go together to Canterbury, the journey is tiring, let's make it lighter by telling stories". We forgot this in the modern era, trying to annul the concept of fatigue, which we still have today.
So, this answers your question about infrastructure in a very vague way, but if we do not contextualise it in a dimension of modernity, in my opinion we do not get very far.

LM: *Something that I found quite interesting, when dealing with these issues, is that even if we all face these issues every day and at all times, it is very difficult to find an exact definition that can define them briefly.*

MM: This means that there is no clear definition of what the theme is.
The history of mobility is a recent phenomenon, which for the last eighty years has only been treated in terms of economic history and business history. It did not raised great attention. We had to wait for the sociologists, anthropologists and geographers.
On this point, I believe that historians should make an effort, which they are now beginning to do.

LM: *Absolutely. However, I cannot understand the reason for this situation, where I have the impression that there is a lack of interest, in the sense that this issue is taken for granted and as such there is no real questioning of its essence.*

MM: No, there are some very powerful agencies, beware!
Transport is a subject in the hands of engineers. Engineers rightly do not deal with history, they do not want to think about what they did yesterday, because they have a very powerful teleology.
So we work on improving the situation, compared to a paradigm of enlightened progress.
This obviously has its benefits because it is very comfortable to travel today, at least for those who have the appropriate passport, have the money, and are white adult males. So we are closing it down to about 10% of the population.
That said, there are very powerful narratives behind it, which have precluded any serious discussion of transport and mobility as a different slant. And then there is another very important element, which is that you need archives to make history. Archives are in the hands of companies, and companies work on complex large technical systems.
Try to do the history of driving in Italy in the 1920s! What sources do you have? Doing social history of transport is a problem. So it is easy to make the usual story of this and that.
And then, I debate against Italy, where in a country like this, the fact of doing social history and using alternative sources to written ones, such as images, photographs, stories and diaries, seems a crazy action, that should even to be despised.
So there are very strong reasons why there is not a comprehensive transport story.
In this regard, museums are a bit of an exception, in the sense that they have worked on the artefacts, but for reasons also specific to the museum, they also look at the users, that is, how these artefacts become alive.

LM: *It is precisely with regard to the world of museums that the next question is addressed: What are the differences between a museum on mobility and one on transport?*

MM: Same as above.
In a mobility museum you also have computers and e-mails, or a modem, a server, letters...
The difference between transport and communication came with the telegraph and here there was a big break. Among other things, I have written about this with Gabriele Baldi, who works on communications. You should read about him too!
The break came in the 1960s, when historians, especially American ones, said: “OK, what travels at the speed of light, like the telegraph, is communication. What travels below that speed is transport”.

We had to wait for Mimi Sheller, who said: “No, it is the same thing. In different ways, in different media, with different transmitted objects, but it is the same thing”.
So, anyone somewhat makes the difference. It also depends on the linguistic context.
Museums also have a budget: if you can sell more tickets because you call it “mobility”, you just call “mobility”.
There is also the question of museums, which have a big problem with enthusiasts. Often, to please the enthusiasts who identify much more with the concept of transport, museums call themselves “Transport Museums”, and then there is the problem of technical museums. From what I have personally seen, technology museums generally deal with mobility issues, for about half of their collections.

LM: *Sure. However, technology museums are always keen to specify that they are not museums of transport.*

MM: Of course, because they also understand the trap of the dominant narrative of transport. You do not sell “transport”. I apologise for the marketing speech, but unless it is the faculty of engineering, this topic does not sell.
Why is there no teaching post for the history of transport in the world? Or of mobility history? Because there is no narrative capable of sustaining the discourse of saying “We need this!”.
Why does the transition to a sustainable mobility plan fail? Because we always think in terms of technological development and we are subject to the dominant engineering narrative. Indeed, the transition is failing.
Now I hope that with the war they will wake up a bit and start thinking more seriously about the transition in transport.
There is no serious discourse on governance, because we are waiting for technology to solve everything. This is a nineteenth century approach that no longer works in politics.

LM: *So a certain role is played by marketing.*

MM: Absolutely!
A museum has to do marketing, otherwise it is not a serious museum.
There is also the risk of going to a technology museum and being seen as weird, even more so if it is a transport museum where you are seen as a nerd. There are many of them and I have a high regard for enthusiasts. They often do works that are very tunnel vision, but sometimes they make interesting discoveries.

There are some works that may be naïve, but they are local research works, which otherwise would not be done and which nobody would have done. Interviews with users, work on this and that.
So chapeau!

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3. Interview by Ludovico Mery (**LM**) with Laura Ronzon (**LR**), Head of Collections at the *Museo Nazionale Scienza e Tecnologia* "Leonardo da Vinci", Milan. 13.04.2022- Audio, 25:18.

LM: *The museum is the place par excellence for the preservation of memory. Nowadays, when the temporal dimension that is given more and more importance is the future, why is it so important to focus on the past?*

LR: To answer your question, I would like to base my answer on the content of a book I have found, that I really liked, which is called *La storia a scuola*, by Bravin and Crivellari. It starts with a research on young people's interest in history, in which it does not emerge the discourse of memory, but rather the interest for the past and not for history. So, it emerges a general interest in understanding where we come from, what happened before, but an inability to use the historical method to learn more. Therefore, from these aspects -to answer your question- in my opinion the museum is perhaps more correctly understood as a place of documentation, than of preservation of memory and historical material culture.
In the first writings of the statute, even this museum talks about documenting the history of science, technology and industry. Memory is never mentioned. We are starting to talk about it today because in some way memory helps institutions like this to approach the subject of history. There is a feeling that it is easier to use oral history, storytelling and narrations from the personal level to tell global stories.
It is also a trend in history that of public history, understood as an active, plural and participatory history. This is precisely the idea, as in all similar institutions; to document history. To answer your question, I like what Stefano Gasparri writes: "In our opinion the most relevant aspect is the acquisition of the awareness that the present we are living is not the only possible condition of existence".[460]

[460] *Secondo noi l'aspetto più rilevante è l'acquisizione della consapevolezza che il presente che stiamo vivendo non è l'unica condizione di esistenza possibile*.

I think this is very interesting, I identify a lot with these words. In my opinion, history is not only interesting for the revisited and reinterpreted knowledge of facts, but also for a new interpretation of facts, that starts from the present. So, if you manage somehow to show less known contexts, such as those of education in general, like science, technology and industry, you can connect what happens in the present with the roots, contexts and causes of the past. In short, these are the information that can be reconstructed around a research question.
For example, If I want to understand why the environmental issue has become so important today -socially, culturally and politically- I can examine the past to see how this question was reached and what model of development led to this question.

LM: *In the case of a museum a lot of information can be obtained from an object, especially three-dimensional objects are collected. What are the criteria according to which some objects are collected and others are not?*

LR: First of all we have to clarify, as a museum, what a "museum object" is. This is no longer just a thing, a painting, a technical object or a tool, but it can also be immaterial, digital.
So, the museum object is something that is given an outline, a limitation; it is a part of reality that is isolated, defined and described to be preserved for future generations. Therefore, it is a form of reality, either left over from the past or identified through research work in the present, which is classified as an "object" and described accordingly.
The "museum object" is this. Traditionally, we have focused a lot on the three types of museum object: the physical object, the document or photograph, and the book. These are the classic museum objects, but they are mainly catalogue objects.

LM: *Is this an old conception?*

LR: It is a conception that you realise that it is just partial, especially when you do the work of describing the object. If you attach some related information to an object in the collections, the object is all that; the history of those who have used it, the documents relating to the different subjects who have produced, used, seen or told about it. You can think of an object as something much more open.

LM: *After defining what an object is, the museum basically has to deal with displaying it to the public. Is it right?*

LR: In the case of museums with open collections, there are two sides of museum work. If the museum, as this one was born, is a place of documentation, it will continue -as we have in our statute- to document science, technology and industry through testimonies of the past and present.

The task of the museum is on the one hand to create this heritage, and on the other hand to study what we have inherited from past years, reinterpreting it. Here again, the exhibition is just one of the forms of restitution and public reinterpretation. There can be many others.
The quintessential museum is the exhibition; the place where a story is told, through space, things, languages that have changed over time. Through the setting up apparatus stories are narrated to the audience. This can also be done with a publication, a public event and many other ways.

LM: *During this restitution phase, does the museum prefer to give a direct and clear message or to leave room for visitor's interpretation?*

LR: The museum, first of all, is made up of about a hundred people, so it is the sum of all these voices. In addition, there are precise guidelines, a practice that is consolidated and there is a hierarchy of approval. However, an exhibition made by a curator can be very different from another curator, because it is a form of thought and a way of expressing content, which depends on the accessible spaces, on the stories that you want to tell, and on the available objects and materials.
Hence, the museum does not have just one voice, but has many. While this could once be seen as a negative aspect, in reality it has to be accepted that there are common practices, but also an interpretation very much linked to one's own experience as a curator.

LM: *How does this plurality of voices within the museum manifest itself in the relationship with visitors?*

LR: Through the different exhibition tools. In other words, there is a desire to narrate the content. The space for the visitor is there but it is limited; there is no obligatory space, but many spaces in which you can freely move but where you have to orient yourself alone.
Visitors are all different. The level of accessibility to information is very diverse, so taking this variety into account is almost impossible. A mediation is sought, even a style that over the years has changed a lot. We started with a few objects and all of them were exhibits, i.e. interactive devices aimed at directly and physically involving the public in the tradition of science centres and making them experience a scientific and technical phenomenon, or even to show a series of contents in an appealing way to then return to consider the relevance of the object as an original of the museum, compared to other places of culture.

If one enters a museum he/she does not expect to listen to music or do gymnastics; he/she expects to see things. This seeing of objects has transformed over time, from the more or less imaginative through the development of the language of exhibition design to the desire to expand the visitor's expectations of museums to the different. We like the idea that you arrive and think you will find something classic, but actually you will find something different. However, it is still a place where you go to see and do things. This is inherent in this type of museum.

LM: *Today -in a reality where we are often inclined to take a stance- when museums deal with certain objects with particular social or political connotations, what attitude do they try to maintain?*

LR: That of the institution. If you study and read the history of institutions, you know that it is very difficult to leave the parameter of the institution. First of all, a museum is never neutral; the people who work there are people with ideas and opinions. It is very difficult to impose intellectual work from above on free people, but at the same time there are unwritten restrictions from which it is very difficult to escape from it. A national museum represents the nation.

This whole movement of international museology to deconstruct the museum, cannot destroy it. The work to be done is to be aware of the context.

Starting from these limits, it is important to try to experiment with more innovative aspects, which aim to be more incisive, clear, involving and interesting for the society in which we live, otherwise we spend a lot of time on things that have no feedback.

So this museum is interesting because it has always left the possibility of experimentation open. Always with a rigid approach to design, this type of museum does have -on an international level- a relationship with the power of industry, therefore with economic power, from which it is very difficult to break free both economically and conceptually. We were born with the industrial revolution, the universal expositions, and the desire and the need to create a public place to celebrate progress and a powerful economic and social revolution, on which nations were also measured politically.

This 19th-century imprinting is very difficult to overcome. So, to return to the visitor's space, the exhibition is the most rigid aspect, because it is fixed and it stays there. Instead, there are more hidden forms, events, projects, meetings, activities, where official communication does not need to be so defined. This is a conflict that exists in all museums of science and technology. It is not easily overcome, because it means going beyond ourselves and what we are; it would be becoming something else.

An interesting aspect is that of research, which technoscientific museums are now rediscovering in recent years. If you work carefully on the material you are dealing with -objects, collections, exhibitions- you can also find different ways of telling stories. But it is not easy.

LM: *So far we have been talking about innovation, research and a continuous attempt to stimulate people's interest. My final question is: at this point, what are the challenges for the museum in the future?*

LR: This should be asked to the General Director of the museum. From my point of view, the challenges are many. To be a cultural laboratory, therefore to be able not only to be the voice of science and industry, but also to bring into the museum the requests that are discussed at an international level by the whole society. This would mean to be able to find what is the declination that we can give as a technoscientific museum in general and as a technoscientific museum in Italy, in Milan.

The challenges are about working with contents that are relevant to people, capturing and documenting significant aspects of science and technology from the past. The tasks are many; above all, to do the work of the museum well. For me, as the Head of Collections, it is about being able to study the collections more, to conserve them better, to valorise them in the widest and most diverse way possible. All these are challenges that a cultural institution cannot do otherwise.

It is not possible not to be a centre of cultural production, otherwise nobody would be interested. Today, no one can tolerate institutions that fail to involve and do interesting, useful, well-positioned and innovative work. I think these are the challenges.

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4. Interview by Ludovico Mery (**LM**) with Marco Iezzi (**MI**), Transport Section Curator at the *Museo Nazionale Scienza e Tecnologia* "Leonardo da Vinci", Milan. 14.04.2022- Audio, 28.06.

LM: *Generally speaking, I would like to ask You what a museum curator is and what his/her goals are.*

MI: Museum curators are figures that depend very much on the nature of the museum they belong to as well as where they are placed and put in context. We can say that in the Museum of Science and Technology it is a figure who basically picks up a theme, tries to develop it and to understand which collection related to it is already in the museum's collections.

He/she also focuses on which part needs to be renewed, because the world around us is constantly being updated.

From there, then, an evaluation is made together with the entire museum structure. So, starting with the general management, as well as the manager of the development area and of the collections and educational services, there is a whole question regarding the approach to the public that has to be compatible with the theme. Here, then, one goes in search of the physical object, which, however, also runs the risk of being a bit of a Chimera, because it takes a lot of energy away from the work of many museum figures, even when sometimes it is not strictly necessary. The function of the object can be transferred to other media; with the advancement of technology in museums, we see so many media being inserted, and hence the relationship between the exhibition and the creative part is fundamental.

Today in the museum we talk about the creative part. I personally do not find this very correct, because everything should be creative: the creativity in the educational services, in the development of the theme, in the analysis of the reading of the theme. The whole part of web communication is also fundamental in this sense, as it converges and contributes to the success of the museum itself. The purpose of the museum curator for me is to be a decent connoisseur of the topic assigned by the management. It is necessary to have particular skills, a good historical analysis of what you are dealing with and to be able to seize the opportunities of the moment.

I am currently working on a project that many people call “Interreg”. In reality “Interreg” is only the funding term, which is a key element. If a theme is not funded, it is not done. Unfortunately, this is a reality to which one must surrender. This project is about the theme of the great European tunnels. In a way, we are experiencing a return to the theme of perforating the Alps to unite Europe, which had been already experienced from 1870 to 1905.

These are the two great extremes with the first Frejus tunnel and the Simplon tunnel, that subsequently opened at the Universal Exhibition in Milan.

So I consider these to be the fundamental tasks. A museum’s project is something that cannot be done alone, but is done by many. Starting with money, which is the real engine that sets a project in motion, to having good ideas. Above all, the curator today is the one who has a good relationship with external institutions that will be able to give you specific answers to any particular need.

To be an expert curator in my field, i.e. the transport curator, is practically impossible. One cannot be an expert on submarines and carriages at the same time; they are two spheres too far apart.

However, I think I have managed to strike a good balance between possible sector-specific experts. So if I need to know things about submarines, engines, carriages or cars, I know whom to call. There are even subsectors linked to specific brands and people. If I need to talk about *Breda*, I know which archive I can refer to.
In this way it is easier to get the information quickly, in the time you need it. This is the figure of the curator today, who on the museum's side responds to exhibition sections and on the other side replies to external stimuli from the researcher and the scholar who is delving into a very specific topic, trying to orientate him/her.

LM: *It is clear that the relationship between a curator and an object is very direct. The main challenge is to give voice to an object that by its nature has none. During this process, what are the aspects that are taken into consideration and what are the difficulties that You may encounter?*

MI: Well, I think you will have already found some answers in this from Laura [Laura Ronzon, Head of Collections at the *Museo Nazionale Scienza e Tecnologia* "Leonardo da Vinci"] . Especially in a museum as large and wide-ranging as the *Leonardo da Vinci* Museum, the object does not have much meaning in itself. It is important to have the *Toti* submarine, but our wealth is not in the diamond placed in the room. It is in the amount of objects and information you can put around it to accompany and deepen the story. Even in the *Leonardo's Gallery*, which gives our museum its name, there is no room dedicated to Leonardo, or the mechanical chariot. There is a plurality of objects.
How the collections are put together can lead you to the theme that brings you to the present day, allowing today's public to understand and interpret it. However, this too has changed to some extent; in the 1950s, when the museum was founded, the transport area was experiencing a rush to the medium and so it is almost more correct to speak of a "means of transport" section. Today our society is no longer so tied to the vehicle; it is much less interesting to say : "I have the Kawasaki you have the Honda". It is more attractive to be able to say that road there has drainage asphalt or has guard-rails that are too dangerous for motorcyclists.
So you can also take commonplaces, which start from a practical need to be analysed by experts. Usually there are actually offices within the various municipalities that analyse these things. These are concerned with analysing and responding to people's needs. You have to be able to mediate and know how to collect and meet these requirements. Perhaps the modern curator in this sense is much more detached from the object and much more attached to the theme, looking at other curators in other realities. In my opinion, the best curator is the one who manages to ask the right question.

LM: *So the difficulty lies in asking the right question?*

MI: When I grow up, I would like to be able to always ask the right question to the public who will enjoy visiting the spaces I am responsible for. To have stimulated them, scraped away some of the clichés and left them some space to ask themselves the above-mentioned question.

LM: *Talking of questions, what do You think is the most appropriate question to ask to bring out the mobile nature of the vehicles on display, which by their very nature, inside a museum, must be immobile?*

MI: Of this I am quite certain: the answer lies in moving from the medium to the system. It is very easy in the railway world; the train runs along a system that we all take for granted, but the train itself -let's take the India Mail for instance- would be a paperweight if there was not any system around it. It does not go anywhere. What is the trigger? It is the transport system. This is another very complex entity that does not work if there is no energy and telecommunications. Let's take the latter, which has probably had one of its greatest boosts of technological development precisely because of the transport system, by generating a real network of self-supporting and self-powering technological systems. In this strand, what is the point of origin? Considering your studies, I would like to ask you as an anthropologist. What is the origin of moving? Is it trade? Or is it knowledge? These are very nice ideas. Very often there is war and people do move because -I think- they are hungry.

LM: *So, before understanding the nature of the object, is it necessary to comprehend the context and the reasons for its use?*

MI: Exactly. For me it was enlightening to discover many years ago the *552*, the *India Mail*. This is a British convoy that was born out of a British need. For Italy, this convoy was born in 1871. In reality it already existed, it was previously passing through Marseilles and had a different route. It was born in 1861. The question is: "Why does Italy spend so much money for it?". It was even decided in 1861 -a few months before the Unification of Italy- to spend huge amounts of capital, more than the Country's gross domestic product, to build this route from Val di Susa to Brindisi.
"What do people do along this route?". "They are farmers, what need do they have to move?" None. "Why this?". It is a political need to exist. It is a new-born country, born out of a war and out of taking land from other countries. It is a matter of self-affirmation. This is incredible because today we take the train to travel. Back then there was no such thing. "Why am I talking about the India Mail?".

Because this means of transport had a maximum capacity of 85 people per week. This is unbelievable if compared with the tram in Milan, which carries much more passengers.
So today this would be an intolerable work for such a type of service. In order to give meaning to it, we must try to read it slightly differently; at the time the need to move did not refer to people, but to things. And today it is the same: infrastructures are made to move things. We deceive ourselves that we build the motorway to go to the sea. In reality, infrastructures are built for particular needs and only then made available for our mobility. All this is to say that this process of analysis, by the Museum, is not only historical, but is much more complex. We are not a history museum, but a place where science, technology, history and anthropology converge, and that is why having a good portfolio of experts, who help give a multifaceted view, is helpful.

LM: *When talking about the train, it emerged how its way of being perceived by people has changed over time, from a political tool to an infrastructure medium. Can it be said that the narrative line that is usually presented to a visitor also undergoes a change over time?*

MI: Yes, absolutely. There is no doubt about it. Usually there is always a tendency to give a central part to man, and so when we talk about "transport", one always thinks that the system and the means were made for us. This is actually true, but the transport system was not created to move people, but things. So, first of all, this aspect of analysis over time does emerge more and more. It is clear that it is very difficult to analyse an aspect when you are directly involved in it. Today, with the new mobility projects for the transport pavilion, it is very difficult to go and analyse those infrastructures that are being built right now, and to understand what they will be used for, because they will be ready in ten years' time. "What do I know about what the world will be like in ten years? Will war be rampant? Will we all be in a "Km 0 psychosis"?".
Even the engineer who deals with this project is in difficulty; by building the Line 7 metro he does not really know the amount of transport flows there will be. In this perspective of uncertainty we have to fit in, and in this sense mathematics helps a lot, where there are probability clouds that tell us that it is more likely what the scenario will be. Only time will say: "That is what happened".

LM: *From a purely professional point of view, the curator needs sources to study an object. Unfortunately, it is known that this is not always the case. My question is: when there is a lack of sources, or the amount of sources is limited, how does he/she cope with this problem?*

MI: This is a problem. One first tries to be honest with himself/herself as well as with the visitor. The whole is about being able to handle the little certain information and being able to combine it with some context parameters. The context must also be attested somehow.

For sure, I can never say: “Julius Caesar rode a bicycle around Gaul” or “Leonardo da Vinci invented the bicycle”. There is no supporting evidence of Leonardo and the bicycle. There is no suggestion that there was a need for a bicycle before 1818. There is a strand of historians and analysts who have shown that in 1818, when the bicycle patent was filed, there was a need. Before that there was not. The historical analysis has been that certain fakes on technology are linked to trying to put the flag on that invention. In the striking case of Leonardo’s bicycle, Italy tried to say: “We invented it first”. The French tried it too, with the “velocifer”, but it nevertheless remains that the patent was taken out by Drais in 1818, filed in various countries and has its own engineering value. It was the analysis of historical contexts, engineering knowledge and many other interrelated factors that allowed a history of the bicycle to emerge that was a little more consistent with the facts.

LM: *Is the formulation of hypotheses a viable route or is it avoidable?*

MI: You have to be frank, because you can be easily misunderstood. If one of your pieces is extrapolated out of context, in just a second it comes out that Leonardo invented the helicopter. You have to be rigorous and precise; every time a communicator provokes you, be ready and say: “It is not like that”. It is a complex context and the fascination lies exactly in this complexity. Knowing how to tell that complexity, the facets, the multifacetedness of the situation, in my opinion makes any subject fascinating.

LM: *One last question: what does the choice of keeping an object in its original state or restoring it depend on?*

MI: I think this is a personal answer and I would like other curators to give different answers. Perhaps because of my studies and training, I would only intervene with restoration if the object is in danger. So it is the materials technologist who tells me: “This object is oxidising, it still has three years to live and then it will be pulverised. It will be gone”. So it becomes a necessity to pass on to future generations, otherwise I would personally leave on the marks of time forever.
Material technologists teach us that this is not the case, that any material -be it wood, a metal, a polymer- has its own process of advancement and causes that material to change in structure. So a physical object will not be forever.

LM: *Is there a risk that a restoration might alter the value of the object?*

MI: Very much so. If you ask our restorer this question, precisely because of her training, I think she will tell you that every time she has to intervene it is a pain. Ideally the restorer should not intervene, he/she should prevent. It is like the story of the dentist; if you use a good toothpaste you will not ruin your teeth and you will not need to intervene. The teeth will be good until later in life.

5. Interview by Ludovico Mery (**LM**) with Lucio Biasiori (**LB**), Professor of Early Modern History at the *University of Padua*. 15.04.2022- Audio, 22:19.

LM: *As I have already anticipated, during the interview with Prof. Moraglio, the theme of danger and risk in travel emerged, to the point that the etymology of the English word "travel" is linked to the Latin word "tripalium", which in ancient times was an instrument used for torture. In this regard, I would like to ask You about the reasons for this negative connotation.*

LB: On this point, I must say that I have always been struck by the etymology of the word *travel*, as something linked to labour and suffering. It is something not linked to the sphere of pleasure, that detaches us from this idea.

Here, some distinctions must be made, because this negative aspect linked to travelling is something that is still present for many people. I myself must say that when I go on a trip, there is certainly a part of me that is curious, anxious to discover new things or to see things I have already seen with different eyes, but this aspect of anxiety is always present.

I suppose it is linked -but I have no definite answer to this- to the practical difficulties involved in travelling. Now there are faster and faster means of transport which are gradually reducing, and will increasingly reduce, these difficulties until -who knows- teleportation comes along. But I can never completely eliminate the practical difficulties linked to the complexity of travel, to our being accustomed to it and therefore being comfortable in a given context. So, when it comes to leaving that context, it is clear that a part of us is also frustrated and dispirited.

Therefore, I think that first of all there are practical reasons linked to the difficulties of travelling, and then perhaps even more profound anthropological reasons, linked to the habitual aspects of men and women, who tend to become familiar with an environment, and to be displeased when it comes to leave, even if temporarily, that environment.

LM: *To explain a concept linked to the past, You referred to present times. Hence my second question: do You think it is possible to identify a precise moment in history when this notion changed its meaning, from a time of uncertainty and anxiety to a time of carefreeness and more or less normality?*

LB: This is a very important question and I would like to clarify it in the same way as I did before, in the sense that it is very complicated, at least for me, because of my training, to speak in general terms.

I have difficulty in finding a precise point in time where this transition from negative to positive can be historically placed, and then generalising within an entire society. I would tend to see the two as always present in some way: the aspect of uncertainty and disquiet and the more liberating aspect of discovery linked to the journey. Because of my training and my readings, which as I said before are very limited from this point of view, I find it hard to see a teleological perspective in which we pass from a journey conceived of as something negative, like an ordeal, to a positive journey.

Let me use a concrete example; that of the great French philosopher Michel de Montaigne. We are in the second half of the 16th century, when he wrote his main work, the *Essais*, which are conceived as a series of experiments on himself. He challenges himself and tells the reader about the effects this testing has on his body and mind. One of these essays is dedicated to carriages and the discomfort he feels in moving and travelling on them. One thing that confirms this difficulty in distinguishing negative aspects from positive ones is that in reality, starting from the suffering that the journey brings him, Montaigne begins a series of considerations that immediately go beyond the difficulties of the journey. He starts talking about the role of carriages in ancient Rome, in travel and pilgrimages, and then from that moment on he uses this as a starting point to compare the various customs that exist in civilisations that are very different from our own. The essay on carriages is one of the clearest essays by the so-called "relativist" Montaigne, i.e. the Montaigne who combats European society's prejudices against savages. That is one of the writings in which he argues that we are the real savages and that those we call "savages" actually have a higher morality and an almost religious sense of life than we do, and can teach the French of his time that they are the real cannibals, because they are killing each other in religious wars.

So, starting from an aspect linked to mobility, to the journey and to their difficulties, Montaigne makes use of this as a pretext for a positive discourse. This is a concrete example that shows us how difficult it is to distinguish the aspect of the fatigue of the journey from that linked to the creativity that the journey brings with it.

Montaigne, fatigued by the heaviness of the carriage ride and the difficulty and heaviness of the journey, which weighs on his physique, is paradoxically allowed by these journeys to fly with the intellect. This led him to the considerations we have just mentioned.

Then there is also another aspect to be considered, which is linked to the purpose of the journey, namely when the goal is greater than the efforts of the journey itself. Think for example of the pilgrimage, which is the most common form of travel in the Middle Ages, both in the Christian world and perhaps even more so in the Islamic one.

In both cases you see how -if you take in hand the reports of these trips- the superiority of the purpose of these trips tends to put in the background those aspects of uncertainty and anxiety that are linked to the pilgrimage.

LM: *By talking about the French philosopher, as well as about pilgrimages, the difference between different civilisations emerged. At this point, I would like to ask You the following question: do You think that there is evidence of differences in the understanding and perception of travel between the Western and Eastern worlds?*

LB: This is also a very complicated question, in the sense that first of all I find it complicated to assume these two blocks, East-West, without making any distinction. If we keep to the case I was making before, that is, if we compare the pilgrimage as it is conceived in the Christian world and in the Islamic world, similarities and differences intertwine in a quite inextricable way. For both of them, whether pilgrims from Central Asia to Mecca or pilgrims from Norway to Santiago de Compostela or Rome, there is this combination of discomfort and religious drive and thirst. But there are also important differences; pilgrimage in the Christian world is a recommended practice, and therefore one that many take into consideration. Nonetheless, they have always been a restricted elite within the Christian world.

In the Christian world, there are alternatives to pilgrimage or to its violent form -like the crusade- such as the invention of the nativity scene, on which Chiara Frugoni, a scholar who died a few days ago, has written a fundamental book. Such an invention is a way of overcoming the difficulties of the journey by recreating sacred places. The nativity scene or the holy mountains -the sanctuaries that recreate the environments of the Holy Land in more familiar places- are ways of compensating for this dimension of the journey, which is recommended but not prescribed. In Islam, on the other hand, the pilgrimage, the so-called *ḥajj* to Mecca, is a duty of the faithful, something that introduces a dimension of mobility into the Islamic world that is quite alien to the Christian one.

LM: *With Prof. Moraglio, the theme of the representation and narration of the journey also emerged. He referred to the Canterbury Tales and also the Decameron, which are two interesting examples of how the journey was not only felt and experienced, but also narrated. Before this concept became what we know today, in its most modern and positive form, always from a purely western perspective, how do You think travel was told and represented in the past? Are there any other examples besides those already mentioned?*

LB: Certainly, there are countless examples of travel stories. You will recall the *Ragionamenti* by Francesco Carletti, on which we have spoken several times. One thing that I think is interesting to explore -again referring to the example of the pilgrimages mentioned above- is how the pilgrim, when he returns from the place of pilgrimage, takes with him not just stories, but also material objects that will serve in many cases for the rest of his life as evidence of having been there.
Objects or even tattoos, in the sense that the first European tattoos that we know of are not -as was believed for a very long time- those brought by Captain Cook and the first travellers to the southern hemisphere.
The idea of leaving an indelible mark on one's body, represents a symbol of a journey made to distant lands. Beyond the literary depictions, albeit interesting, a promising perspective that I think would be fascinating to explore, would be that of the use of material culture. The bringing back of objects -from the place where one has been- takes on a second life once transplanted in the place of return, and another compelling perspective is that of the use of one's own body.
One of the ways in which pilgrims remember their journey is by having tattoos on their bodies, linked to the place of pilgrimage. Contrary to popular belief, tattoos certainly began to appear in Europe following the voyages of exploration by Captain Cook and others, but -even before that- many pilgrims returning from Loreto or from Santiago de Compostela -for instance- wore tattoos on their bodies. In the sanctuaries there were even specific tattoo workshops and they wore marks on their bodies that testified to the fact that they had been to that place once they returned home.
Still today, if we go to the museums of some sanctuaries, there are showcases with the stamps for the tattoos that were used to mark the pilgrim and indelibly print on his body the experience of mobility and of religious research.

LM: *I understand that the religious dimension is very much linked to the concept of travel. Hence the next question: beyond a practical matter, linked to means and conditions, can this perceived negativity of the journey in history also be identified in particular social or cultural causes, in addition to religious ones?*

LB: Yes, there is no doubt about it. To the religious causes, and also to the social and cultural ones, I would add another important motivation, which is that of gender. Travel undertaken by women was discouraged in the past, much more than travel by men. Ancient European civilisation had at its core the notion of honour, and naturally women's honour was considered something that had to be defended. So it was thought that women who travelled were in danger of having their honour violated.

Whether they were religious or married secular women, whoever controlled their mobility -whether it was their superior or their husband- tended to limit them a lot and prevent them from moving around. Naturally, more recent researches have shown that this proscription of female mobility was actually violated. In many cases women were able to carve out for themselves spaces of agency and even autonomy in the dimension of travel.

Of course, this was rooted in a negative view of mobility and displacement, which for women took on even more negative overtones because their sphere was thought to be the house.

Moreover, mobility tended to be discouraged because it brought with it -especially at a time when Europe was beginning to divide on a religious basis- the risk that the physical mobility would also involve a mobility of ideas and therefore a danger of heretical contagion.

LM: *So travel is also a form of emancipation?*

LB: Yes, certainly.

LM: *I would like to conclude with a final question. The factor of both physical and psychological fatigue from travelling has come up. In this regard, is there any information on remedies to cope with this problem?*

LB: On this I would suggest a very instructive read, the book by a Swiss medieval historian, his name is Hans Conrad Peyer, translated into Italian as *Viaggiare nel Medioevo: dall'ospitalità alla locanda*. Peyer shows how -in order to address these dangers of travel, which we have mentioned so far- there were authorities to some extent, but especially a spontaneous movement, which gradually tried to provide individual hospitality by creating a network of hostels and inns to protect the traveller.

LM: *A kind of welfare network?*

LB: A sort. This is a good example of a remedy that was created to deal with such a problem.

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