Reproduction of the magnetic detector in a cigar box.1930s. Inv. IGB-2139

The magnetic detector is a device for receiving long-distance telegraph signal prior to the thermionic valve. It used the principle of magnetic hysteresis and the Faraday-Neumann Law to detect electromagnetic waves. It is made up of two coaxial copper coils, an iron wire running through them along their axis, and two horseshoe magnets positioned at the ends of the coils, their endpoints turning towards the wire. The magnets are positioned to magnetize the section of metallic wire near their poles in opposite directions. The inner spool is connected to the receiving antenna, while the outer one forms part of a circuit containing an amplifier, such as a headset or telephone receiver. When an electromagnetic signal reaches the antenna, activating the metallic wire to run through the system, a magnetic field is produced inside the inner coil. This causes a variation in the magnetic field through the outer coil, triggering a potential difference at its terminals, which can then be amplified by the circuit and transformed into sound. This mechanism was deemed much more reliable than the coherer, an earlier device that was considered unstable and vulnerable to atmospheric discharges, thus preventing a continuous signal reception. The fact that the magnetic detector is contained in a cigar box is a historical reference, disclosed by Luigi Solari in his 1940 biography on Marconi, about how the inventor created the magnetic detector in his room at the Haven Hotel in Poole, using makeshift objects such as magnets and a cigar box. This reproduction, dated back to the 1930s, was donated to the Museum by Guido Ucelli in 1956, who had received it as a personal gift from Marconi himself.

Guglielmo Marconi's Magnetic Detector in a Cigar Box. The 'Self-Made' Myth

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The artefact analysed in this text is a small, wooden cigar box of approximately 25 × 16 × 3 cm, with red and black coloured edges, and glued to a slightly larger wooden plank. We notice it is a cigar box because of the many inscriptions on the wood, and because of the remains of the revenue label near the box opening and the logo of the cigar brand Conte di Cavour. It also contains two horseshoe magnets, is attached to a wooden board replacing its bottom, and contains a coil of copper wires through which a braid of iron wire and silk passes.

This object is a reproduction of the prototype in a cigar box of Guglielmo Marconi's magnetic detector, a receiver of wireless signals (prior to the thermionic valve) which used the principle of magnetic hysteresis and the Faraday-Neumann Law to detect electromagnetic waves. Its functioning made it more reliable than the coherer, an earlier device which was deemed unstable and subject to atmospheric discharging, thus not allowing a continuous reception of the signal.

This 1930s reproduction was donated in 1956 by MUST founder Guido Ucelli, as it was originally a personal gift to him from Marconi.[1] From that moment on, it has always been on display in the three Telecommunication galleries.

This exemplar is not one of a kind: several exist in other Italian museums dedicated to telecommunications or to Marconi. Some are almost identical to this or datable around the 1930s

1 MUST catalogue entry IGB-2139. Some inventories indeed assert that it was built personally by Marconi. Inventario degli artefatti in Sala Marconi, ca. 1955, Scatola 17 "17 Materiali ex documentario CNR". ASMUST, Museo Industriale, Esposizioni. Pagina d'inventario del detector magnetico Marconi IGB-2139, ca. 1965, Scatola 6 "1365 Ottica – Marconi – Telecomunicazioni – Radiocomunicazioni". ASMUST, Allestimento sezioni museali, Inventari beni museali.

like this one; others are more recent. All have in common the myth they convey in material form: the story of how Marconi allegedly prototyped the magnetic detector in a cigar box, as told by Luigi Solari (1873-1957), Marconi's friend and manager of his Italian affairs.

What the unquestioned presence of this myth in museum narratives conceals is how Marconi himself used this kind of object to carry on the mythical narrative in the 1930s, when he was in the top positions of Italy's three main cultural and scientific institutions during Italian fascism. Following Carlo Ginzburg's (2004) approach to cultural history and reconstructing the biography of the object, we can use the cigar box as a source of 'clues' to observe the institutional relations between Marconi and MUST. Here, I will first present the 'material' myth conveyed by these cigar boxes, then its hidden history, which reveals Marconi's active role in promoting a heroic 'self-made' narrative through these objects and museums.

1 Marconi's 'Garage Moment'

If we open the box, we find a long inscription typed on a piece of paper glued to it, saying in Italian:

> REPRODUCTION OF THE MAGNETIC DETECTOR
>
> Devised and built by Guglielmo Marconi in 1901 and experimented in 1902 aboard the Italian R.S. [Royal Ship] "Carlo Alberto".
> Presented by H.M. the King of Italy to the Czar of Russia in Cronstadt [sic] (July 1902).
> The expedition on the Italian navy cruiser *Carlo Alberto* took place in the summer of 1902 and allowed Marconi to test the detector in order to make it marketable and avoid depending on other people's inventions and patents to receive wireless signals. (transl. by the author)

The myth of this crossing is told in a biography published by Luigi Solari, Marconi's friend and manager of his Italian affairs, including the Officine Marconi (Marconi Workshops), the Italian branch of the Marconi Company. Solari also managed Marconi's relations with the Regia Marina Italiana (Royal Italian Navy), as he was a Navy lieutenant, and with the Italian government, through the Ministry of the Navy.[2] He took part with Marconi in the 1902 radiotelegraphic campaign aboard the *Carlo Alberto*, as he had convinced the King of Italy Vittorio Emanuele III to host Marconi and his experiments on the warship, when the King sailed on it to join the coronation of King Edward VII of the United Kingdom and to meet the Russian Czar Nicholas II in Kronstadt (Raboy 2016, 208-9).

Solari published at least four biographical accounts of his friend. His full biography of Marconi is titled *Marconi: Nell'intimità e nel lavoro* (Marconi: In Intimacy and at Work) and was published in 1940, three years after Marconi's death.[3] It is indeed a vivid account, full of anecdotes and memories (many of which cannot be fully verified).

2 Regarding relations between Marconi, Solari and Italy, see Balbi and Pietrangeli, *infra*.

3 Marconi's full biography entitled *Marconi: Nell'intimità e nel lavoro* was published by Solari in 1940. It was later republished by Odoya in 2011 with a preface by Barbara Valotti. Other books by Solari are *Marconi: Dalla Borgata di Pontecchio a Sydney d'Australia* published in 1928 by A. Morano Editore, *Storia della Radio* published in 1939 by Mondadori and *Sui mari e sui continenti con le onde elettriche. Il trionfo di Marconi* published in 1942 by Fratelli Brocca Editori.

As Barbara Valotti states in her preface to the re-edition of Solari's book (2011), this first-person biography has hagiographic overtones and is greatly influenced by the historical context in which it was written. Solari wrote and published Marconi's biographies during the fascist Ventennio, and the Italian fascist regime was central in the creation of Marconi's myth in the biographies, as Solari's praise for the regime emerges from the text and it often mingles with his enthusiastic representation of Marconi (Raboy 2016, 672-30). At the same time, Valotti continues, it is undoubtedly an invaluable historical document, if we interpret it as an outline of the entrepreneurial and scientific contexts in which Marconi and Solari worked (Solari 2011, 7-10).

We can thus read this biography as the source of a discourse that has been very popular among Marconi's aficionados. Indeed, Solari offers a very detailed and colourful account of how the inventor gave his idea a material shape, starting from Ernest Rutherford's discovery, by fabricating the prototype in a cigar box:

> He left his workshop in Poole, got on his bicycle (as he did not have a car at the time), and rode to Bournemouth, a few miles from the Haven Hotel in Poole. He searched for some very fine iron wire and, after visiting several shops, found what he needed at *a beautiful florist* he knew, who used iron wire to support flower stems.
>
> Back in his workshop with what he needed, he asked one of his assistants to provide him with a small wooden box. *He was presented with an empty old cigar box, which he declared suitable for the purpose.*
>
> He then formed a thin braid with the wire purchased in Bournemouth and threaded a small cardboard tube onto it. On this cardboard tube, he wound a thin copper wire to form a coil.
>
> He then attached the two coil of wire described above to the inside of the cigar box, connected the ends of the first coil to two clamps fixed to the edge of the box, to which the antenna and the earth connection were also attached. He then connected the ends of the second coil to two other clamps also fixed to the edge of the cigar box. With these clamps were tightened the ends of the two cords of a telephone.
>
> Within the first spool, Marconi passed the braid of a wire through so that it could be easily moved. Close to the iron braid he placed two magnets. [An explanation of how the device works follows…]
>
> *In this way, the 'Marconi magnetic detector' was built*. (Solari 2011, 64-6, transl. and emphasis added by the author)

Marconi is portrayed in an agitated eureka moment: as soon as he realises the materials that he needs to materialise his invention, he gets on his bicycle to go find them. The cigar box, empty waste material, is portrayed as a serendipitous object that happened to be there and could find another, important use. The story is like a gospel parable, with a moment of realisation, followed by tense research for the solution, some tinkering described with thorough technical detail, and finally the declaration of success: "In this way, the 'Marconi magnetic detector' was built" **[fig. 1]**.

Solari spends time to explain the detector, using a popular science tone and representing himself trying out the device under the skilful guidance of the inventor, and when he assesses its functioning, he congratulates him:

> "Bravo Marconi!", I exclaimed, having ascertained the accuracy of what he had told me.
> But Marconi, who often switched to the subject of women when he was in a good mood, added: "Do you know who gave me this wire? *That pretty florist in Bournemouth, where I go sometimes to buy flowers*".
> And, because I smiled, he continued with a somewhat mischievous expression: "Think no harm. Besides,

there would be no harm in it. You know very well that *I, as a good Bolognese, am an admirer of beautiful women*". (transl. and emphasis added by the author)

The attention of the reader is quickly moved on to Marconi's attitude towards women and the florist, the only female character in this story and only connotated by the adjective 'beautiful' (*bella fioraia*), in an act of benevolent sexism (throughout the whole biography, Solari enjoys portraying Marconi as a lady-killer). The implicit assumption in the text is that Marconi only remembered where to find the fine iron wire because he remembered the beautiful florist and her trick for supporting the flower stems.[4]

The representation of Marconi we gather from the passage perfectly complies with the trope of the 'garage moment' that so often recurs in the media history and symbolically invests the foundational myths of the Silicon Valley and many technology companies, especially in the digital sector (Audia, Rider 2005; Godelier 2007). According to Peppino Ortoleva, whether it is the story of a tum-of-the-century inventor like Edison or Marconi, or a corporate narrative of a Big Tech company, the inventor-entrepreneur (typically, a man) is always portrayed as the lone genius shut away in his workshop or garage.

Ortoleva draws a common thread, between the nineteenth-century genre of the biographies of inventors and the contemporary trans-mediatic narratives of the Big Tech entrepreneurs and media moguls. Anecdotes about genius and serendipity, as well as difficulties in being acknowledged and in starting from poverty, are recurrent tropes that have allowed inventors to trace their mythology and build their own image as heroes of our time (Ortoleva 2019, 263-82).[5] These narratives shape our contemporary understanding of the relationship between innovation and society in at least two ways. They are often part of the Big Tech strategy of 'corporational determinism', i.e. the narrative attempt to present a Big Tech corporation and/or product as the only agents of sociotechnical innovation, thus as able to shape the past, present, and future of society (Natale, Bory, Balbi 2019).

In the story of the cigar box, the tropes of serendipity and genius mentioned by Ortoleva are widely represented. The cigar box is portrayed as the unexpected locus of innovation and evokes Marconi's ability and genius, reiterating the idea, typical of the engineering ethos, that an invention is only such when it is materialised in a prototype. The ability to craft a device with makeshift means denotes the relevance of materiality in the story and for the people remembering it, referring to it, and looking at it as inspirational.

The value of the cigar box is thus amplified by its legacy, made of all the cigar boxes in Italian museums related to Marconi and wireless history that are there to materially evoke Solari's story. Like any proper myth, this artefact tells and retells the same story, representing Marconi's creative flair and ingenious mind in making innovation.[6]

4 This story is found in other biographical accounts of Marconi: the 1922 *De Souza Manuscript* (MS Marconi 55, f. 177. OBL, Marconi Archives, Papers relating to Marconi and the development of wireless telegraphy, Personal papers of Guglielmo Marconi) written by Marconi's Chelmsford secretary Leon de Souza; and Solari's 1939 popular science book *The History of Radio*. While the former mentions a lingerie shop, the latter uses the same text as the 1940 edition but the part about Marconi the womanizer is left out.

5 Glen Fuller (2015) also analysed the 'tinkering in the garage' theme which led Steve Jobs and Steven Wozniak to create the Apple II and, as it is said, to set up Apple, defining the 'garage workshop' as a place for masculine action (practical, manual activities and fiddling), where the technology developed offers a world of opportunity, for example aiming for economic success and technological innovation.

6 Ortoleva (1996) stressed how many recurring themes linked to the biographies of the inventors were already circulating during Marconi's lifetime. They included his being a headstrong and precocious child, his constant attention for experiments considered crucial within a certain technological route, and the spasmodic attention for the difficulties encountered on his path to success.

Figure 1
The magnetic detector in the 1940 edition of the biography written by Solari.
Biblioteca Museo Nazionale Scienza e Tecnologia Leonardo da Vinci

In the Marconi Archives, George Kemp's (Marconi's Chief Assistant) 1902 diary, and the expanded extracts he wrote around 1930, contain a day-by-day summary of what they did. These documents show the efforts Kemp and Marconi made to find the best wires and coils to devise the prototype of the magnetic detector for approximately a month and a half, between the end of April and June 1902.[7]

At the Haven Hotel, where they were lodging, Kemp and Marconi (when present) started looking for the best conductor for the coils of the 'new magnetic detector in Mr. Marconi's room' through a trial-and-error process. On 27 April they started receiving signals on the magnetic detector. Marconi left again on 29 April and Kemp conducted the experiments on his own. The experiments carried on throughout May: Kemp continued making magnetic detectors for days.

On 7 June, we read for the first time about cigar boxes: "I made a set of magnetic detectors in cigar boxes"[8]

7 Expanded extracts from George Kemp's diaries, ca. 1930, MS Marconi 92. OBL, Marconi Archives, Papers relating to Marconi and the development of wireless telegraphy, Personal papers of George S. Kemp.

8 "Note on a Magnetic Detector of Electric Waves, which can be Employed as a Receiver for Space Telegraphy" by G. Marconi, M.I.E.E. Communicated by Dr. J.A. Fleming, F.R.S., 12 June 1902, MS Marconi 49. OBL, Marconi Archives, Papers relating to Marconi and the development of wireless telegraphy, Personal papers of Guglielmo Marconi.

Figure 2
Exterior of the cigar box lid.
On the left, the logo of the Conte di Cavour cigars, featuring the House of Savoy coat of arms and the red *fascio littorio*.
Museo Nazionale Scienza e Tecnologia Leonardo da Vinci, inv. IGB 2139

(Raboy 2016, 202; 208). He kept making them for the next two days. While, on 12 June, Marconi sent John Ambrose Fleming to deliver a lecture on the magnetic detector at the Royal Institution of Great Britain, the testing of detectors went on – and cigar boxes are explicitly mentioned – until 17 June (Kemp worked even while he was confined to bed with influenza).[9] In the meantime, the *Carlo Alberto* sailed from Naples with Luigi Solari and Admiral Carlo Mirabello on board (Raboy 2016, 209). On 10 June Solari writes they got to Poole (a town near Bournemouth) on 15 (2011, 67). Marconi went on board the warship on 26 June to leave Poole the following day. Between 15 and 26 June, Marconi and Solari met and, according to Kemp's diary and expanded extracts, they indeed played with the detector. When George Kemp wrote in his diary "Today Mr. Marconi tested the magnetic detectors for the benefit of Marquis Solari" (the only plausible moment on the diaries in which Solari might have witnessed a garage moment), it was 22 June, almost time to embark on the *Carlo Alberto*.[10]

By the time of Solari's visit, many cigar boxes had already been built.

9 "Note on a Magnetic Detector of Electric Waves, which can be Employed as a Receiver for Space Telegraphy" by G. Marconi, M.I.E.E. Communicated by Dr. J.A. Fleming, F.R.S., 12 June 1902, MS Marconi 49. OBL, Marconi Archives, Papers relating to Marconi and the development of wireless telegraphy, Personal papers of Guglielmo Marconi.

10 Kemp's diary recounts: "Marquis Solari + Mr. Marconi try the Magnetic Detector". Furthermore, Solari reports subsequent conversations with Admiral Mirabello in accordance with Kemp's Diary (Solari 2011, 68-9). Expanded extracts from George Kemp's diaries, ca. 1930, MS Marconi 92. George Kemp's 1902 diary, 1902. MS Marconi 58. OBL, Marconi Archives, Papers relating to Marconi and the development of wireless telegraphy, Personal papers of George S. Kemp.

2 The Cigar Box and the Founding of MUST: Consolidating the Garage Narrative

What role did MUST have in the diffusion of Solari's material myth? A clue that we gather from Guido Ucelli's cigar box helps us understand when the box was produced and how the myth was disseminated. It is in the logo of the Conte di Cavour cigars **[fig. 2]**. Next to the portrait of Camillo Benso, Count of Cavour, is the coat of arms of the house of Savoy (the Italian Royal Family) on the left and the *fascio littorio*, the symbol of Italian fascism, on the right. This means that the cigar box at MUST was assembled between the 1920s and the 1930s. A comparison with a box of Cavour cigars confirms that this box was serially produced in that period by SAFFA (Società Anonima Fabbriche Fiammiferi e Affini), a match company based in Piedmont and Lombardy.[11]

Ucelli and Marconi met at the end of the 1920s: Ucelli was called upon to report on the work of the municipal commission for an industrial museum in Milan at a meeting of the directorate of the CNR, of which Marconi was president and which Mussolini had commissioned to set up a national museum of science and technology (Redemagni 2011, 146). It is from this encounter that a valuable alliance for Ucelli's project will be established.

The incoming 1933 *A Century of Progress* World's Fair in Chicago reinforced this alliance. On this occasion Marconi had confirmed the CNR's production of reproductions of instruments, machines, and objects representing ltalian excellence in the technical and scientific fields; at the same time, he had called upon Ucelli – as president of the Riva, a leading company in the production of turbines and pumps – to present three objects exemplifying the technologies developed by the company, as well as material relating to the recovery of the Navi di Nemi that he had conducted (Giorgione 2018, 53-5).

One of the objects exhibited at Chicago World's Fair in 1933 was exactly a cigar box bearing the same iconography and made of the same materials as Ucelli's box **[fig. 3]**.

An article from the magazine *L'Illustrazione italiana* reporting on the second edition of the Chicago World's Fair says:

> Marconi *personally showed* to the authorities who visited the exhibition the devices he invented and built […]. Among other things, he showed with particular satisfaction a cigar box containing the magnetic detector built in 1901 [sic!] and tested on board the *Carlo Alberto* during the crossing from England to Russia. ("L'Italia scientifica all'Esposizione Internazionale di Chicago" 1933, transl. and emphasis added by the author)

Therefore, Marconi himself had embraced Solari's 'garage' story before it was published, and had the detector built in a cigar box to create and reinforce his portrayal as the ingenious national hero with the help of Solari's myth.

The Chicago World's Fair and the massive political influence Marconi had on the foundation of MUST as a national museum consolidated the relationship between Marconi and the Museum in two ways. In one respect, the future Museum secured the promise of one of the four CNR copies of collections for Chicago and for other important science and technology museums around the world, alongside the

11 "Counte di Cavour cigar box", inv. IGB-11554, Museo Nazionale Scienza e Tecnologia Leonardo da Vinci. Print of the MUST catalogue entry dated 2012.

Figure 3
The cigar box reproduction displayed at the 1933-34 Chicago World's Fair, as published in the article "L'Italia scientifica all'Esposizione Internazionale di Chicago" 1933. Courtesy of Biblioteca De Gemmis, Città Metropolitana di Bari

Documentario dei primati scientifici e tecnici degli Italiani,[12] which confirmed Marconi among such firsts.[13]

Second, Marconi could place his hopes in the national museum project to secure the narrative of technoscientific hero that he had built through his influence on the Chicago World's Fair. Marconi, who had always been interested in controlling his own image and narrative, could rely on a strong position of power in the Italian fascist hierarchy: he was President of the three major cultural institutions in the 1930s, namely CNR, Reale Accademia d'Italia, and Istituto dell'Enciclopedia Italiana Treccani. He could also trust on a cultural climate

12 On the complex issues relating to the collections and the *Documentario*, see Reali 2018; Giorgione 2018; Canadelli 2018.

13 List handwritten by Franco Soresini: "MATERIALE CONSIGLIO NAZIONALE DELLE RICERCHE passato al MUSEO DELLA TECNICA", 1 October 1952, Scatola 5 "1324 Cimeli Marconiani e Sala Marconi". ASMUST, Allestimento sezioni museali, Telecomunicazioni; Reali 2018.

made of institutions and personalities, including Mussolini himself, who were ready to glorify him as an Italian inventor and scientist.[14]

Part of Marconi's strategy to promote his 'self-made' myth could have been to gift important institutions and people with a cigar box, a symbol of the *Carlo Alberto* expedition which had been possible thanks to the Italian Royal Navy, therefore an all-Italian endeavour, compatible with nationalist fascist values exalting Italian ingenuity. These important people certainly included Ucelli, who was on track to establish a national museum dedicated to science and technology in Milan.

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14 On Marconi's cult of personality and his institutional roles in Italian fascism, see Raboy 2016, 552-60. The 1932 work of scientific disclosure by Francesco Savorgnan di Brazzà entitled *Da Leonardo a Marconi*, glorified Marconi and compared him to Leonardo da Vinci, another fascist icon.