Replica of a ‘Righi oscillator’, or four-sphere spark gap, Marconi’s Wireless Telegraph Company Ltd., 1932, inv. D-000030

The spark gap is a device that, when connected to an electrical power supply, discharges sparks into the space, or ‘gap’, between the brass spheres that are mounted on insulated supports made of wood and ebonite. The sparks generate electromagnetic waves which can be received by a detector. The name ‘spark gap’ (Fleming 2015) was sometimes literally translated as ‘intervallo di scintilla’ or ‘scintillatore’ in Italian (Simion 1927). Several historical sources describe this device as a fundamental component of the first wireless transmitters assembled by Guglielmo Marconi from 1895 onwards. It features in many photographs and illustrations. These materials, often written for educational purposes, are widely available in the Museo Nazionale Scienza e Tecnologia (MUST) library. The name ‘Righi oscillator’ refers to Augusto Righi: the Italian physicist had already used a very similar spark gap in his laboratory where Marconi visited him while developing his first experiments. Righi wrapped the two central spheres with parchment into which he poured oil, thus obtaining a better control of the insulation (Cinti 1933, 9). Marconi adapted the Righi oscillator for his own purposes while developing radio telegraphy, modifying Righi’s experimental high-frequency “quasi-optical” instruments: he added two small dipole radiators (small antennas with two terminals) to both sides of Righi’s oscillator, significantly extending the length of the waves emitted (Hong 2001, 19). In 1955, at the request of Guido Ucelli, the Società Italiana Radio Marittima (SIRM) of Rome, a satellite company within network of Italian Marconi-related agencies, donated this replica, dating back to 1932 and bearing the logo of Marconi’s Wireless Telegraph Company Ltd, to the Museum, along with many other Marconi relics.

The Righi Oscillator. The ‘Marconi Relics’ in the Museum Collections

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At MUST, the objects collected over time to commemorate Guglielmo Marconi’s work have traditionally been referred to as ‘Marconi relics’. Most of them are displayed in an area dedicated to the inventor within the permanent Telecommunications gallery. Others are housed in the museum store and kept for study purposes.

The process of gathering material for the planned national museum collections reached a pivotal moment in the 1930s when Marconi became involved in the establishment of the museum institution. It is well known that science and technology museums worldwide took shape in close connection with the major international exhibitions organized between the nineteenth and twentieth centuries. MUST is no exception. The first collection hubs deriving from the relationship with the 1933 Chicago World’s Fair, and the role of the CNR (National Research Council), which at that time was chaired by Marconi, are well documented (Paoloni, Reali, Ronzon 2018).

However, the link between Marconi as ‘cultural ambassador’, and the collections dedicated to him, has still not been fully explored. A museum was a place that was especially suited to forms of self-representation that allowed Marconi to appear as a history-maker, consistent with his characteristic attention to the construction of his own image.[1] Understanding how collections assigned to this specific task were formed – by assembling objects from diverse sources – is not only a geographical journey, but also a search for meaning: it enables us to

This chapter is the result of total collaboration between the authors, and the order of names is purely alphabetical. Simona Casonato worked primarily on the drafting of the first and fourth sections, while Roberta Spada focused on the second and third sections. The overall framework and conclusions are the joint work of both authors.

1 See introduction, *infra*.

understand when and how the artefacts arrived at the Museum, and, most importantly, their purpose and use. These are visions that, as we will see, were not always consistent.

1 Objects and Information

The profile of the MUST 'Marconi relics' collection is unclear. Long taken for granted within the institution's history, details about the origins of this group and the criteria used to create it have blurred over time. Curating involves inheriting collections and interpretive frameworks from previous curators, which are then reformulated when new rationales or information arise, prompting their re-evaluation and reinterpretation. However, in the past, science and technology museums did not place great importance on the philological accuracy of data associated with museum objects. Managerial and operational aspects took precedence, and legal constraints were less stringent than they are today (Canadelli 2019).

The first artefact we find in the exhibition area (inv. IGB-9718), for example, is a well-known component of the early wireless transmitters assembled by Guglielmo Marconi from 1895 onwards. In MUST's inventory records, it is listed as a 'Righi four-sphere oscillator', donated by the CNR (National Research Council) in 1953. A second, identical object (D-30), apparently in even better condition, is part of the Museum's study collections and is catalogued as a 'spark gap'. It was donated to the Museum in 1955 by the Società Italiana Radio Marittima (SIRM) of Rome. Both are marked as having been built by the 'Marconi Company', with the source attributed to the English parent company, although this is indicated with an abbreviation. Despite not being one of his inventions, as was implied by the initial designation,[2] this type of object represents the experimental beginnings of Marconi's career in numerous exhibitions and illustrations. The dating, noted in the museum records as spanning from 1897 – the year Marconi's Wireless Telegraph Company Ltd. was founded – to 1933, the year of the Chicago World's Fair, raises a question about their 'origin' **[figs 1a-b]**.

This uncertainty should not surprise us. Traditionally, in the eyes of the scientific museum community, consistent naming and dating, referring to what the object 'says' on a historical level, are less relevant compared to what the object can 'do'. In other words, what the object can bring to light in relation to the theory and practice of contemporary sciences, as we will also see in the case of Marconi relics.

However, from the perspective of cultural heritage, things work in a different way. From a museological standpoint, two objects with different inventory numbers, even if identical, are considered two distinct articles, each with its own provenance.[3] The compilation and editing of a catalogue entry requires the museum to account for discrepancies, such as those that arise from their comparison. Are they originals or copies? Which of the two names – both correct, but not entirely equivalent from a historical perspective – is it better to use? Why is there such a broad dating range? Towards which reconstruction of Marconian events do the different origins of the objects lead us?

2 A four-sphere oscillator, even if slightly different, had already featured in the first famous journalistic photo of Marconi published in London by *Strand Magazine* (Raboy 2016, 81).

3 For an overview of reflections on the concept see Volonté 2009; Christillin, Greco 2021, 93-5; Spada, *infra*.

Figures 1a-b On the left, the model of the Righi oscillator donated by the CNR in 1953 (inv. IGB-9718). In contrast to its replica, it is missing some parchment. On the right, an aspect which is identical on both objects: brass disks on the base bearing the full name of the parent company

In all the leading museums in the field, in the development of science and technology heritage, these detailed criteria which were based on scientific literature, historiographical analysis or on archival standards, such as the evaluation of the producer and of the archival bond (the logical connection that links the pieces in a collection), were not considered fundamental. Priority was given to abstract, taxonomic and encyclopaedic criteria, with little attention paid to the historical accuracy of the artefact on display (Collins 2017, 40-8). As pointed out by Tim Boon, “the creation and development of collections is a profoundly idiosyncratic matter, very much contingent on the opportunities that arise to collect, and our antecedents’ beliefs, expertise and enthusiasms that interacted with those opportunities” (Boon 2023).[4]

The uncertainty of the terminology and of the chronological limitations that define the ‘Marconi relics’ is nonetheless interesting from a cultural history perspective. It compels us to explore the origins and rationales behind the public representation of wireless communication as a scientific and educational fact, at a time when it was still relatively new. Marconi died in 1937, shortly after contributing to trigger a chain of events which would lead to the foundation of the Museum. Who took charge of curating his cultural heritage in Italy? Which principles were followed, and what remains of this process today?

4 On the subject, see also Paoloni, *infra*.

2 Institutions and Curators

In 1950, three years before the official opening of MUST, the exhibits displayed in Chicago and later in the new CNR headquarters were sent to Milan, "except for the Marconi relics which were appropriately placed in the auditorium [of the CNR] named after the great inventor" (transl. by the authors).[5]

Thus, despite MUST being an ideal place to assemble the national legacy of science, the figure of Marconi remained tied to the history of another great Italian scientific institution, which understandably felt entitled to keep the material mementos of its late, illustrious president.

Archival records show that Guido Ucelli, the founder and president of the Museum, did not give up easily. Marconi was a key component of the commemorative scientific 'pantheon' that Ucelli intended to honour (Redemagni 2011, 152). In 1951 he submitted a request to the CNR asking that the Marconi relics be brought together in Milan. The CNR however replied that there was a plan to "create a Marconian museum in Sasso Marconi", adding that "in this instance the possibility of duplicating some 'documentation' for the Museum"[6] could be considered.

At the time it was widely accepted that a copy could be an equally valid form of 'documentation' for a museum. Marconi was of the same opinion. He wrote to Ucelli in 1931:

> The Board [of the CNR] has no intention of depriving cities and Institutions of the artefacts that they painstakingly preserve and in which they take great pride. It is often sufficient for the Museum to house copies of the artefacts; I state this immediately to avoid unsubstantiated concerns, although it would of course be better to have the originals. Of utmost importance for the development of the Museum, is the documentation of scientific and industrial achievements using documents, prints, patents, photographs, artefacts, models, machines, manufactured products etc., and especially anything that highlights Italy's participation in global technological progress. (transl. by the authors)[7]

In the following decades, Ucelli diligently set about organising the collection, having widely researched the methods used by institutions in other countries. Records of his interaction with Marconi on this matter began when Marconi invited Ucelli to Rome for an "exchange of ideas regarding a science museum" in February 1931, later going on to advocate for the project at Milan City Hall.[8]

The following year, Ucelli's project coincided with Italy's upcoming involvement in the Chicago World's Fair. The opportunity stimulated an increase in the production of replicated and reconstructed artefacts intended to document Italian genius, both at the fair and in the leading museums around the world. Marconi wrote to Ucelli on behalf of Mussolini:

> His Excellency the Head of Government has decided that Italy will participate in the Chicago World's Fair

5 ASMUST, Corrispondenza I serie, 783, Consiglio Nazionale Ricerche (3), "Estratto dal verbale n. 277 della riunione della Giunta Amministrativa", 26/05/1950.

6 ASMUST, Corrispondenza I serie, 783, Consiglio Nazionale Ricerche (3), 20/11/1951.

7 ASMUST, Corrispondenza I serie, 783, CNR, letter from G. Marconi to G. Ucelli, 17/03/1931.

8 ASMUST, Allestimento sezioni museali, Telecomunicazioni, Cimeli Marconiani e Sala Marconi, telegram from G. Marconi to G. Ucelli, 14/02/1931; letter from G. Marconi to the Podestà di Milano, 17/03/1931.

> with a collection of replica artefacts and documents to serve as evidence of the magnitude of our country's contribution to the scientific and technological progress of humanity. The collection will subsequently be moved to the American Museum of Science in Chicago. Taking advantage of the preparatory work necessary to set up this exhibition series, His Excellency the Head of Government has ordered that not one but four collections be prepared, one of which will be kept in Italy, one assigned to the London Science Museum and the other to the Munich Science Museum. (transl. by the authors)[9]

The American exhibition, which traced the origins of Italian innovation back to ancient Rome, also included accounts of Marconi's work.[10]

In spite of this preparation, on the eve of its opening in the 1950s, MUST ironically risked being deprived of the very heritage linked to Marconi. In 1953 Ucelli therefore changed his approach and instead turned to the Italian company Marconi Italiana S.p.A., in an attempt to obtain Marconi-related objects similar to those retained by the CNR.[11]

The next two years saw a long series of negotiations involving the Museum, Managing Director of the Marconi Italiana, Rodolfo Raoul Chiodelli, and CNR representatives. Engineer Franco Soresini, a young advisor of Ucelli's, also participated in the discussions, informally taking on a role (often without a salary) that today would be defined as curatorial.[12] From these letters we can infer that the CNR artefacts were initially owned by the Marconi companies and then donated to the CNR, apart from some artefacts that were "religiously" preserved at the Italian company headquarters (apparently part of the scientific apparatus used aboard the yacht *Elettra*).[13] From time to time, exhibitions of Marconi relics appeared at Marconi stands during commercial events, such as the 19th National Radio and Television Exhibition held in Milan in September 1953 or the Levante Trade Fair held in Bari in 1954. In the autumn Chiodelli confirmed that, subject to the consent of Marconi's son, Marquis Giulio,[14] the artefacts could be housed at the Museum "displayed

9 MUST, Archivio Museo industriale (AMI), Exhibitions, Chicago World's Fair 1933, letter from G. Marconi to G. Ucelli, 14/10/1932. During the preparation of this volume, the presence of objects pertaining to these sets was effectively established, not only at MUST, but also at the Griffin Museum of Science and Industry in Chicago and the History of Science Museum in Oxford (Casonato, personal message). Identical labels on the artefacts and the notes in the inventory records are consistent with this source.

10 These were displayed in a dedicated section: Masina 2016, 263; Spada Potenziani (1933?). On page 32 in the latter publication, a photograph shows Marconi standing in front of the display cases of a "Marconi Exhibit", as indicated by an inscription above them. The photograph is captioned "S.E. Marconi in the Science Exhibition Hall".

11 ASMUST, Allestimenti sezioni museali, Telecomunicazioni, Cimeli Marconiani e Sala Marconi, letter from G. Ucelli to Marconi Italiana S.p.A., 05/10/1953.

12 The extensive correspondence that Engineer Soresini maintained for several decades with Ucelli and the other members of the Museum includes proposals for acquisitions, recommendations for the exhibition of objects and various communications relating to contents, evaluations of artefacts, historical research and interactions with promoters, contributors, and other museums. ASMUST, Corrispondenza II Serie, 228 Soresini.

13 As written in ASMUST, Allestimenti sezioni museali, Telecomunicazioni, Cimeli Marconiani e Sala Marconi, l, letter from R. Chiodelli to G. Ucelli, 29/10/1953; letter from F. Rolla to G. Ucelli, 04/05/1954. We can infer from their exchange that the two had been friends for some time. Chiodelli, a pivotal but little-known figure in the history of Italian telecommunications, also served as Director General of EIAR from 1929 to 1943. See Petrangeli, *infra*.

14 ASMUST, Corrispondenza II Serie, 228 Soresini, handwritten note, 11/09/1954; ASMUST, Allestimenti sezioni museali, Cimeli Marconiani e Sala Marconi, promemoria del 12/09/1954.

in a designated area", on the condition that the Marconi companies would be able to request them at any time for celebratory events.[15] In the meantime, Soresini was continuing to develop the Museum's collection in various areas. He wrote to Ucelli in December advocating the need to replicate or reconstruct "artefacts and antique devices in order to eliminate serious omissions in the collections on display". However, he did not consider the CNR reconstructions of documentation of Italian scientific breakthroughs to be good examples:

> Not one device is consistent with the original. These reconstructions replicate only the exterior aspect and should not therefore be exhibited when a certain seriousness is required. Please find attached a list of the items that should be reconstructed most urgently, which I myself could personally oversee with all the love and enthusiasm that I have for this type of relic.[16]

According to his curatorial criteria, not only was it important to replicate precisely every detail, but also to guarantee potentially functioning objects. The vision of the artefacts is that of technology-in-use, in other words artefacts characterized by means of a specific purpose (Suchman 1999; Bruni 2020). More than mere evidence of a historic moment, it was essential that through the artefact the museum displayed the technological principle that had motivated its existence.[17] With regard to the Marconi relics, this view eventually had to deal with other circumstances that influenced their fate and purposes.

3 Negotiations and Odysseys

A group of objects finally arrived in Milan at the end of March 1955, annotated with captions and labels citing SIRM as their point of origin **[figs 2a-b]**.

It is interesting to note that Chiodelli now appears as an administrator of this satellite company within the Marconi network, but information on its origins and relationship with the parent company remains unclear.[18] One month later, the paralysis at CNR was resolved, thanks to the intervention of Franco Rolla, the new Secretary General of the institution, who wrote to Ucelli to put together something that he himself referred to as "a little conspiracy". He suggested that Ucelli write to the then-president of the CNR Gustavo Colonnetti asking that "some important artefacts, as well as an optimal reconstruction of objects from the ship *Elettra*" be brought to Milan. Rolla would undertake to request the authorisation of the Ministry of Post and Telecommunications, which owned some of the artefacts.[19] In the subsequent interactions between Rolla and Ucelli, a clear vision for the destiny of these objects emerged, which Ucelli wrote in a letter to Colonnetti on 9 May:

> It is well known that this Museum aspires to […] highlight and document the contributions to the civil and

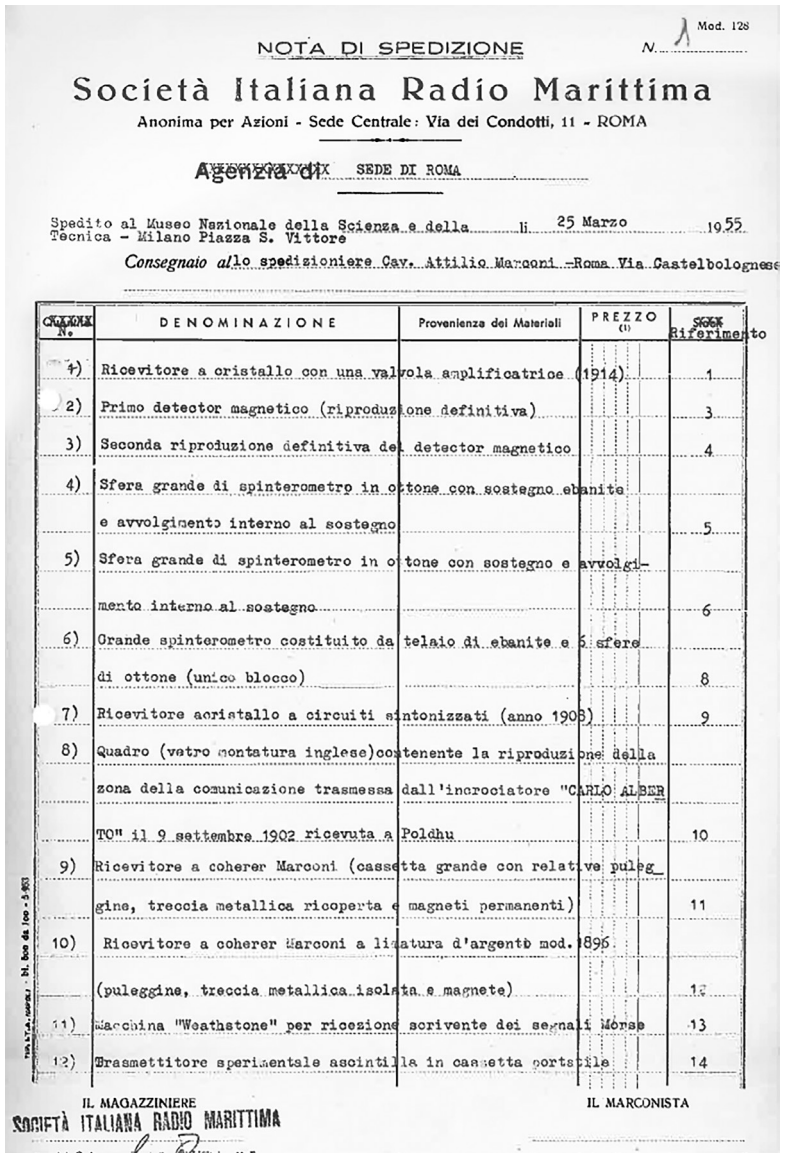
15 ASMUST, Allestimenti sezioni museali, Cimeli Marconiani e Sala Marconi, letter from Chiodelli to G. Ucelli, 13/12/1954.

16 ASMUST, Corrispondenza II Serie, 228 Soresini, letter to G. Ucelli, 16/12/1954.

17 ASMUST, Corrispondenza II Serie, 228 Soresini, letter to G. Ucelli, 16/12/1954.

18 ASMUST, Allestimento sezioni museali, Telecomunicazioni, 1324 Cimeli Marconiani e Sala Marconi, letters from R. Chiodelli to G. Ucelli, March 1955.

19 ASMUST, Corrispondenza II Serie, 909 Consiglio Nazionale delle Ricerche (2), b, Cimeli Marconiani, letter from F. Rolla to G. Ucelli, 28/04/1955.



NOTA DI SPEDIZIONE N. 1 Mod. 128

Società Italiana Radio Marittima

Anonima per Azioni - Sede Centrale: Via dei Condotti, 11 - ROMA

Agenzia di SEDE DI ROMA

Spedito al Museo Nazionale della Scienza e della Tecnica - Milano Piazza S. Vittore li 25 Marzo 1955

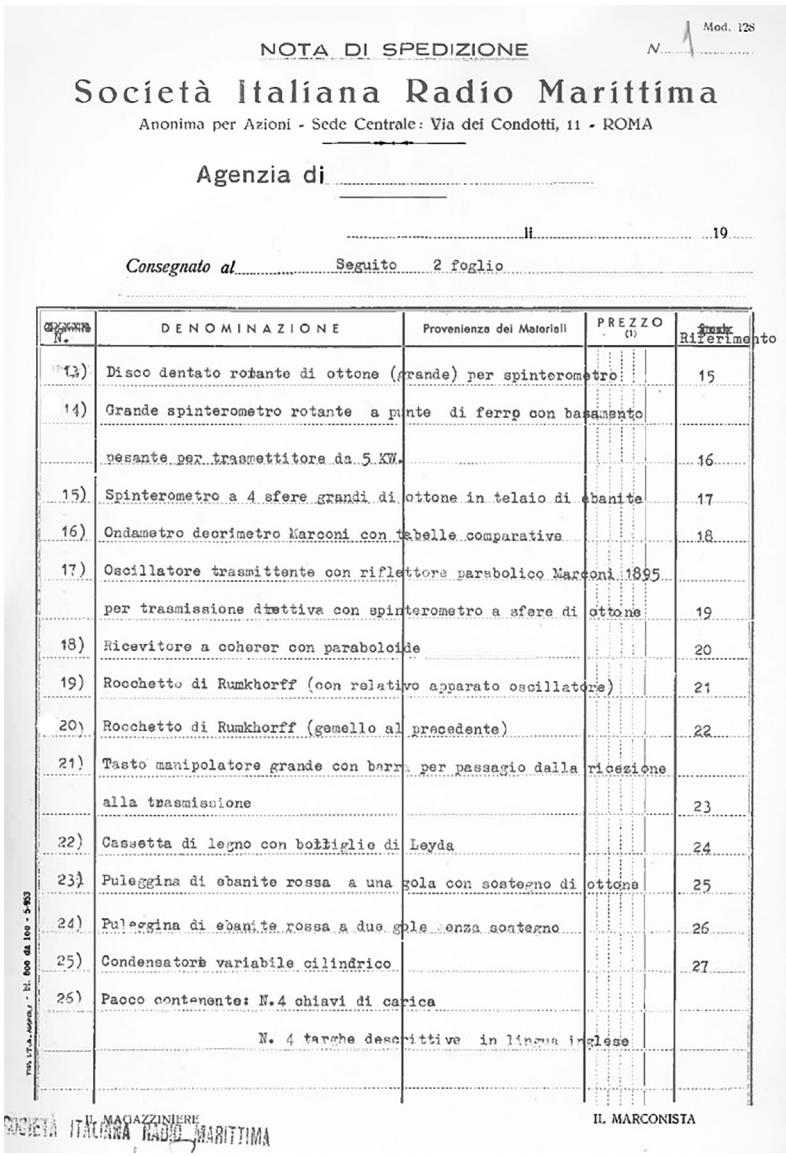
Consegnato al lo spedizioniere Cav. Attilio Marconi -Roma Via Castelbolognese

Quantità N.	DENOMINAZIONE	Provenienza dei Materiali	PREZZO (1)	Riferimento
1)	Ricevitore a cristallo con una valvola amplificatrice (1914)			1
2)	Primo detector magnetico (riproduzione definitiva)			3
3)	Seconda riproduzione definitiva del detector magnetico			4
4)	Sfera grande di spinterometro in ottone con sostegno ebanite e avvolgimento interno al sostegno			5
5)	Sfera grande di spinterometro in ottone con sostegno e avvolgimento interno al sostegno			6
6)	Grande spinterometro costituito da telaio di ebanite e 6 sfere di ottone (unico blocco)			8
7)	Ricevitore acristallo a circuiti sintonizzati (anno 1908)			9
8)	Quadro (vetro montatura inglese)contenente la riproduzione della zona della comunicazione trasmessa dall'incrociatore "CARLO ALBERTO" il 9 settembre 1902 ricevuta a Poldhu			10
9)	Ricevitore a coherer Marconi (cassetta grande con relative puleggine, treccia metallica ricoperta e magneti permanenti)			11
10)	Ricevitore a coherer Marconi a legatura d'argento mod. 1896 (puleggine, treccia metallica isolata e magnete)			12
11)	Macchina "Weathstone" per ricezione scrivente dei segnali Morse			13
12)	Trasmettitore sperimentale ascintilla in cassetta portatile			14

IL MAGAZZINIERE

SOCIETÀ ITALIANA RADIO MARITTIMA

IL MARCONISTA



NOTA DI SPEDIZIONE N. 1 Mod. 128

Società Italiana Radio Marittima

Anonima per Azioni - Sede Centrale: Via dei Condotti, 11 - ROMA

Agenzia di

li 19

Consegnato al Seguito 2 foglio

Quantità N.	DENOMINAZIONE	Provenienza dei Materiali	PREZZO (1)	Riferimento
13)	Disco dentato rotante di ottone (grande) per spinterometro			15
14)	Grande spinterometro rotante a punte di ferro con basamento pesante per trasmettitore da 5 KW.			16
15)	Spinterometro a 4 sfere grandi di ottone in telaio di ebanite			17
16)	Ondametro decrimetro Marconi con tabelle comparative			18
17)	Oscillatore trasmittente con riflettore parabolico Marconi 1895 per trasmissione direttiva con spinterometro a sfere di ottone			19
18)	Ricevitore a coherer con paraboloide			20
19)	Rocchetto di Rumkhorff (con relativo apparato oscillatore)			21
20)	Rocchetto di Rumkhorff (gemello al precedente)			22
21)	Tasto manipolatore grande con barra per passaggio dalla ricezione alla trasmissione			23
22)	Cassetta di legno con bottiglie di Leyda			24
23)	Puleggina di ebanite rossa a una gola con sostegno di ottone			25
24)	Puleggina di ebanite rossa a due gole senza sostegno			26
25)	Condensatore variabile cilindrico			27
26)	Pacco contenente: N.4 chiavi di carica N. 4 targhe descrittive in lingua inglese			

IL MAGAZZINIERE

SOCIETÀ ITALIANA RADIO MARITTIMA

IL MARCONISTA

Figures 2a-b Shipping docket for Marconi relics from SIRM to MUST, 25/03/1955. ASMUST, Allestimento sezioni museali, Telecomunicazioni, 1324 Cimeli Marconiani e Sala Marconi. The spark gap is listed as no. 17 on sheet 2. We were able to verify the identity of this copy from the paper label bearing this number that was still glued to the object

Milano, 14 Aprile 1955

prot. n. 1/14

Spett.
Soc. It. RADIOMARITTIMA
Via dei Condotti 11
R O M A

Abbiamo regolarmente ricevuto le sette casse di apparecchi e cimeli Marconiani che ci avevate annunciato, ma esigenze molteplici ed urgentissime, connesse con la "Settimana della Scienza" organizzata dal C.N.R. presso questo Ente, non ci hanno consentito di procedere all' apertura delle casse prima d' ora.

A parte uniamo, per eventuale controllo, una breve nota dei pochi rilievi emersi durante la verifica del loro contenuto.

Qui vogliamo esprimere ancora il nostro vivo compiacimento e la nostra sentita riconoscenza per averci reso possibile la presentazione ai visitatori del Museo di un materiale scientifico di così elevato interesse documentario ed illustrativo.

Gli oggetti esposti sono stati accompagnati da cartelli e didascalie recanti la dicitura "Proveniente dalla Soc. It. Radiomarittima - Roma". Ma è nostro intendimento che l' illustrazione di tali apparecchi - fondamentali nella storia delle radiocomunicazioni - in attesa di comparire nel catalogo del Museo, in programmazione, sia subito affidata al commento parlato di personale esperto ed idoneo.

Codesta spett. Società ci ha consentito di realizzare efficacemente, per quanto riguarda la storia della radiocomunicazioni quei fini didattici ed educativi che sono tra gli scopi essenziali del Museo.

Per questo rinnoviamo l' espressione dei nostri più sentiti ringraziamenti, porgendo deferenti ossequi.

n. 1 allegato

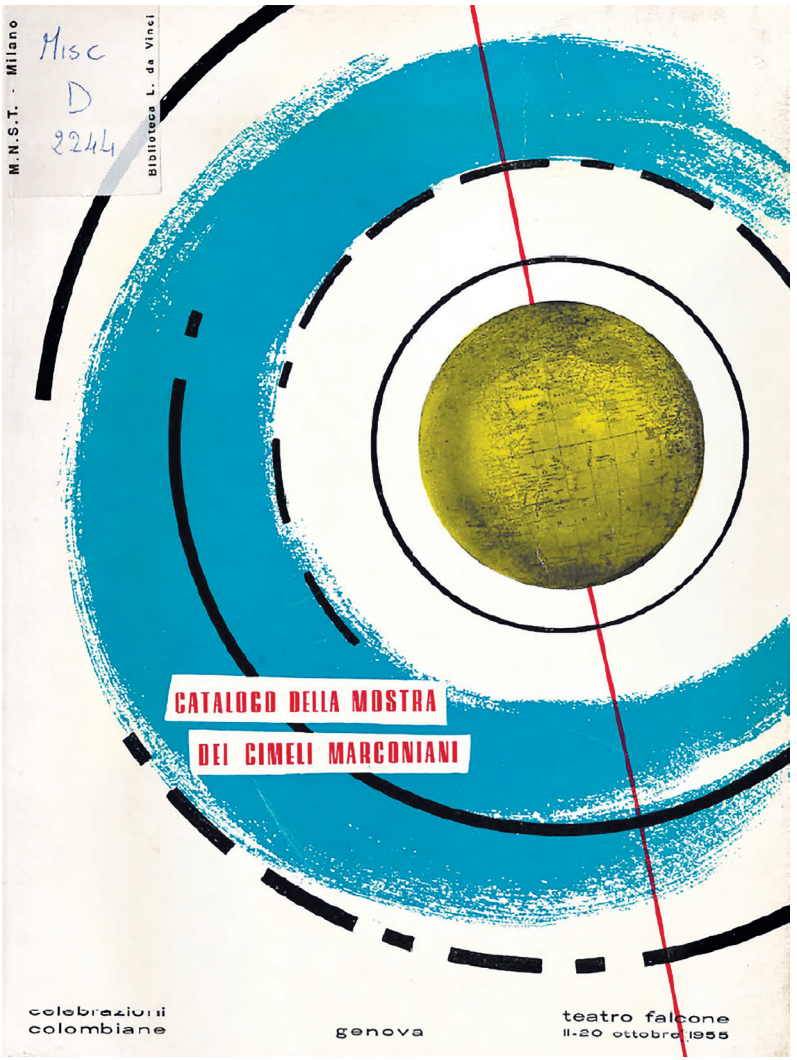


Figure 3 Letter from Guido Ucelli to SIRM, 14/05/1955. ASMUST, Allestimento sezioni museali, Telecomunicazioni, 1324 Cimeli Marconiani e Sala Marconi

Figure 4 Cover of *Catalogo della mostra dei cimeli Marconiani* (11-20 ottobre 1955). Genova: Celebrazioni Colombiane. Biblioteca Museo Nazionale Scienza e Tecnologia Leonardo da Vinci

> technological progress of humanity made by academics and researchers from every country, so that visitors can learn about them and recall not only the names but also the patient endeavours, trials and technical efforts undertaken to effect these audacious and ingenious concepts.[20]

The ultimate goal is to gather together all of the Marconi relics (or at least the most important ones) in the future Marconi Exhibition Hall in a Historic Gallery of Physics:

> for the purpose not only of making Italians and foreigners alike aware of the prestigious work of the great Italian, but also of stimulating their *gratitude*, in a more effective and *evocative* way. (italics added)[21]

Rolla and Ucelli had a common goal: to ensure that the largest possible number of visitors fully engaged with the collected documentation. The educational aim had to coincide with the celebratory and spectacular objective, in accordance with the tone that defined Ucelli's vision for the museum (Canadelli 2016; Casonato, Canadelli 2019).

This public objective continued to overlap with the promotional interest of the Marconi companies, which worked together to allow the Marconi relics to encompass a dual function, both museological and commercial, as is confirmed in the terms of the collection storage. Although Ucelli, most likely adopting Soresini's vision, had made it clear that, when presenting the artefacts, the descriptive labelling provided by SIRM did not replace "the commentary of appropriate expert personnel", thereby indirectly asserting the epistemic authority of the Museum in interpreting the collection **[fig. 3]**.[22]

During the summer of 1955, tensions and fragilities emerged between the parties regarding the management of the artefacts. At that point different organisations were jointly taking care of them, in spite of their belonging to different worlds of research, culture and business, in which elements of state infrastructure were involved in various ways.[23] The artefacts were moved from Milan to Genoa in October at the request of SIRM, as per agreements, for a Marconian Artefact Exhibition organised for the Colombian Celebrations (Montefinale 1955). The sense of continuity between the objectives of the industrial

20 ASMUST, Corrispondenza II Serie, 909 Consiglio Nazionale delle Ricerche (2), b. Cimeli Marconiani, letter from G. Ucelli to G. Colonnetti, 09/05/1955.

21 ASMUST, Corrispondenza II Serie, 909 Consiglio Nazionale delle Ricerche (2), b. Cimeli Marconiani, letter from G. Ucelli to G. Colonnetti, 09/05/1955.

22 ASMUST, Allestimento Sezioni museali, Telecomunicazioni, 1324 Cimeli Marconiani e Sala Marconi, letter from G. Ucelli to SIRM, 14/05/1955.

23 The CNR was a public body, MUST semi-public, SIRM a sole provider of State services (Pietrangeli, *infra*). The company history of SIRM has still not been examined in depth. According to the current company bearing this name, resulting from the 2016 merger of "the branch of Leonardo Marine Electronics (formerly Finmeccanica) operating in the United Kingdom, already known as Marconi International Maritime Company" (MIMC), the origin of the Italian company can be traced to the 1927 transformation of the "Compagnia Internazionale Marconi per le comunicazioni marittime". This company was already an approved wireless services provider and was converted into SIRM following Law 1082 of 16/06/1927, which ratified the Royal Decree 1557/3/9/1926. This stipulated that companies receiving state concessions for merchant ships had to be "registered in the Kingdom with a majority of Italian capital and [...] have their headquarters in Italy" (Art. 1). SIRM was also financed by English capital, as we are reminded in the biography of Giovanni Treccani, who became a board member (`https://www.treccani.it/enciclopedia/treccani-degli-alfieri-giovanni_(Dizionario-Biografico)/`). From MIMC records of agreements, it appears that on 18/12/1928, SIRM issued bonds at 500 lire each totalling 9,256,000 lire, with a 5% interest rate redeemable over 20 years (OBL MS Marconi 1927, MIMC, Register of Agreements & C, 7,143). SIRM appeared to represent the full expression of the economic and organisational connection that linked Marconi and his companies to the Italian government. See Balbi, *infra*.

exhibitions and those of the Museum is evident.[24] Exhibiting the artefacts to the public meant not only celebrating Marconi and his technological innovations, but also certifying in some way the originality of those objects under Marconi Italiana's sponsorship **[fig. 4]**.

Nevertheless, not everyone in Rome agreed with the Milanese organisation envisioned by Ucelli, Rolla, and Chiodelli. Others claimed the right to Marconian Cultural heritage: in October 1955 Vittorio Gori, director of the Istituto Superiore di Poste e Telecomunicazioni (ISPT), and a member of the Ministry of the same name, wrote a letter to Chiodelli from the Centro Radioelettrico Sperimentale Marconi to say that he had asked the CNR to transfer the remaining artefacts to the ISPT, but that was not all:

> With the intention of establishing a permanent exhibition of these artefacts in a suitable space within this building, easily accessible to the numerous engineers and officials of the armed forces […]. For this purpose, it would be highly beneficial to be able to include in the proposed exhibition the artefacts of this Company which are currently located in Genoa, and in the long term others that could be obtained from Marconi London or other institutions. […] In this way enabling the creation of the most interesting and complete Marconian exhibition which experts in the field could widely experience and explore.[25]

Therefore, for Gori, the privileged target audience to enjoy the Marconi relics was not the general public but specialists. Nevertheless, Chiodelli continued to back Ucelli's 'cause'.[26] He then contacted his friends at the CNR. A personal memo recalls:

> [Rolla has disclosed that] the Ministry of Post and Telegraphs plans to build a dedicated Museum in Rome and would therefore be opposed to sending the artefacts in question to Milan. Dr. Rolla has however informed us that this plan depends on the fact that 6,000,000 lire was spent on the exhibition in Genoa and, due to the lack of funds, the Ministry believes it would be easier to obtain international financing for the new Museum, also covering expenses in Genoa, rather than finding a way to pay off the current debts. Regardless of the comments, Ingegner Ucelli pointed out that the Museum could take responsibility for materials that could be reused in the Milan exhibition.[27]

In a subsequent letter, Ucelli even offered to pay for the direct costs of the Genoa exhibition, counting on being able to use the installations again in the Museum. With the help of statistics he maintained that tens of thousands of visitors would then be able "to honour […] the work and the memory of Guglielmo Marconi in a concrete way".[28] Ucelli became a champion for the so-called 'science for all' movement, which

24 ASMUST, Allestimento Sezioni museali, Telecomunicazioni, 1324 Cimeli Marconiani e Sala Marconi, letter from R. Chiodelli to G. Ucelli, 21/10/1955.

25 ASMUST, Allestimento sezioni museali, Telecomunicazioni,1324 Cimeli Marconiani e Sala Marconi, letter from V. Gori to R. Chiodelli, 29/10/1955.

26 ASMUST, Allestimento sezioni museali, Telecomunicazioni 1324 Cimeli Marconiani e Sala Marconi, letter from R. Chiodelli to V. Gori, 03/11/1955; letter from Marconi Italiana to G. Ucelli, 17/11/1955.

27 ASMUST, Allestimento sezioni museali, Telecomunicazioni 1324 Cimeli Marconiani e Sala Marconi, internal memorandum, 08/11/1955. 'Ingegner' (Engineer) in Italian is a honorary title.

28 ASMUST, Allestimento sezioni museali, Telecomunicazioni, 1324 Cimeli Marconiani e Sala Marconi, draft letter from the MUST Presidency to the CNR Presidency, 08/11/1955.

Figure 5
W.G. Richards, ‘Publicity Manager’ for the Marconi companies from 1922, photographed in 1942. He was employed in 1920 as the deputy of Arthur Burrows, and subsequently replaced him when Burrows became the first Director of Programmes at the recently established British Broadcasting Corporation (BBC) (OBL MS Marconi d74)

had already been established in Italian museums since the liberal era. As it grew stronger during the second post-war period, the initiative spread to European and American museums (Govoni 2002; Canadelli 2016).

The CNR and Ucelli finally found a solution, allowing the Ministry to make copies for the ISPT, before returning the objects to Milan.[29] SIRM’s Marconi relics were moved from Genoa to Rome and then returned to Milan in April 1956, but it was in fact the copies that were sent. Soresini, who undertook to compile a list of the material received free of charge, immediately reported the error.[30] The originals returned on 23 April and in June 1956 the artefacts from the *Elettra* finally arrived as well. The Marconi exhibition hall at MUST could at last be

29 ASMUST, Corrispondenza II Serie, 909 Consiglio Nazionale della Ricerca (2), letter from F. Rolla to G. Ucelli, 17/11/1955.

30 Soresini did not hesitate to highlight the problem. He wrote that an “inferior copy” of a final version of the magnetic detector, a “quite well executed false copy” of the 7777 circuit and a “fraudulent replica” of the CNR 4-sphere spark gap. Allestimento sezioni museali, Telecomunicazioni, 1324 Cimeli Marconiani e Sala Marconi, F. Soresini, list, 07/04/1956.

set up and it was officially opened on 10 October 1956.[31] But the saga of the artefacts had not yet ended. In 1956 they were again requested by Rai (Italy's National Broadcasting Company) for a Radio Exhibition, while in 1957 they were again asked for by Rai for the Levante Trade Fair in Bari.[32] The clashes between the institutions over the Marconian legacy also continued: as early as 1958, the ministry sought the return of the *Elettra* artefacts for exhibition at the future Museo delle Poste e Telecomunicazioni (now the Museo Storico della Comunicazione, at the MISE – Ministry of Enterprises and Made in Italy).[33] Ucelli again managed to extend the stay of the artefacts at the Museum with the help of the CNR, but in 1978, with the presidency of Francesco Ogliari (Ucelli died in 1964), the *Elettra* artefacts were returned permanently to the Ministry where they are now housed.[34]

4 Origins and Meanings

The reconstruction of the museum 'biography' of the Marconi relics allows us to understand which parties cooperated in the creation of the core collection of objects and with what expectations. The mystery of the imprecise labelling procedure has become clearer. In the SIRM documents, the object now referred to as D-30 is a 'spark gap': a generic name for any device with that type of function. It is a matter of a technical and operational perspective. After all, SIRM's attitude is business oriented. On the other hand, in the habits of CNR, a body representing scientific research, the identical IGB-9718 assumes the lofty name of 'Righi oscillator', an explicit reference not only to the Bologna physicist but also to the theoretical concept of the oscillator, fundamental to physics.[35] As Marc Raboy observes, the young Marconi rhetorically emphasized his entry into the historic flow of predecessors by recognizing with this designation his debt to Augusto Righi, a physicist much more famous than he was at the time (Raboy 2016, 63). The origin and the dating of these objects remained a mystery, due to the significance given to the copies at the time. Who had really produced them? Where and when?

The examination of documents from the English parent company which are kept in the Marconi Archives in the Bodleian Libraries at Oxford University, places the Italian situation within a broader dynamic, in line with the international aspirations of the Marconi business. Documentation reveals that Radio Intelligence Ltd., a subsidiary company founded as a communication service in 1924, became the communication agency serving all the Marconi Company divisions from 1932 onwards. In this capacity, it was responsible for organizing all

31 ASMUST, Allestimento sezioni museali, Telecomunicazioni, 1324 Cimeli Marconiani e Sala Marconi, letter from MUST to Istituto Superiore Poste e Telegrafi, 23/04/1956. Letter from CNR to MUST, 07/06/1956. ASMUST, 908 Consiglio Nazionale delle Ricerche (1), letter from G. Ucelli a F. Rolla, 4/10/1956.

32 ASMUST, Telecomunicazioni, 1324 Cimeli Marconiani e Sala Marconi. Letter from Rai to MUST, 12/07/1957.

33 ASMUST, Corrispondenza II serie, 909 Consiglio Nazionale delle Ricerche (2), letter from F. Rolla to G. Ucelli, 14/02/1958.

34 Ogliari tried to defend the position of MUST in relation to the aims of the CNR, but on 9 April 1979 the *Elettra artefacts* were returned to Rome. ASMUST, Telecomunicazioni 1325 Sala Marconi, minutes of the board of auditors no. 43/87, 30/09/1987.

35 In physics, a device which, once appropriately energised, generates oscillating electrical currents (electrical oscillator) or alternatively mechanical oscillations (mechanical oscillator)

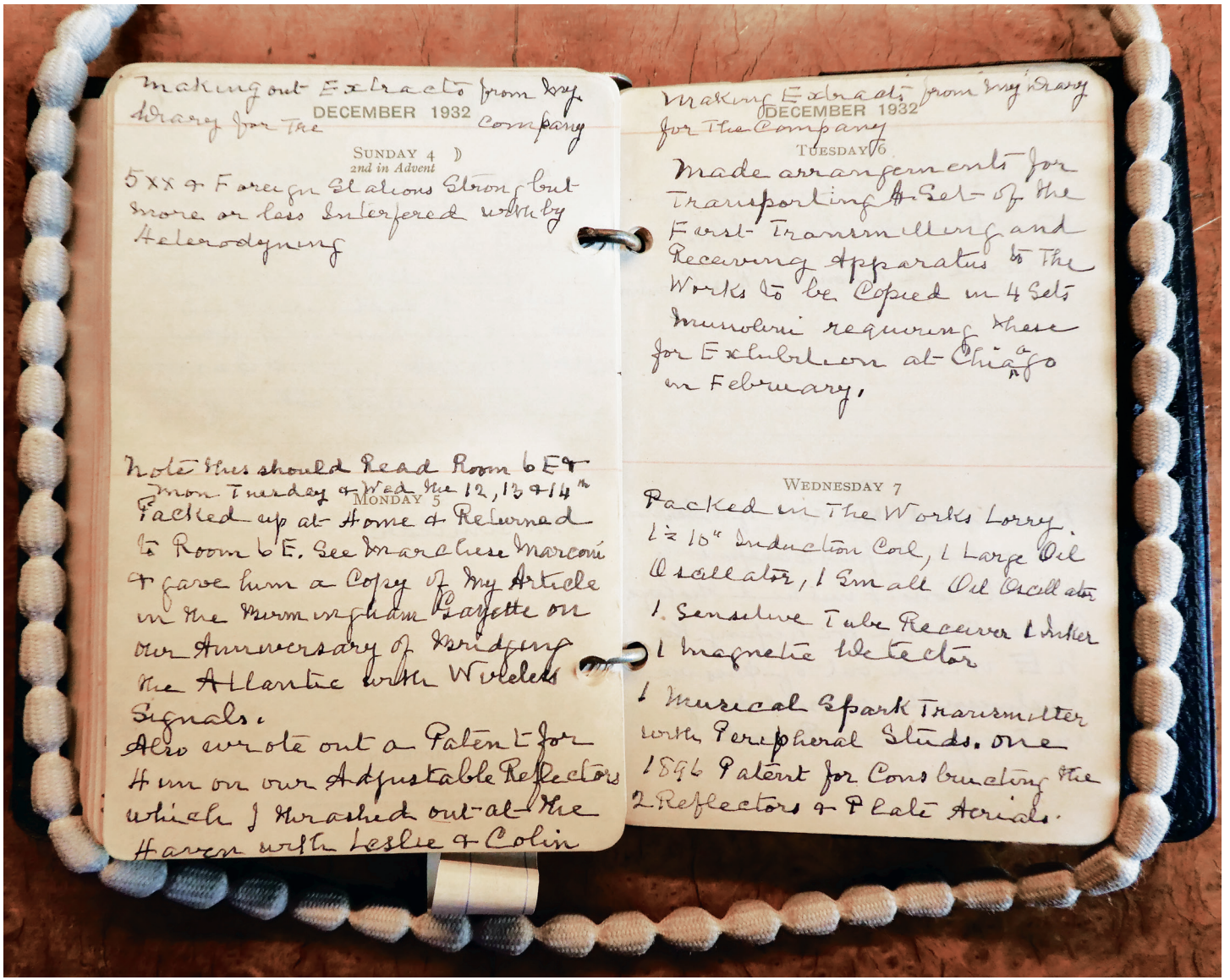


Figure 6 Extracts from the pages of George Kemp's diary from December 1932, Oxford (OBL MS Marconi 88), with notes regarding the reconstruction of the Marconi relics at the request of Mussolini and Marconi for the Chicago World's Fair in 1933. A "small Righi Oil Oscillator" is mentioned on 16 December, which would suggest that this terminology regained popularity when referring to Marconi's legacy

Figure 7
Model preserved by the Oxford History of Science Museum. It has an identical disk bearing no. 14, which might identify it as one of the four copies produced by Kemp, or at any rate, as an MWTC ‘promotional’ replica.

exhibitions.[36] They were largely promotional events, but often also included historical sections, as mentioned in some press releases. Of particular interest are the exhibitions connected to the commemoration of other scientists. For the centenary of Alessandro Volta (1927), the apparatus used by Marconi at his family home near Bologna in 1895[37] was loaned to the exhibition celebrating Volta at Villa Olmo in Como. The press release for the exhibition dedicated to Michael Faraday (1931) demonstrates that the type of ‘co-curatorship’ between companies and museums that was adopted in Milan in the 1950s was already used in London during Marconi’s lifetime **[fig. 5]**:

> A number of items of Marconi apparatus have been withdrawn from the Science Museum for the purpose of this Exhibition. These include replicas of apparatus used by Marchese Marconi in his earliest experiments in Bologna, in Italy in 1895.[38]

In this light, Marconi’s words to Ucelli, the head of the CNR in 1931, take on a new undertone, revealing a familiarity

36 OBL MS Marconi 1707, *Radio Intelligence Ltd.* report, 31/12/1935.

37 OBL MS Marconi 1707, *Volta Centenary Exhibition. Historical ‘Beam’ Apparatus*, press release, 28/05/1927. Alessandro Volta (1745-1827) was an Italian scientist, renowned for his groundbreaking studies on electricity.

38 OBL MS Marconi 1707, *Faraday Exhibition. Historical Marconi Exhibits*. Michael Faraday (1791-1867) was an English scientist renowned for his studies on magnetism.

with organised and modern promotional methods, in which marketing had become of considerable importance and exhibitions events of great appeal (Elmer 2017, 1840). The constant systematic relationship with the science museums shows the importance of the symbolic and narrative aspects of the science and technology development of the era, an objective that businesses and cultural entities cooperated on together in the name of progress (Natale, Balbi 2014). Marconi put all the organisational and technical capacities of his company at the disposal of Italian propaganda. The diary of Marconi's assistant, George Kemp, records some fundamental information for understanding this intention. On 6 and 7 December 1932 **[fig. 6]** Kemp notes having transported Marconi's first original apparatus from the London Science Museum to the Marconi workshops in Chelmsford ("to the Works"), to be copied in four sets, as "Mussolini requests them for the Chicago World's Fair in February". The following day Kemp notes the list of apparatus that he had loaded onto the company lorry: "1½ 10'' Induction Coil, 1 Large Oil Oscillator, 1 Small Oil Oscillator, 1 Sensitive Tube Receiver, 1 Inker, 1 magnetic detector, 1 musical transmitter with pepripheral Studs, one 1896 Patent for Constructing 2 Reflectors & Plate Aerials".[39] Comparing this list with the SIRM shipping document of 25 March 1955, there are the same types of objects, albeit with varying labels **[fig. 6]**.

If the Oxford archives and the literature of the period help to reveal semantic variations inherited from the past, meticulous observation methods, which are standard professional competencies in the art world and among cultural material experts, assist in identifying the common origin of objects and in dating them (Alberti 2022, 31). As well as the trademark of the English parent company, artefacts of different origins, from SIRM and CNR, also carry small circular disks engraved with sequential numbering. The Marconi Company document archives were transferred to the Bodleian Libraries in the 1990s, while the company collections of historic objects went to the Oxford History of Science Museum. A comparison with the photographic documentation relative to these objects, both contemporary and historical, reveals the presence of the same numbered disks, which seem to indicate that objects recovered from different places and donated to museums by different parties, share an identical point of origin and are part of a serial production of replicas. In each of the three copies taken into account the oscillator/spark gap bears the number 14 **[fig. 7]**.

Images from English trade fairs in the immediate post-war period show that the 'Marconi relics' circulated in the United Kingdom in the same manner as they would be in Italy shortly afterwards **[figs 8-10]**.

39 OBL MS Marconi 88. G. Kemp's Diary, 1932.

Figure 8
Photo of a display case in Marconi's 1947 Jubilee Exhibition in London, on the occasion of the 50th anniversary of the MWTC, from the Celebratory Dinner album (OBL MS Marconi 73). On the bottom left, one of the replicas of the Righi oscillator, also bearing a disk with the no. 14. Next to it two other typical Marconi relics: a wireless telegraphy printer and the first coherer receiver, of which MUST preserves a copy

Figure 9
Entrance hall of Marconi's 1947 Jubilee Exhibition, from the Celebratory Dinner album (OBL MS Marconi 73)

Figure 10
A trade-fair stand of the Marconi maritime division, the Marconi International Marine Communication Company, at the end of the 1950s. The exhibition showcased the latest wireless technologies for navigation alongside historical artefacts. There are some classic 'Marconi relics' at the centre of the photo: a coherer, a Ruhmkorff coil, a magnetic detector, and a crystal receiver (OBL MS Marconi c354)

5 Conclusions

Nicholas Thomas, the director of the Cambridge Museum of Archaeology and Anthropology, observed that museum procedures such as cataloguing, which seem trivial and routine, are in fact quite the opposite. They embody the essence of the museum, conceived as an authentic 'method' of knowledge production, which takes the form of some specific practices: physical contact with the artefacts, (re) discovery, description and comparison (Thomas 2010).

Research begins and takes shape because of the need to know precise information, such as the name of an object, its origin and its material characteristics. In this way so-called musealisation takes on a special role in the production of knowledge. It is the intentional extraction of special material 'specimens' from the fabric of contemporary reality, which are destined to become museum exhibits and to be preserved in order to stimulate new viewpoints on the world (Cirese 1977; Pearce 2012). In *Sorting Things Out*, Geoffrey Bowker and Susan Leigh Star claim that the ways in which we classify and standardise knowledge, even if at first glance they appear to be mere administrative procedures, incorporate world views and define customs and communities (Bowker, Star 2000). The museum catalogue is an important example of this. The historical configuration of how science museum catalogues have been compiled up to the present day, says a great deal about our historiographical conceptions of these objects.

This type of research in our digital era has taken on its own unique characteristics. Documentation is no longer limited to static paper files, from which the sequence of choices adopted by precursors emerges as a succession of well-defined layers. It is today rather a dynamic instrument, equipped with its own algorithmic logic that automates research and data correlation. It is a fundamental tool, which speeds up and broadens opportunities for knowledge, but which elevates the 'museum as method' and the phase of curatorial 'discovery' to a level of greater complexity. The tasks of labelling, description and comparison thereby become engaged in the fine-tuning of a complex "congruence engine" (Boon 2023).

The production and the distribution of the 'Marconi relics' tell us about the process of constructing symbolic aspects of science and technology, which relate to the social memory of their origins, and about which we are yet to fully understand the value. This process takes place by means of the exhibition and circulation in various contexts of cultural heritage, which is both material and intangible. It is carried out by a variety of agents who carry forward this legacy: the Museum, the CNR and the Italian Marconi companies. In doing so they convey differing aspirations, forming a community gathering around Marconi's cultural heritage, against the flourishing backdrop of the 'media century' (Tauschek 2015; Ortoleva 2009). Seemingly contradictory features coexist in this heritage, such as historical memory, national identity, educational needs and transnational dimensions. It is interesting to note that this dynamic also repeats itself in other themes and in other science and technology 'heritage communities', such as in the case of information technology (Casonato 2025).

The Marconi relics are scientific objects that skilled experts can use effectively in explaining the scientific principles of wireless communication. However, this quality cannot be separated from their identity as cultural objects, produced in the name of (motivated) patronage of scientific culture for the people, which lends itself well to the notion of Marconi as "the merchant prince of contemporary technology" (Monteleone 1995, 9).

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