

CHAPTER 3

The Quest for the Technological Soul of a Nation

The Catalan Forge and the Display of Politics (1914–1949)

Jaume Valentines-Álvarez

Post-Doctoral Fellow

*CIUHCT | Interuniversity Center
for the History of Science and
Technology*

*Nova University of Lisbon
Portugal*

During the last days of July in 1914, two young Catalan engineers hurried to flee from France and crossed the border towards home.¹ World War I had started. They brought in their baggage plenty of papers with notes, maps, drawings, and data collected from some of the quietest, most remote, and least populated areas in the Pyrenees mountains. Santiago Rubió (1892–1980) and Antoni Gallardo (1887–1942) had been looking for the “technological soul” of Catalonia:² the legendary *farga catalana* (Catalan procedure, or Catalan forge).³ The material remains of the *farga* were supposed to be the footprints of

Catalonia’s lost “golden age” of metallurgy, which was traced back to the Middle Ages. World-renowned from the seventeenth century until the mid-nineteenth century, this technology had been appropriated throughout Europe and the Americas, from Minas Gerais in Brazil to Vermont in the United States.⁴ Rubió and Gallardo wrote about the oblivion of Catalonia’s technological past in a romantic and nationalist way: “Now that the spring floods of the rivers have roughly pushed downstream the tools and remains of work lost; now that the mallets are quiet, the anvils are silent, and the drop hammers do not ring, it is still possible to find the last proofs of the work at the forges which spread the name of our land all over the world.”⁵

With the aim of recovering these “last proofs,” the engineers traveled through green valleys and tiny rivers by car and walked along narrow paths throughout the Catalan-speaking Pyrenees belonging to Spain, France (Roussillon), and Andorra (Figures 1 and 2).⁶ As “industrial archaeologists,” they mapped the geographical location of the forges, surveyed sites, took photographs of buildings, drew layouts of structures, preserved samples of minerals and slags, collected artifacts, and interviewed old inhabitants who retained the know-how and associated skills.⁷ The fieldwork was just part of the activities in the search for this “technological soul.” In the Pyrenees, they also consulted ecclesiastic and administrative archives in towns and villages, visited local museums such as the Sant Pere Museum in Ripoll, and studied the traditional smith industries and their final products, including nails, arms, keys, locks, and anvils.

In Barcelona, at the libraries of the School of Industrial Engineers and the Association of Industrial Engineers, the travelers came across old technological studies that ranged from contemporary geological and water engineering reports to classic metallurgical treatises by Philippe-Frédéric de Dietrich (1786), Henri C. Landrin (1859), Charles-Edouard Jullien (1861), John Percy (1864), and Luis Barinaga (1879). They also consulted more recently published treatises, such as the one by a Catalan professor of architecture in which the Catalan procedure was extensively described (Figure 3).⁸

Besides, a different kind of reference work was key for the young engineers: books that dealt with the historical origins and geographical milieu of the so-called “Catalan civilization,” and



Figure 1. Raiders of the Lost Forge (next to an ancient iron workshop in the Catalan mountains). [M. Tell]. From A. Gallardo Garriga, and S. Rubió Tudurí, *La farga catalana: Descripció i funcionament, història, distribució geogràfica* (Barcelona: Exposició de Barcelona, 1930). Published with permission of the Biblioteca Nacional de Catalunya.



Figure 2. Archaeological fieldwork in the Pyrenees. From A. Gallardo Garriga, and S. Rubió Tudurí, *La farga catalana: Descripció i funcionament, història, distribució geogràfica* (Barcelona: Exposició de Barcelona, 1930). Published with permission of the Biblioteca Nacional de Catalunya.

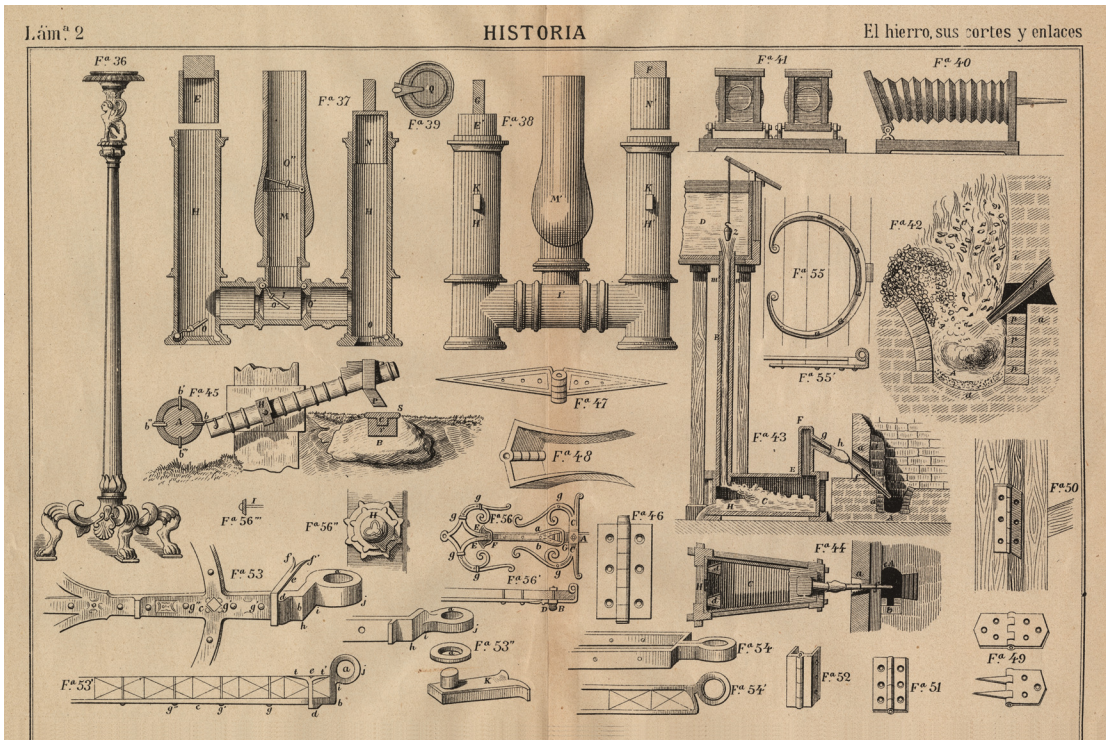


Figure 3. Techniques and objects of Catalan iron history, as depicted by Rovira Rabassa in his metallurgical treatise (on the Catalan forge, see figures 42–45). From A. Rovira Rabassa, *El hierro, sus cortes y enlaces* (Barcelona: Libr. Alvaro Verdaguier [1910]), Lamina 2. Published with permission from the Biblioteca Nacional de Catalunya.

which were entangled with the rise of Catalan proto-nationalism.⁹ Rubió and Gallardo made the Catalan forge part and parcel of a pastoral “Catalan soul”—in the words of anthropologist Llorenç Prats—which had been idyllically set in the farmlands and mountains of Catalonia in the nineteenth century.¹⁰ The image of the innocent and pristine (but often challenging) “patriarchal life” in rural areas continued to be spread during the first decades of the next century, in particular by engineers, architects, and other science and technology professionals.¹¹ In his book devoted to scientifically organizing Catalan economy, for example, industrial engineer Lluís Creus worshiped the countryside’s purity, writing that it is “sound, brightness and harmony . . . This is the life in our fields which are covered with radiant grass. Symbol of our patriarchal agriculture, here you have an eclogue, under the regard of the Puigsacalm mountain.”¹²

This time, “the machine” did not seem to produce feelings of anxiety or dislocation when it entered “in the garden”; the idyll was not interrupted.¹³ Rubió and Gallardo stressed that the technological legacy was also an unavoidable part of the “radiant” green landscapes and of Catalan quintessence. Besides the forge, the two engineers were also very interested in cataloging the medieval Romanesque architecture in the highest Catalan towns, as well as the most popular farm constructions, the *masias*.¹⁴ They studied this heritage by entering in the alleged core of the national territory: the hinterland of Catalonia, especially the farthest mountains in the Pyrenees.¹⁵ According to some of the first key ideologists of Catalan nationalism, the Pyrenees were the “entrails of the Catalan mother.”¹⁶ Walking along valleys and climbing mountains were acts of breathing in pure air as well as national essences. Hiking and going on excursions had become a bourgeois hobby linked to hygiene theories, natural sciences, and nationalism, especially since the creation of the Catalanist Association for Scientific Excursions in 1876; love of country was supposed to mature when being “watered” by scientific knowledge.¹⁷ Neither technology nor science were at odds with the pastoral “national nature.” The mountains were undoubtedly far away from the huge amount of new technology that had been put on display in Barcelona by engineers, especially since the 1888 Barcelona International Exhibition.¹⁸ Nonetheless, the newest technologies, such as funicular railways, rack railways, and cable railways, were promoted as means to gain access to and enjoy these landscapes. In fact, Rubió designed a funicular in 1917 to reach the gorgeous location of the Núria Sanctuary in the Pyrenees, which was surrounded by several peaks of nearly 3,000 meters.¹⁹

In addition to the young engineers, senior fellows of the profession also strengthened this vision of a quiet, hilly core of the nation as well as the relevance of past national technologies. These proponents included engineer and economist Carles Pi Sunyer (1888–1971), who served as secretary of the main association of owners of textile industries, the *Federació de Fabricants de Filats i Teixits de Catalunya*, during the 1920s, and became head of the Department of Culture of the Catalan government at the end of the 1930s. He wrote some “sketches on the history of Catalan cotton industry” in 1924 and, in 1929, his influential book on the “economic aptitude of Catalonia.”²⁰ This latter explained that the people of the Pyrenees were the

“skeleton of the Catalan personality” because of their alleged capacity for “ethnic conservation.” Ingenuity, humble industriousness, enterprising dynamism, and technical skills characterized this “personality.”²¹ The remains of the Catalan forges were understood to be the bones of that “skeleton,” and the ancient metallurgy—alongside other iconic technologies such as the Catalan vault, the spinning machine *Bergadana*, the submarine *Ictineu*, and the cork industry—seemed to be clear evidence of how the “national intelligence” had contributed to universal science and technology.²²

Displaying Relics at the Pavilions of the International Exhibition (1929–1931)

The industrial heritage recovered by the young engineers was supposed to be displayed at the Barcelona Exhibition of Electric Industries in 1917. The exhibition had been promoted by the urban economic elite—especially those linked to the energy sector—as well as by the *Mancomunitat* of Catalonia, the first attempt at an autonomous government for the whole region. Since 1914, the *Mancomunitat* had enhanced a right-wing political program to “modernize” the nation through new cultural institutions and large technological networks, such as hydroelectric, telephone, and road systems.²³ Nevertheless, the exhibition was postponed due to the outbreak of World War I and, after the war, to local circumstances. During the first years of Miguel Primo de Rivera’s dictatorship (1923–1930), the project was again taken up as an international exhibition of arts, sports, and industry.²⁴

Finally, the Barcelona International Exhibition was held in 1929 by the Spanish government, Barcelona’s city hall, the Catalan “civil society” (in Gramscian terms), private companies, and, last but not least, professional associations.²⁵ It epitomized the expression of technological sublime and enthusiasm in the city up to that moment. With its engineered fountains, lights, gardens, transport networks, and amusement rides, this exhibition represented what was called the “triumph” of the Catalan engineering profession.²⁶ The engineer-in-chief and orchestra conductor of this high-sounding event was Mariano Rubió, Santiago’s father. Mariano was a renowned military engineer who had been involved in the organization of the Exhibition of Electric Industries from the mid-1910s onward.²⁷ Santiago Rubió was in charge of the design of transport facilities, such as the funicular railway ascending to the prominent National Palace of Montjuïc hill. At that time, he was an expert in transport engineering and had already designed the first line of the Barcelona subway as well as two funicular projects reaching religious and symbolic epicenters of Catalan nationalism: the aforementioned Núria Sanctuary and the mystical Montserrat mountain, which houses the black Madonna statue *Moreneta*.

No trace of the “golden” metallurgical past of Catalonia appeared, however, when the exhibition opened its doors. Santiago Rubió publicly attributed this fact to full occupancy of the pavilions by international and local stands, but there must have been political reasons that he preferred not to mention. The 1929 international exhibition was sponsored by the regime of Primo de Rivera, who promoted a wide range of right-wing policies against workers’ organizations and

non-Spanish nationalisms. The dictatorship fervently wished to “de-Catalanize” the exhibition and the city. One of the clearest examples of this was the destruction in 1928 of four high columns that represented the Catalan flag and stood in front of the National Palace. When the military dictator fell during the first weeks of 1930, the political context seemed much more suitable for showing the “relics” of the Catalan forge. This was the case starting 28 May 1930.²⁸

Although the 1929 international exhibition officially ended in January 1930, many stands and displays remained and new ones were set up, such as the *farga* exhibition, which could be visited from 9 PM to 2 AM. At the Palace of Electricity and Metallurgy, exhibits in a gloomy 130-square-meter room, with both replicas and originals, sought to reproduce the atmosphere of ancient workshops in the Pyrenean valleys (Figures 4 and 5). Members of the public were meant to emotionally immerse themselves in the environment and the ancient techniques. With the light



Figure 4. The *farga* at the pavilions of the 1929 Barcelona International Exhibition, cross section. From Arxiu Històric de la Ciutat de Barcelona, Tuboteca, 2955–2959. With the permission of the Arxiu Històric de la Ciutat de Barcelona.

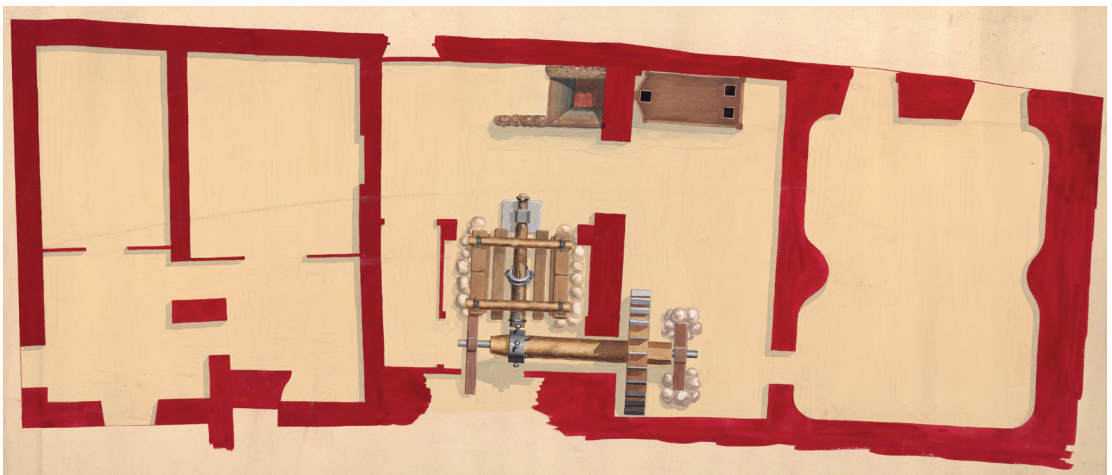


Figure 5. The *farga* at the pavilions of the 1929 Barcelona International Exhibition, floor plan. From Arxiu Històric de la Ciutat de Barcelona, Tuboteca, 2955–2959. With the permission of the Arxiu Històric de la Ciutat de Barcelona.

of a single sunbeam that came across the wood ceiling joist “as it usually entered in the ancient forges,” the visitor could recognize the different elements that characterized the Catalan forge: the low furnace with a truncated square pyramid shape; the horn (or trompes), which substituted for a bellows thanks to the water flow and the Venturi effect; the hydraulic wheel; the big drop hammer; and the charcoal tank.²⁹ Mallets and other original instruments that had been collected from forge workshops in ruins hung now on the faux stone walls or rested on the ground, as if ready to be used by forgers.³⁰ Other museographic resources contextualized the pieces and architectures, and gave the visitor a comprehensive view of this technological artifact/architecture/procedure: a diorama representing the Pyrenees (painted by the famous stage designer Oleguer Junyent); a drawing showing skilled staff making ore into a high-quality, low-carbon iron; graphics, posters, and texts, which defined the technical nomenclature, described the specific parts of the furnace, drop hammer, and horn, and explained how they worked; and photographs showing current forges that hybridized the former procedure with new materials and energy sources. In addition, next to the *farga* room, an exhibition about the popular art of Catalan blacksmiths displayed old, everyday objects such as knockers, hangers, lamps, flowerpot stands, and religious images. For the occasion, low-ranking technicians and members of the Barcelona Association of Locksmiths and Blacksmiths highlighted the role of iron as an “ancestral tradition of our homeland.”³¹

Certainly, engineers and technicians sought to recover the technical past so as “not to let our things be lost,” as Rubió summed up, and also to let new things be Catalan. He wrote, “love to old things . . . is nothing to do with hating progress.”³² The display of the *farga* in the pavilions complemented the display of contemporary “national inventions” and new industry sectors developed in Catalonia.³³ These included a novel automatic system for railway signals, cutting-edge engines developed by the Hispano-Suiza automotive company, and several products from the Asland cement factory, which—nationalist journal *Ciència* wrote—“[honored] Catalonia abroad” as they were made “with Catalan materials, workers, technicians and capital.”³⁴ The past could seem a mirror for the future, reflecting a blurred but powerful image when a nation sought independence from foreign machines, technicians, and raw materials, and promoted new industrial sectors, in particular new metallurgical industries. Engineers asked for the “rebirth” of the national iron industry, though they were in fact asking for the development of imported blast furnace techniques in Catalonia (significantly, not low furnace techniques, which were characteristic of the Catalan forge).³⁵

The year 1929 became a landmark in the rise of the engineering profession in Catalonia: the success at the international exhibition, the global financial crack along with the forthcoming local crises, and the collapse of the Primo de Rivera dictatorship allowed Catalan industrial engineers to ask for a more radical, numbers-based management of the factory and the nation, built upon scientific principles and technical planning.³⁶ Especially since the proclamation of the Second Spanish Republic (1931–1939) and the Autonomous Government of Catalonia (1932–1939), the multilayered project to rationalize, standardize, and streamline industrial and social production went hand in hand with a professional nationalism aimed at making Catalonia technological as much as making (old and new) technology Catalan.³⁷

Building a Temple in the Museum of Popular Art (1931–1939)

When the pavilions of the Barcelona International Exhibition definitely closed their doors, the set of artifacts displaying the Catalan procedure had no place to go. No national museum of technology existed in Barcelona, and the challenging proposal by Mariano Rubió to create the world's largest technical museum in the former pavilions of the international exhibition was just a vague idea that was never realized.³⁸

Nonetheless, an opportunity to keep alive the metallurgical past arose at the end of 1931. An institutional agreement transferred the pieces exhibited at the Palace of Metallurgy to the Barcelona Board of Museums, a public but privately sponsored institution created in 1907 to preserve and curate artwork, especially medieval paintings and architecture.³⁹ At that time, the board was planning the creation of the Museum of Popular Art. The leading figure of this institution, Joaquim Folch Torres, made the objectives of the museum clear: on one hand, to show the works and results of the folklore “activism” that had allegedly enhanced “the Catalan rebirth”; on the other hand, to develop “scientific means” for new ethnographic research following the path of Scandinavian and German museologies.⁴⁰ One of the sections of the museum was to be devoted to the preservation of the “industries of popular art that are dying” and to show the “workshops in which the smith forges, the weaver weaves, and the old printer prints.”⁴¹ The *farga* exhibit was perfectly suited to the project, complementing other installations such as the Auditorium of Popular Songs and the Live Section of Fiestas, Dances and Christian Mysteries.

Beginning in November 1931, the board was in charge of the Spanish Village,⁴² a kind of open-air theme park created in 1929 as part of the international exhibition and Primo de Rivera's Spanish nationalist program. Buildings reproduced traditional architectural features from every region of Spain except the Canary Islands. Although the initial project (called *Iberiona* and drafted by the engineer and art promoter Miquel Utrillo in 1923) was not conceived according to this nationalist program, the Village was regarded and politically appropriated as a representation of the unity of Spain.⁴³ After visiting it, philosopher José Ortega Gasset summed up his feelings: “The site as an art archive is impressive. It will give to foreigners a clear and categorical idea of what Spain is.”⁴⁴ After the exile of the dictator—and especially after the proclamation of the Second Republic—the Village was considered a representation of a different Spain, more in tune with the original ideas behind *Iberiona*: a federal state built upon several regions and cultures. During the first anniversary of the Village on 15 May 1930, a popular Catalan festival was celebrated. While the Pyrenean *farga* was exhibited at the Palace of Metallurgy, at the Village, a Pyrenean traditional marriage was acted out, “starring” a bride and a groom in traditional costume, musicians with ancient tambourines and whistles, folklore dancers, horses, mules, and hens.⁴⁵

In 1932, Santiago Rubió described a new proposal for exhibiting the forge in the journal of the Board of Museums: the *farga* should be located in the so-called “Catalan neighborhood” of the Spanish Village, which already hosted a smithery from the Barcelona Association of Locksmiths

and Blacksmiths in its central square, Fountain Square (Figure 6).⁴⁶ He pointed out that “despite it having the virtue of crossing borders . . . , the origin was in our home.”⁴⁷ The square was framed by “typical Catalan façades” of buildings that had big keystones as well as Gothic and Romanesque motifs and were from all the provinces of Catalonia.⁴⁸ In fact, there were also other compelling museological reasons to locate the *farga* in this “neighborhood” (Figure 7). On the outskirts of the Village, an evocation of the Pyrenean landscape would add to the historical reconstruction of the workshop that was displayed at the international exhibition. Rubió stated, “the Romanesque monastery and the more and more lush portion of forest will keep the old forge company and will remind the visitor of . . . those valleys that day and night had heard the loud and unhurried sound of the drop hammer.”⁴⁹

Besides Santiago Rubió, other engineers and technicians spread the new national technological icon across the Catalan territory during the 1930s. The most relevant example might be engineer Rafael Campalans (1887–1933). Founder and leader of the Catalan socialist party USC (1923), he was one of the few members in the official commission in charge of writing the Statute of Autonomy (1932), the home rule for Catalonia until the end of the Spanish Civil War in 1939. At that time, he was teaching one of the first official courses devoted to the history of science and technology, the theoretical–practical course History of Sciences at the School of Library Studies for Women in Barcelona.⁵⁰ One of the sections of this course was specifically about the Catalan procedure. But the icon traveled still farther from Barcelona, reaching even



Figure 6. Fountain Square, the core of the “Catalan neighborhood” in the Spanish Village (with ironwork behind its arches). From *Exposición Internacional de Barcelona: Pueblo Español MCMXXIX* (Barcelona: Concesiones Gráficas, 1929). With the permission of the Biblioteca Nacional de Catalunya.

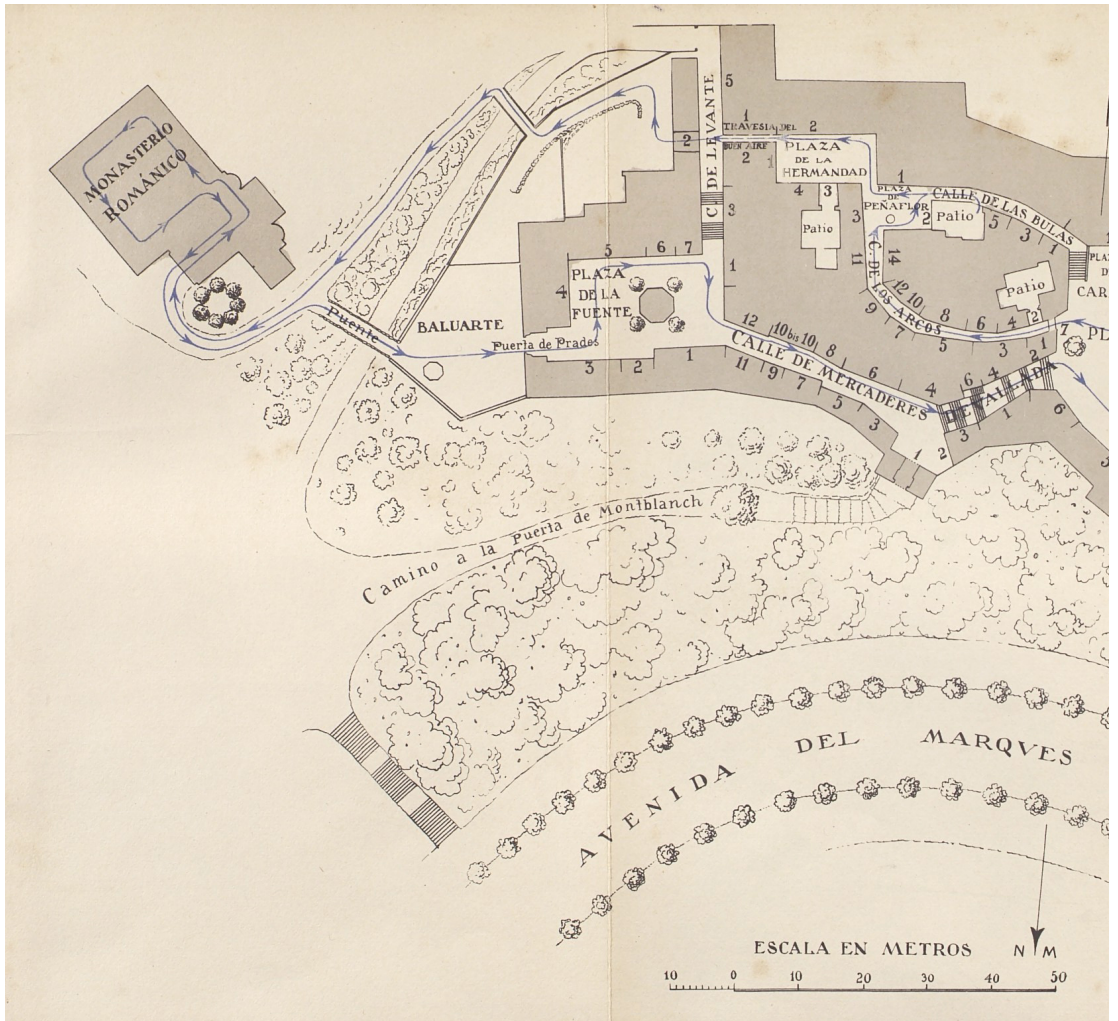


Figure 7. The “Catalan neighborhood” surrounded by the “Pyrenean atmosphere” (the Romanesque church, the bridge, the trees, the trails . . .), as drawn in *Guía del Pueblo Español* (Barcelona: n.d., ca. 1929), follows p. 39. With the permission of the Biblioteca Nacional de Catalunya.

the historical core of this technology; 100 kilometers away, close to the Pyrenees, students of the Arts and Craft School in Ripoll could listen to engineer Ramon Casanova Danés (1892–1968) speak about the technical and symbolic features of the old metallurgy. They took notes on his detailed descriptions of procedure, tools, and skills while learning that “this procedure perfectly suits the minerals, the fuels, and the ethnic character of our country.”⁵¹ They also learned that the arts and craft schools in the peripheries of Catalonia needed to connect the old forge tradition with the most advanced technologies in the world in order to bring again “the richness of the iron activities to our country.”⁵² Casanova Danés was the grandson of the “last forger” in the Pyrenees, and his father owned a successful metallurgical company that earned three medals in the 1888 Barcelona International Exhibition. Even more relevant, he was the entrepreneur who introduced new stamping machines and innovative tool designs into the traditional metal workshops to produce supplies for high-tech companies based in Barcelona, such

as Hispano-Suiza, the internationally renowned automotive company devoted to production of luxury cars and aircraft engines.⁵³

As the creation of the Museum of Popular Art was delayed, in mid-1935 the wealthy businessman and director of Hispano-Suiza in Barcelona, Miquel Mateu, agreed to pay all the costs for moving the large, heavy pieces of the *farga* exhibition to a new museum,⁵⁴ the Cau Ferrat Museum (1933) in Sitges, a tourist and bourgeois seaside town near Barcelona.⁵⁵ This museum was also managed by the Board of Museums and held rich collections of popular arts, especially of iron, glassware, ceramics, and furniture arts. In fact, art-nouveau painter Santiago Rusiñol founded it from a collection of wrought iron. “Ferrat,” in fact, means “adorned with iron” in Catalan.⁵⁶

Epilogue: Burying the *farga* (1936–1949)

During the Spanish Civil War (1936–1939), the main metallurgical companies in Barcelona such as Hispano-Suiza and La Maquinista were recycled into collectivized and government-held war industries, producing armored cars, weapons, aircraft engines, and machine tools (Figure 8).⁵⁷ While trying to overcome the technological challenges and pitfalls of the military and economic war,

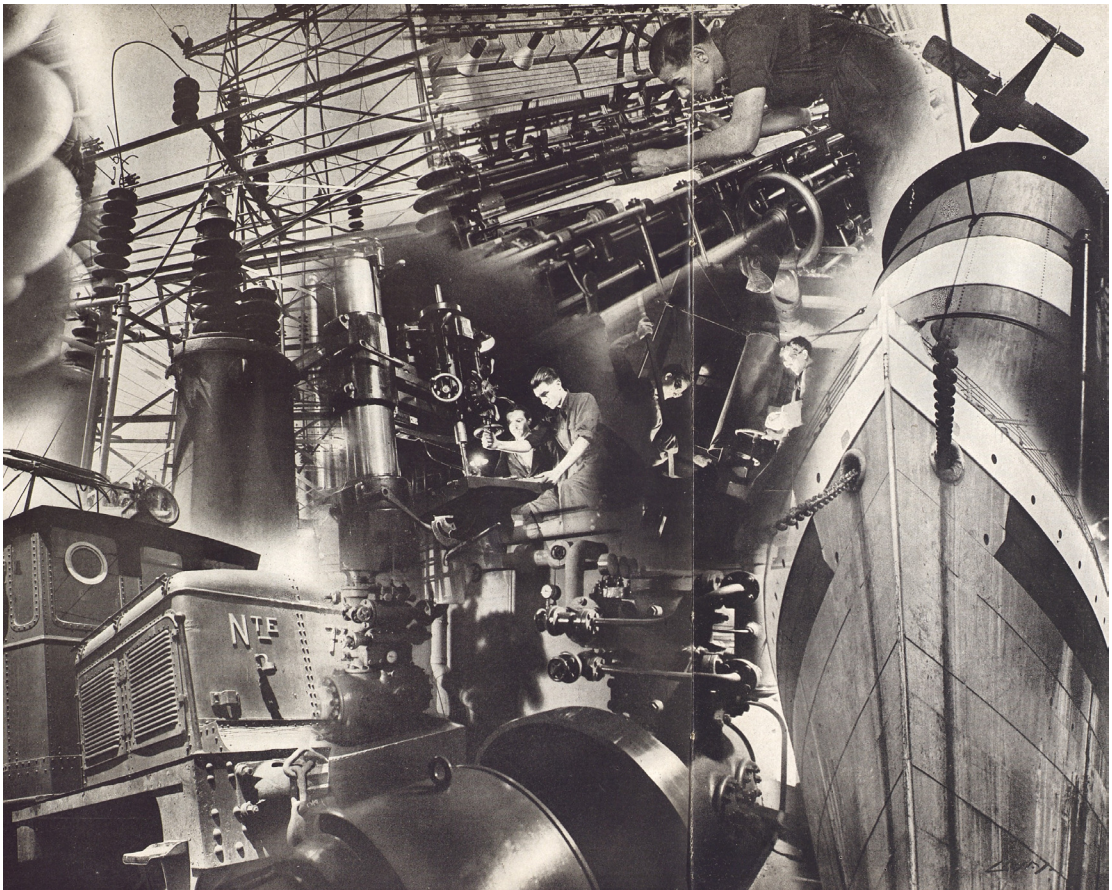


Figure 8. An official picture collage showing the Catalan metallurgical “effort” for winning the war and strengthening the revolution. From *Butlletí trimestral. Conselleria d’Economia, Generalitat de Catalunya* 3 (1937): 58–59. Published with permission of the Biblioteca Nacional de Catalunya.

Catalan engineers on the Republican side continued evoking the “technological soul” of the nation. The metallurgical past was now used as an incentive to make Catalonia technologically capable enough to defeat fascism and to strengthen the revolution (Figure 9).⁵⁸ At that time, Santiago Rubió was president of an ambitious official project called CAIRN, which planned to survey all the material and energy resources of the nation, particularly the so-called “landscapes of wonder” in the



Figure 9. The idyllic melding of the old and the new, with the smith in the center. From *Economia: butlletí mensual del Departament d'Economia de la Generalitat de Catalunya*, 1 (1937). With the permission of the Biblioteca Nacional de Catalunya.

Pyrenees.⁵⁹ When asking for renewed exploitation of the Catalan iron mines as part of this project in order to obtain high-quality steel through ironworks and new techniques, Rubió had not wanted to forget that “our land was once producer and exporter of the iron of the famous forges.”⁶⁰ Moreover, Rubió was one of the few experts behind the hurried design of an ambitious museological project, the Technology Museum of Catalonia. The *farga* remnants from the 1929 International Exhibition might have been part of the museum section II, which was to be devoted to metallurgical and mechanical production,⁶¹ but instead, as with the displays of the Catalan forge at the museums of Popular Art and Cau Ferrat, the Technology Museum of Catalonia was never initiated. The Second Spanish Republic and the Catalan Autonomous Government were defeated by the armies of Franco, Mussolini, and Hitler several months before the outbreak of World War II.

After the Spanish Civil War, the drop hammers and other material evidence of Catalan technonationalism were put aside. The Spanish National-Catholic regime “buried” any icon that could recall Catalan nationalism (while burying in mass graves thousands of people who had opposed fascism, especially anarchists and Marxists).⁶² The new politicians and governors in Catalonia had no intention of reviving the *farga*, such as Miquel Mateu, who governed Barcelona with an iron fist during a period of great repression and brutality, just after the victory of the fascists (1939–1945) (Figure 10).⁶³ When the Museum of Popular Art (at the time, named Museum of Popular



Figure 10. The fascist Victory Parade in Barcelona on 21 February 1939; dictator Franco waves from a shiny Hispano-Suiza (probably the car Miquel Mateu gifted to Franco in 1938). AMCB. Fons Ajuntament de Barcelona: B101 Actes protocolaris, exp. 5/1939. Published with permission of the Arxiu Municipal Contemporani de Barcelona.

Industries and Arts) was finally established in the Spanish Village in 1942, it sought to reinforce the Spanish nationalist discourse. This discourse was strengthened soon after with the Spanish imperialist rhetoric at the Ethnological and Colonial Museum in 1949 in Barcelona, which featured objects coming from the Spanish colonies and ex-colonies such as Equatorial Guinea and the Philippines.⁶⁴ Remains of foreign traditions of crafts and technologies promised a “rebirth” of another kind of national grandeur in the fascist and Catholic New Spain. No (literal) room was left for the “technological soul” of Catalonia.⁶⁵ Ultimately, focusing attention on the “politics of display” in international exhibitions and national museums sheds light on “the display of politics” in specific ideological and nationalist contexts.⁶⁶ After 1939, the remains of the *farga* exhibited in the pavilions of the 1929 Barcelona International Exhibition became definitively lost.⁶⁷

Acknowledgments

I greatly appreciate the comments and suggestions for this chapter by José Pardo-Tomás, Alfons Zarzoso, Sophia Vackimes, Jaume Sastre-Juan and Francisco Pinheiro, and by the editors and reviewers of this volume. This research has been developed in the framework of the post-doctoral project “Technocrats for the Nation or the Nation for Technocrats? Technology, Governance and Citizenship in Southern Europe, 1929–1975” (SFRH/BPD/93264/2013, FCT, Portugal), and the project “From the Cabinet of Wonders to the Popular Anatomical Museum: Regimes of Exhibition and Material Culture of Medicine” (HAR2015-64313-P, CSIC, Spain). This chapter is dedicated to Cal Farré.

Notes

1. A. Gallardo Garriga, and S. Rubió Tudurí, *La farga catalana: Descripció i funcionament, història, distribució geogràfica* (Barcelona: Exposició de Barcelona, 1930), 87.
2. The search for “technological souls” and, particularly, the making of old technologies into national icons was contemporaneously promoted in other countries during the first decades of the twentieth century, e.g., the Newcomen’s and Watt’s steam machines in England, the milling machine and the machine tools in the United States, the electrical and chemical industries in Germany, the Viking ships and John Ericsson’s hot-air machines in Sweden, and Leonardo da Vinci’s inventions in Italy. See, for instance, P. Morris, ed. *Science for the Nation: Perspectives on the History of the Science Museum* (Palgrave: London, 2010), esp. 333–339; J. Sastre-Juan, *Un laboratori de divulgació tecnològica: el New York Museum of Science and Industry i la política de la museïtzació de la tecnologia als Estats Units, 1912–1951* (Ph.D. diss., Universitat Autònoma de Barcelona, Barcelona, 2013), 131–137 and 155; E. Duffy, *Representing Science and Technology: Politics and Display in the Deutsches Museum, 1903–1945* (Ph.D. diss., University of North Carolina, Chapel Hill, 2002), 66–111 (esp. 100); A. Houltz, “Modern Accounts of Past and Present: The Gothenburg Exhibition of 1923,” in *Modernism and Rationalization*, ed. C. Jørgensen and M. Pedersen (Aalborg: Museum of Northern Jutland, The Heritage Agency of Denmark, 2006), 117–132; E. Canadelli, “Le macchine dell’ingegnere umanista’: Il progetto museale di Guido Ucelli tra Fascismo e Dopoguerra,” *Physis. Rivista Internazionale di Storia della Scienza* 51 (2016): 93–104; G. Somsen, “Science, Fascism, and Foreign Policy: The Exhibition ‘Scienza Universale’ at the 1942 Rome World’s Fair,” *Isis* 108, no. 4 (2017): 769–791 (for the Italian case, see also the chapters by Elena Canadelli, Francesco Barreca, and Claudio Giorgione in this volume).
3. Two biographies: G. Lusa Monforte, *Los tres directores de la Escuela durante la Guerra (1936–1939). Santiago Rubió i Tudurí* (Barcelona: Universitat Politècnica de Catalunya, 2015), 5–111; R. Matheu, *Notes biogràfiques de Antoni Gallardo i Garriga* (Barcelona: 1962).
4. In nineteenth-century North America, it was common to name any type of bloomery a “Catalan forge.” For the circulation and appropriation of this technology and these terms, see: F. Overman, *The Manufacture of Iron: In All Its Various Branches* (Philadelphia: Henry C. Baird, 1854), 245–249 (section “The Catalan Forge”) [e-reprinted in the collection *Making of America* by Applewood Books]; R. B. Gordon and D. J. Killick, “The Metallurgy of the American Bloomery Process,” *Archeomaterials* 6 (1992): 141–167. See also: E. Tomás, “The Catalan Process for the Direct Production of Malleable Iron and its Spread to Europe and the Americas,” *Contributions to Science* 1, no. 2 (1999): 225–232; F. R. Morral, “The Catalan ‘farga’ in the New World (1500–1900),” in *La farga catalana en el marc de l’arqueologia siderúrgica*, ed. E. Tomás (Andorra la Vella: Ministeri d’Afers Socials i Cultura, 1995), 125–129.

5. Gallardo and Rubió, *La farga catalana*, 8–9.
6. Rousillon was part of the historical Principality of Catalonia and became part of France with the Treaty of the Pyrenees (1659).
7. It is worth pointing out that Rubió and Gallardo never used the terms “industrial archaeology.” Nonetheless, before their broad use in England in the 1950s, this term had been proposed by the Portuguese journalist and historian Francisco Marques de Sousa Viterbo in the article “Arqueologia industrial portuguesa: os moinhos” (*O Archeologo Português*, 1896). Moreover, “archaeology” applied to industrial evidences had been used even before, for example, in the paper by I. Fletcher, “The Archaeology of the West Cumberland Coal Trade” (*Transactions of the Cumberland and Westmoreland Antiquarian and Archaeological Society*, 1878), as noted in K. Hudson, *Industrial Archaeology: An Introduction* (London: University Paperbacks, Methuen, 1965), 13–14.
8. A. Rovira Rabassa, *El hierro, sus cortes y enlaces* (Barcelona: Libr. Alvaro Verdagué, [1910]), 55–61.
9. J. Balari Jovany, *Orígenes històrics de Catalunya* (Barcelona: Instituto Internacional de Cultura Románica, 1964 [1899]), 674–675; F. Carreras Candi, *Geografía General de Catalunya* (Barcelona: Albert Martín, 1908–1918).
10. L. Prats, *El mite de la tradició popular: els orígens de l'interès per la cultura tradicional a la Catalunya del segle XIX* (Barcelona: Edicions 62, 1988), 175 and 198.
11. Concerning architecture professionals in Catalonia, see: J. M. Puigvert Solà, *Josep Danés i Torras. Noucentisme i regionalisme arquitectònics* (Barcelona: Publicacions de l'Abadia de Montserrat, 2008), esp. 35–42. The search for an authentic and innocent nature to renew and modernize Spain is extensively studied in S. Casado de Otaola, *Naturaleza patria: ciencia y sentimiento de la naturaleza en la España del regeneracionismo* (Madrid: Marcial Pons, 2010) (concerning Catalan nationalism, see: 192–202, 244–252 and 268–269). Further periods are covered in C. Taberner, ed., “La invención del patrimonio natural en España: Política, academia, activismo y comunicación,” Special Issue, *Arbor* 192, no. 781 (2016).
12. L. Creus Vidal, *Visió econòmica de Catalunya. Riquesa antiga i actual, i possibilitats econòmiques de Catalunya* (Barcelona: Llibreria Catalonia, 1934), 46b (and 302b).
13. See: L. Marx, *The Machine in the Garden: Technology and the Pastoral Ideal in America* (Oxford: Oxford University Press, 2000 [1964]).
14. A. Gallardo Garriga, *Els nostres claustres romànics* (Barcelona: 1918); A. Gallardo Garriga, *Del Mogent al Pla de la Calma* (Barcelona: Centre Excursionista de Catalunya, 1938). On the role of professionals of architecture in the pastoral construction of the masia as the core of an idyllic rurality: J. M. Puigvert Solà, “L'elaboració del discurs paisatgista a la Catalunya contemporània: la contribució dels arquitectes i els estudiosos de la masia, 1908–1936,” *Estudis d'Història Agrària* 12 (1998): 77–108; J. Moner, and J. M. Puigvert Solà, “Els estudis danesians de la masia, revisitats,” in *Materials per a l'estudi de la masia*, ed. Josep Danés Torras (Girona: Documenta Universitaria, 2010), 11–56.
15. Rubió was also very interested in the philological heritage of the Catalan Pyrenees (especially, in the non-Latin etymology of the names of its towns). S. Rubió Tudurí, “Noms de lloc explicables per l'èuscar,” *Butlletí del Centre Excursionista de Catalunya* 43, no. 460 (1933): 364–375 (associated manuscripts on Basque toponymy are preserved in Santiago Rubió Tudurí's Personal Records, at the National Archive of Catalonia).
16. P. Estasén, *Cataluña. Estudio acerca de las condiciones de su engrandecimiento y riqueza* (Barcelona: F. Seix, 1900), 6–7, 103–118.
17. About the “patriotic-scientific” endeavor of hiking in Catalonia, see: J.-L. Marfany, *La cultura del catalanisme: El nacionalisme català en els seus inicis* (Barcelona: Empúries, 1995), 293–306; J. Martí Henneberg, *L'excursionisme científic i la seva contribució a les ciències naturals i a la geografia* (Barcelona: Alta Fulla, 1994); J. M. Camarasa and A. Roca Rosell, “One Hundred Years of Science Policy and the Institute of Catalan Studies,” *Coneixement i societat. Knowledge and Society. Journal of Universities, Research and Innovation* 14 (2008): 6–51.
18. See, for instance: O. Hochadel and A. Nieto, eds. *Barcelona: An Urban History of Science and Modernity, 1888–1929* (New York: Routledge, 2016).
19. The funicular project was ultimately not implemented in favor of a rack railway, which was inaugurated in 1931. About the technological construction of the Núria Sanctuary (especially in terms of religious buildings and tourism facilities), see: J. M. Puigvert Solà, *Josep Danés i Torras*, 102–122. Among the literature dealing with the technological production of “national parks,” see, for instance, L. F. McClelland, *Building the National Parks: Historic Landscape Design and Construction* (Baltimore: Johns Hopkins University Press, 1998).
20. C. Pi Sunyer, “Apunts per a la història de la indústria cotonera catalana,” *Butlletí de l'Associació de Fabricants de Filats i Teixits*, May 1925: 74–78.
21. C. Pi Sunyer, *L'aptitud econòmica de Catalunya* (Barcelona: La Magrana, 1983 [1927–1929]), 71–73, 296–298.
22. Pi Sunyer, *L'aptitud econòmica de Catalunya*, 71–72; R. Soler Vilabella, *Essai on the Catalan Cotton Spinning Frame known as the Bergadana or Marxerina Machine / Ensaig sobre la màquina catalana de filar cotó coneguda per bergadana o marxerina* (Barcelona: J. Horta, [1911]). About the “Catalan vault” (or tile arch), the “Catalan cotton spinning frame,” and the Ictineu submarine, see: R. Graus Rovira, *Modernització tècnica i arquitectura a Catalunya, 1903–1929* (Ph.D. diss., Universitat Politècnica de Catalunya, Barcelona, 2012); À. Solà Parera, “Filar amb berguedanes: Mite i realitat d'una màquina de filar cotó,” in *La indústria tèxtil: Actes de les V Jornades d'Arqueologia Industrial de Catalunya*, ed. L. J. de Cisneros (Barcelona: Marcombo, 2002), 143–168; C. Puig-Pla and A. Roca Rosell, “Narcís Monturiol (1819–1885), Pioneer of Submarine Navigation,” *Contributions to Science* 5, no. 2 (2009): 147–157.
23. *L'obra realitzada: anys 1914–1923* (Barcelona: Mancomunitat de Catalunya, 1923); A. Roca Rosell, “Ciencia y sociedad en la época de la Mancomunitat (1914–1923),” in *Ciencia y sociedad en España*, ed. J. M. Sánchez Ron (Madrid: El Arquero/CSIC, 1988), 223–252.
24. Due to the lack of primary sources, I cannot answer key questions on the debates about heritage design and musealization before 1929; for example: which forges remain; how many of them; where, how, and by whom preserved; and in which buildings and ways should the collections be exhibited.

25. J. Ehrenberg, *Civil Society: The Critical History of an Idea* (New York: New York University Press, 1999).
26. J. Valentines-Álvarez, *Tecnocràcia i catalanisme tècnic a Catalunya als anys 1930: Els enginyers industrials, de l'organització del taller a la racionalització de l'estat* (Ph.D. diss., Universitat Autònoma de Catalunya, Barcelona, 2012), especially 63–67.
27. About this clan of engineers and its role in the making of Barcelona city, see: J. Sastre-Juan and J. Valentines-Álvarez, "Technological Fun: The Politics and Geographies of Amusement Parks," in *Barcelona*, ed. Hochadel and Nieto, 92–112 (especially 107–110).
28. Outstanding projects for national museums were developed during the years that followed, such as the Art Museum of Catalonia (1934), the Archaeological Museum of Catalonia (1935), and the Maritime Museum of Catalonia (1936).
29. *Venturi effect* is the reduction of pressure caused by liquid flowing through a narrowing or constricted section of pipe. Gallardo and Rubió, *La farga catalana*, 48, 87–89. Descriptions are also based on photographs and newspaper articles, especially the articles published in *La Vanguardia* on 1 May 1930, 21 May 1930, 28 May 1930, 29 May 1930, and 30 May 1930. The original plans of the display preserved at the Arxiu Històric de la Ciutat de Barcelona (AHCB) have also been taken into account: "Farga Catalana. Planta amb indicació de les obres a fer" (2959), "Farga Catalana: Tall A-b amb indicació de les obres a fer" (2955), "[La Farga Catalana]" (2956) and "Exposició Montjuich. Farga Catalana" (2957–2958).
30. Despite the scarcity of archive sources about the organization of the *farga* exhibition, *La farga catalana* (1930)—published specially for the event—suggests that Rubió and Gallardo were in charge of the museological design of the exhibition as well as being the consultants in technical, geographical, and historical issues. Only some original plans are preserved in the Arxiu Històric de la Ciutat de Barcelona (AHCB) and no record is available in the National Archive of Catalonia (Santiago Rubió Tudurí Personal Records) or in the Arxiu General Fira de Barcelona (AGFB). I thank Santi Barjau (AHCB) and Marià Hispano (AGFB) for their work.
31. "Exposición de Hierros de Arte," *La Vanguardia*, 21 May 1930: 8.
32. S. Rubió Tudurí, "La farga catalana de l'Exposició al Museu d'Art Popular del Poble Espanyol," *Butlletí dels Museus d'Art de Barcelona* 12 (1932): 159–160.
33. About the internationalized "nationalization" of new inventions, see: R. Brain, *Going to the Fair: Readings in the Culture of Nineteenth-Century Exhibitions* (Cambridge: Whipple Museum of the History of Science, 1993); P. Fritzsche, *A Nation of Flyers: German Aviation and the Popular Imagination* (Cambridge: Harvard University Press, 1992); S. Lindqvist, "An Olympic Stadium of Technology: Deutsches Museum and Sweden's Tekniska Museet," in *Industrial Society and Its Museums*, ed. B. Schroeder-Gudehus (Langhorne: Harwood Academic Publishers, 1993), 37–54; D. Edgerton, *The Shock of the Old: Technology and Global History since 1900* (London: Profile Books, 2008), 103–113 (about the specific case of the Spanish inventor Juan de la Cierva, see p. 103). See also the bibliography quoted in note 2, since the making of new technologies into national icons was entangled with the construction of a "pedigree" for them.
34. "Companyia General d'Asfalts i Portland Asland," *Ciència* 5, no. 36 (1930): 679–680.
35. A. Homs, "La siderúrgia a Catalunya: Consideracions a propòsit del Palau de la Metallúrgia de l'Exposició de Barcelona," *Ciència* 5, no. 36 (1930): 646–652.
36. J. Valentines-Álvarez, "Seeing like a Factory: Technocratic Nationalism in Catalonia, 1930–1939," *History and Technology*, 34, no. 3–4 [forthcoming].
37. Valentines-Álvarez, "Seeing like a Factory"; Valentines-Álvarez, *Tecnocràcia i catalanisme tècnic a Catalunya*.
38. About this failed museological proposal, see: J. Valentines-Álvarez and J. Sastre-Juan, "The Failed Technology Museum of Catalonia: Engineers and the Politics of the Musealization of Technology in Barcelona, 1929–1939," *Nuncius. Journal of the Material and Visual History of Science* 34, no. 1 (2019).
39. "Resum d'adquisicions, donatius i dipòsits per als nostres museus, 1931–1932," *Butlletí dels Museus d'Art de Barcelona* 20 (1933): 15. About the Barcelona Board of Museums since 1930, see: E. March, "L'acció de la Junta de Museus des de la caiguda de la Dictadura de Primo de Rivera fins a l'esclat de la Guerra Civil (1930–1936)," in *Cent anys de la Junta de Museus de Catalunya, 1907–2007*, ed. A. Garcia (Barcelona: Abadia de Montserrat, 2008), 105–133 (esp. 105–115).
40. J. Folch Torres, "El Museu d'Art Popular del Poble Espanyol," *Butlletí dels Museus d'Art de Barcelona* 15 (1932): 242–245 (esp. 243–244); M. Vidal Jansà, *Teoria i crítica en el Noucentisme: Joaquim Folch i Torres* (Barcelona: Abadia de Montserrat, 1991), 347–351.
41. Folch Torres, "El Museu d'Art Popular," 244.
42. The headquarters, the library, and the restoration laboratories of the board were moved to the Spanish Village in 1934. "El trasllat, l'ampliació i la metodització dels museus," *Butlletí dels Museus d'Art de Barcelona* 7 (1931): 219–222 (especially 221).
43. Miquel Utrillo was a student at the Barcelona School of Industrial Engineering, and he completed his engineering studies in Paris.
44. Quoted in S. Bengoechea, *Els secrets del Poble Espanyol* (Barcelona: Poble Espanyol, 2004), 155.
45. Bengoechea, *Els secrets*, 161.
46. *Guía del Pueblo Español* (Barcelona: n.d., ca. 1929), 44. See also: *Guide of the Spanish Village: Montjuich Park* (Barcelona: Junta de Museus, [1930]); *Exposición Internacional de Barcelona: Pueblo Español MCMXXIX* (Barcelona: Concesiones Gráficas, 1929).
47. Rubió, "La farga catalana," 160.
48. *Guía del Pueblo Español*, 23–25.
49. Rubió, "La farga catalana," 160.
50. R. Campalans, *Història de les ciències*, apunts presos per Rosa Leveroni Valls (1930–1931), Biblioteca de Catalunya, ms. 3326.

51. R. Ballús, "La farga de Campdevàrol," in *Memòria. Associació d'Alumnes i Ex-Alumnes de l'Escola Menor d'Arts i Oficis de Ripoll* (Ripoll: Tipografia Ripollesa, 1934), 40–44 (esp. 41); "Conversa de Ramon Casanova Danés," in *Memòria*, 33–34.
52. "Conversa de Ramon," 34. About the relevance of epistemic and geographic peripheries in the history of technology: M. Macedo and J. Valentines-Álvarez, "Technology and Nation: Learning from the Periphery," *Technology and Culture* 57, no. 4 (2016): 989–997.
53. A. Jiménez, "La farga Casanova," *Annals de l'Institut d'Estudis Gironins* 46 (2005): 285–342 (esp. 289–294); M. Lage, *Hispano-Suiza 1904–1972: hombres, empresas, motores y aviones* (Madrid: LID, 2003).
54. "Maricel" per a la ampliació del 'Cau Ferrat,'" *Butlletí dels Museus d'Art de Barcelona* 51 (1935): 246–256 (esp. 256).
55. March, "L'acció de la Junta," 125–126.
56. Nonetheless, it seems that the move of the *farga* exhibition to the Cau Ferrat museum was finally not implemented. The minutes of the Barcelona Board of Museums preserved at the National Archive of Catalonia (ANC) contain no reference to the *farga*. See: "Acta de la sessió de la Junta de Museus de Barcelona" (16/01/1934– 06/07/1936), ANC1-715 / Junta de Museus de Catalunya, Arxiu Nacional de Catalunya. Moreover, the archives of the Art Museum of Catalonia and of the Cau Ferrat Museum have no evidence of this heritage in their inventory files, catalogs, or record books. I am grateful to Elisenda Casanova (Sitges Heritage Consortium) for her help in trying to provide me with any evidence.
57. F. J. de Madariaga Fernández, *Las industrias de guerra de Cataluña durante la Guerra Civil* (Ph.D. diss., Universitat Rovira i Virgili, Tarragona, 2005); M. Lage, *Hispano-Suiza*; J. Corral i Martí, *El caixer de 'La Hispano' Suïssa: vida, treball i mort en una gran indústria de guerra catalana, 1936–1939* (Barcelona: Ajuntament de Barcelona, Duxelm, 2016).
58. Valentines-Álvarez and Sastre-Juan, "The Failed Technology Museum of Catalonia."
59. M. Carrió, "La CAIRN," *Economia. Butlletí mensual del Departament d'Economia* 2 (1937): [s.n.]; "Conferència acerca del aprovechamiento industrial de las riquezas naturales de Cataluña," *La Vanguardia*, 19 February 1937: 3.
60. M. Carrió, "La CAIRN", [s.n.].
61. I use "might" because there is no record of the detailed museological report that the Steering Committee of the Technology Museum of Catalonia had to deliver in June 1937 to the official Permanent Industry Committee of the Department of Economy. The official documentation of this committee was mainly lost at the end (or in the aftermath) of the war, although it is quite likely that the report was never completed due to the war affairs. About the project (and genealogy) of this failed national museum of technology, see: Valentines-Álvarez and Sastre-Juan, "The Failed Technology Museum of Catalonia."
62. P. Preston, *The Spanish Holocaust: Inquisition and Extermination in Twentieth-Century Spain* (New York: W. W. Norton, 2012).
63. M. Marín Corbera, *Els ajuntaments franquistes a Catalunya: política i administració municipal, 1938–1979* (Lleida: Pagès, 2000).
64. C. Huera Cabeza, "El Museu Etnològic de Barcelona," *Revista d'Etnologia de Catalunya* 3 (1993): 160–164.
65. I am totally aware that heritage is something more than just a political tool for creating a "national culture," but my point is that Catalan engineers were experts in that kind of tool as much as in machine tools, dams, and engines. About the agency on and of heritage, see: C. Brumann and R. Cox, eds. *Making Japanese Heritage* (London, New York: Routledge, 2010), 1–18; R. Samuel, *Theatres of Memory: Past and Present in Contemporary Culture* (London: Verso, 1994); T. H. Eriksen, *Ethnicity and Nationalism: Anthropological Perspectives* (London: Pluto Press, 1993).
66. A seminal work on the "politics of display": S. MacDonald, ed. *The Politics of Display: Museums, Science, Culture* (London: Routledge, 1998). See also: S. MacDonald, ed. *A Companion to Museum Studies* (Malden, Oxford: Blackwell, 2006) (concerning the entanglement between world fairs, museums and politics, see the chapter by Robert W. Rydell).
67. Unfortunately, the primary sources to answer how, when, where, and why the *farga* remains were lost are not available. During the war and the postwar periods, like many metal pieces such as bells, the drop hammer, mallets, and other iron pieces could have been melted to produce arms or other products. In fact, a telling example is the case of a heavy half-drop hammer that was collected by an engineer in the Pyrenees during the 1960s. The other half had been sold by an inhabitant of a close parish in the aftermath of the war (once he smashed the hammer with explosives and broke it into pieces). One of my deepest memories of my childhood is the image of a man without hands who lights a cigarette with a match while I am buying jelly bellies in La Perlera, next to Cal Farré, in Bellcaire d'Urgell (Lleida). *Cal Farré* can be translated as "the Smith's House." The village is just a few kilometers away from one of the long-lasting and dreadful frontlines in Catalonia during the Spanish Civil War, and the man with the burning cigarette had lost his hands picking up nonexploded bombs and shrapnel to sell their iron after the conflict.

Bibliography

- Balari Jovany, J. *Orígenes històrics de Catalunya*. Barcelona: Instituto Internacional de Cultura Románica, 1964 [1899].
- Ballús, R. "La farga de Campdevàrol." In *Memòria: Associació d'Alumnes i Ex-Alumnes de l'Escola Menor d'Arts i Oficis de Ripoll*, pp. 40–44. Ripoll: Tipografia Ripollesa, 1934.
- Bengoechea, S. *Els secrets del Poble Espanyol*. Barcelona: Poble Espanyol, 2004.
- Brain, R. *Going to the Fair: Readings in the Culture of Nineteenth-Century Exhibitions*. Cambridge: Whipple Museum of the History of Science, 1993.
- Brumann C., and R. Cox, eds. *Making Japanese Heritage*. London: Routledge, 2010.
- Canadelli, E. "Le macchine dell'ingegnere umanista: Il progetto museale di Guido Ucelli tra Fascismo en Dopoguerra," *Physis. Rivista Internazionale di Storia della Scienza* 51 (2016): 93–104.

- Camarasa J. M., and A. Roca Rosell. "One Hundred Years of Science Policy and the Institute of Catalan Studies." *Coneixement i societat. Knowledge and Society: Journal of Universities, Research and Innovation* 14 (2008): 6–51.
- Carreras Candi, F. *Geografía General de Catalunya*. Barcelona: Albert Martín, 1908–1918.
- Carrió, M. "La CAIRN." *Economia. Butlletí mensual del Departament d'Economia* 2 (1937): [s.n.].
- Casado de Otaola, S. *Naturaleza patria: ciencia y sentimiento de la naturaleza en la España del regeneracionismo*. Madrid: Marcial Pons, 2010.
- "Conferencia acerca del aprovechamiento industrial de las riquezas naturales de Cataluña." *La Vanguardia*, 19 February 1937: 3.
- Corral i Martí, J. *El caixer de "La Hispano" Suïssa: vida, treball i mort en una gran indústria de guerra catalana, 1936–1939*. Barcelona: Ajuntament de Barcelona, Duxelm, 2016.
- Creus Vidal, L. *Visió econòmica de Catalunya: Riquesa antiga i actual, i possibilitats econòmiques de Catalunya*. Barcelona: Llibreria Catalonia, 1934.
- Duffy, E. *Representing Science and Technology: Politics and Display in the Deutsches Museum, 1903–1945*. Ph.D. diss., University of North Carolina, Chapel Hill, 2002.
- Edgerton, D. *The Shock of the Old: Technology and Global History since 1900*. London: Profile Books, 2008.
- Ehrenberg, J. *Civil Society: The Critical History of an Idea*. New York: New York University Press, 1999.
- Eriksen, T. H. *Ethnicity and Nationalism: Anthropological Perspectives*. London: Pluto Press, 1993.
- Estasén, P. *Cataluña: Estudio acerca de las condiciones de su engrandecimiento y riqueza*. Barcelona: F. Seix, 1900.
- Exposición Internacional de Barcelona: Pueblo Español MCMXXIX*. Barcelona: Concesiones Gráficas, 1929.
- Folch Torres, J. "El Museu d'Art Popular del Poble Espanyol." *Butlletí dels Museus d'Art de Barcelona* 15 (1932): 242–245.
- Gallardo Garriga, A. *Del Mogent al Pla de la Calma*. Barcelona: Centre Excursionista de Catalunya, 1938.
- Gallardo Garriga, A. *Els nostres claustres romànics*. Barcelona, 1918.
- Gallardo Garriga, A., and S. Rubió Tudurí. *La farga catalana: Descripció i funcionament, història, distribució geogràfica*. Barcelona: Exposició de Barcelona, 1930.
- Gordon R. B., and D. J. Killick. "The Metallurgy of the American Bloomery Process." *Archeomaterials* 6 (1992): 141–167.
- Graus Rovira, R. *Modernització tècnica i arquitectura a Catalunya, 1903–1929*. Ph.D. diss., Universitat Politècnica de Catalunya, Barcelona, 2012.
- Guía del Pueblo Español*. Barcelona: Seix y Barral, n.d., ca. 1929.
- Guide of the Spanish Village: Montjuich Park*. Barcelona: Junta de Museus, n.d., ca. 1930.
- Hochadel O. and A. Nieto, eds. *Barcelona: An Urban History of Science and Modernity, 1888–1929*. New York: Routledge, 2016.
- Homs, A. "La siderúrgia a Catalunya: Consideracions a propòsit del Palau de la Metallúrgia de l'Exposició de Barcelona." *Ciència*, no. 36 (1930): 646–652.
- Houltz, A. "Modern Accounts of Past and Present: The Gothenburg Exhibition of 1923." In *Modernism and Rationalization*, eds. C. Jørgensen and M. Pedersen, pp. 117–132. Aalborg: Museum of Northern Jutland, The Heritage Agency of Denmark, 2006.
- Hudson, K. *Industrial Archaeology: An Introduction*. London: University Paperbacks, Methuen, 1965.
- Huera Cabeza, C. "El Museu Etnològic de Barcelona." *Revista d'Etnologia de Catalunya*, 3 (1993): 160–164.
- Jiménez, A. "La farga Casanova." *Annals de l'Institut d'Estudis Gironins* 46 (2005): 285–342.
- Lage, M. *Hispano-Suïza 1904–1972: hombres, empresas, motores y aviones*. Madrid: LID, 2003.
- Lindqvist, S. "An Olympic Stadium of Technology: Deutsches Museum and Sweden's Tekniska Museet." In *Industrial Society and Its Museums*, ed. B. Schroeder-Gudehus, pp. 37–54. Langhorne: Harwood Academic Publishers, 1993. <https://doi.org/10.1080/07341519308581834>.
- Lusa Monforte, G., ed. *Los tres directores de la Escuela durante la Guerra (1936–1939)*. Santiago Rubió i Tudurí. Barcelona: Universitat Politècnica de Catalunya, 2015.
- MacDonald, S., ed. *A Companion to Museum Studies*. Malden, Oxford: Blackwell, 2006. <https://doi.org/10.1002/9780470996836>.
- MacDonald, S., ed. *The Politics of Display: Museums, Science, Culture*. London: Routledge, 1998.
- Macedo M., and J. Valentines-Álvarez. "Technology and Nation: Learning from the Periphery." *Technology and Culture* 57, no. 4 (2016): 989–997. <https://doi.org/10.1353/tech.2016.0118>.
- Madariaga Fernández, F. J. *Las industrias de guerra de Cataluña durante la Guerra Civil*. Ph.D. diss., Universitat Rovira i Virgili, Tarragona, 2005.
- March, E. "L'acció de la Junta de Museus des de la caiguda de la Dictadura de Primo de Rivera fins a l'esclat de la Guerra Civil (1930–1936)." In *Cent anys de la Junta de Museus de Catalunya, 1907–2007*, ed. A. Garcia, pp. 105–133. Barcelona: Abadia de Montserrat, 2008.
- Marfany, J.-L. *La cultura del catalanisme: El nacionalisme català en els seus inicis*. Barcelona: Empúries, 1995.
- "Maricel' per a la ampliació del 'Cau Ferrat.'" *Butlletí dels Museus d'Art de Barcelona* 51 (1935): 246–256.
- Marín Corbera, M. *Els ajuntaments franquistes a Catalunya: política i administració municipal, 1938–1979*. Lleida: Pagès, 2000.
- Martí Henneberg, J. *L'excursionisme científic i la seva contribució a les ciències naturals i a la geografia*. Barcelona: Alta Fulla, 1994.
- Marx, L. *The Machine in the Garden: Technology and the Pastoral Ideal in America*. Oxford: Oxford University Press, 2000 [1964].
- Matheu R. *Notes biogràfiques de Antoni Gallardo i Garriga*. Barcelona, 1962.

- McClelland, L. F. *Building the National Parks: Historic Landscape Design and Construction*. Baltimore: Johns Hopkins University Press, 1998.
- Moner J., and J. M. Puigvert Solà. "Els estudis danesians de la masia, revisitats." In *Materials per a l'estudi de la masia*, ed. Josep Danés Torras, pp. 11–56. Girona: Documenta Universitaria, 2010.
- Morral, F. R. "The Catalan 'farga' in the New World (1500–1900)." In *La farga catalana en el marc de l'arqueologia siderúrgica*, ed. Estanislau Tomàs, pp. 125–129. Andorra la Vella: Ministeri d'Afers Socials i Cultura, 1995.
- Morris, P., ed. *Science for the Nation: Perspectives on the History of the Science Museum*. Palgrave: London, 2010. <https://doi.org/10.1057/9780230283145>.
- L'obra realitzada: anys 1914–1923*. Barcelona: Mancomunitat de Catalunya, 1923.
- Overman, F. *The Manufacture of Iron: In All Its Various Branches*. Philadelphia: Henry C. Baird, 1854.
- Pi Sunyer, C. *L'aptitud econòmica de Catalunya*. Barcelona: La Magrana, 1983 [1927–1929].
- Pi Sunyer, C. "Apunts per a la història de la indústria cotonera catalana." *Butlletí de l'Associació de Fabricants de Filats i Teixits*, (May 1925): 74–78.
- Prats, L. *El mite de la tradició popular: els orígens de l'interès per la cultura tradicional a la Catalunya del segle XIX*. Barcelona: Edicions 62, 1988.
- Preston, P. *The Spanish Holocaust: Inquisition and Extermination in Twentieth-Century Spain*. New York: W. W. Norton, 2012.
- Puig-Pla C., and A. Roca Rosell. "Narcís Monturiol (1819–1885), Pioneer of Submarine Navigation." *Contributions to Science* 5, no. 2 (2009): 147–157.
- Puigvert Solà, J. M. "L'elaboració del discurs parralista a la Catalunya contemporània: la contribució dels arquitectes i els estudiosos de la masia, 1908–1936." *Estudis d'Història Agrària* 12 (1998): 77–108.
- Puigvert Solà, J. M. *Josep Danés i Torras: Noucentisme i regionalisme arquitectònics*. Barcelona: Publicacions de l'Abadia de Montserrat, 2008.
- Roca Rosell, A. "Ciencia y sociedad en la época de la Mancomunitat (1914–1923)." In *Ciencia y sociedad en España*, ed. José M. Sánchez Ron, pp. 223–252. Madrid: El Arquero/CSIC, 1988.
- Rovira Rabassa, A. *El hierro, sus cortes y enlases*. Barcelona: Libr. Alvaro Verdaguer, n.d., ca. 1910.
- Rubió Tudurí, S. "La farga catalana de l'Exposició al Museu d'Art Popular del Poble Espanyol." *Butlletí dels Museus d'Art de Barcelona* 12 (1932): 159–160.
- Rubió Tudurí, S. "Noms de lloc explicables per l'èuscar." *Butlletí del Centre Excursionista de Catalunya* 43, no. 460 (1933): 364–375.
- Samuel, R. *Theatres of Memory: Past and Present in Contemporary Culture*. London: Verso, 1994.
- Sastre-Juan, J. Un laboratori de divulgació tecnològica: el New York Museum of Science and Industry i la política de la museització de la tecnologia als Estats Units, 1912–1951. Ph.D. diss., Universitat Autònoma de Barcelona, Barcelona, 2013.
- Sastre-Juan J., and J. Valentines-Álvarez. "Technological Fun: The Politics and Geographies of Amusement Parks." In *Barcelona: An Urban History of Science and Modernity, 1888–1929*, eds. O. Hochadel and A. Nieto, pp. 92–112. New York: Routledge, 2016.
- Solà Parera, À. "Filar amb berguedanes: Mite i realitat d'una màquina de filar cotó." In *La indústria tèxtil: Actes de les V Jornades d'Arqueologia Industrial de Catalunya*, ed. L. J. de Cisneros, pp. 143–168. Barcelona: Marcombo, 2002.
- Soler Vilabella, R. *Essai on the Catalan Cotton Spinning Frame known as the Bergadana or Marxerina Machine / Ensaig sobre la màquina catalana de filar cotó coneguda per bergadana o maxerina*. Barcelona: J. Horta, n.d., ca. 1911.
- Somsen, G. "Science, Fascism, and Foreign Policy: The Exhibition 'Scienza Universale' at the 1942 Rome World's Fair," *Isis*, 108, no. 4 (2017): 769–791. <https://doi.org/10.1086/695758>.
- Tabernero, C., ed. "La invención del patrimonio natural en España: Política, academia, activismo y comunicación." Special issue, *Arbor* 192, no. 781 (2016).
- Tomás, E. "The Catalan Process for the Direct Production of Malleable Iron and its Spread to Europe and the Americas." *Contributions to Science* 1, no. 2 (1999): 225–232.
- Valentines-Álvarez, J. *Tecnocràcia i catalanisme tècnic a Catalunya als anys 1930: Els enginyers industrials, de l'organització del taller a la racionalització de l'estat*. Ph.D. diss., Universitat Autònoma de Catalunya, Barcelona, 2012.
- Valentines-Álvarez, J. "Seeing like a Factory: Technocratic Nationalism in Catalonia, 1930–1939," *History and Technology* 34, no. 3–4 [forthcoming].
- Valentines-Álvarez, J., and J. Sastre-Juan, "The Failed Technology Museum of Catalonia: Engineers and the Politics of the Museumization of Technology in Barcelona, 1929–1939," *Nuncius. Journal of the Material and Visual History of Science* 34, no. 1 (2019).
- Vidal Jansà, M. *Teoria i crítica en el Noucentisme: Joaquim Folch i Torres*. Barcelona: Abadia de Montserrat, 1991.

Contents

Series Preface by Bernard Finn	v
Introduction by Elena Canadelli, Laura Ronzon, and Marco Beretta	vi

Nineteenth-Century Legacy: History and Heroes

CHAPTER 1	Lavoisier and the French Chemical Heritage at the Musée Centennial of the Paris World Exhibition (1900) by Marco Beretta	2
CHAPTER 2	Telegraphs and National Heroes: A Case Study of Telegraphy as a Mirror of National Branding by Tina Kubot	15

Rethinking Science Display: Interwar Exhibitions

CHAPTER 3	The Quest for the Technological Soul of a Nation: The Catalan Forge and the Display of Politics (1914–1949) by Jaume Valentines-Álvarez	32
CHAPTER 4	From Instruments of Science to Instruments of History: Andrea Corsini and the Birth of the Museo Galileo by Francesco Barreca	51
CHAPTER 5	History of the CNR Artifacts Collection: From the Century of Progress Exposition in Chicago to the Museum of Science and Technology in Milan by Claudio Giorgione	69
CHAPTER 6	Astronomy between Solemnity and Spectacle: The Adler Planetarium and the Century of Progress Exposition in Chicago (1933–1934) by Pedro M. P. Raposo	89
CHAPTER 7	Built in Thoughts Rather than Stone: The Palais de la découverte and the 1937 Paris International Exposition by Andrée Bergeron and Charlotte Bigg	108
CHAPTER 8	Science Versus Technology: The Exhibition of Universal Science in E42 Rome and the Museum of Science and Technology in Milan by Elena Canadelli	132

Postwar Exhibitions: What Is the Role of Artifacts?

CHAPTER 9	North American World's Fairs and the Reinvention of the Science Museum in the 1960s by Arne Schirmmacher	158
CHAPTER 10	The Rise, Fall, and Unexpected Rebirth of Russia's <i>Buran</i> Shuttle at the Exhibition of Economic Achievements, 1988–2014 by Cathleen Lewis	182
CHAPTER 11	National and International Expositions and the Origins of the National Apollo 11 Artifacts Collection by Allan A. Needell	203
CHAPTER 12	Presenting the Past, Present, and Future of Technological Innovation: The Japanese Pavilion at Expo '70 as a Discourse on Science and Technology Policy by Nobumichi Ariga	221

Conclusion

Science and Technology in the Twentieth Century Exhibitionary Complex by Robert Friedel	238
About the Contributors	249
Index	253

The series “Artefacts: Studies in the History of Science and Technology” was established in 1996 under joint sponsorship by the Deutsches Museum (Munich), the Science Museum (London), and the Smithsonian Institution (Washington, D.C.). Subsequent sponsoring museums include Canada Science and Technology Museum; Museo Galileo—Istituto e Museo Nazionale di Storia della Scienza; Medicinsk Museion København Universitet; MIT Museum; Musée des Arts et Métiers; Museum Boerhaave; Národní Technické Museum, Prague; National Museums of Scotland; Norsk Teknisk Museum; Országos Műszaki Múzeum Tanulmánytára (Hungarian Museum for S&T); Technisches Museum Wien; Tekniska Museet–Stockholm; The Bakken; Whipple Museum of the History of Science.

Editorial Advisory Board

Robert Anderson, Science History Institute
Jim Bennett, Museum of the History of Science, University of Oxford
Ruth Cowan, University of Pennsylvania
Bryan Dewalt, Canada Science and Technology Museum
Robert Friedel, University of Maryland
Ulf Hashagen, Deutsches Museum
Sungook Hong, Seoul National University
David Hounshell, Carnegie Mellon University
Otmar Moritsch, Technisches Museum Wien
Peter J. T. Morris, Science Museum
David Rhees, The Bakken
Ken Arnold, Medicinsk Museion Kobenhavns Universitet
Liba Taub, Whipple Museum of the History of Science
Frode Meinich, Norsk Teknisk Museum
Helena Wright, Smithsonian Institution
Tom Zeller, University of Maryland

Published by SMITHSONIAN INSTITUTION SCHOLARLY PRESS
P.O. Box 37012, MRC 957, Washington, D.C. 20013-7012
<https://scholarlypress.si.edu>

Copyright © 2019 by Smithsonian Institution

Essays by C. Lewis and A. A. Needell were created by federal employees and are in the public domain. The rights to all other text and all images in this publication, as well as cover and interior designs, are owned either by the Smithsonian Institution, by contributing authors, or by third parties. Fair use of materials is permitted for personal, educational, or noncommercial purposes. Users must cite author and source of content, must not alter or modify copyrighted content, and must comply with all other terms or restrictions that may be applicable. Users are responsible for securing permission from a rights holder for any other use.

Cover image: Model of a maglev, a magnet-levitated train, displayed at the Japanese Pavilion during the Japan World Exposition in Osaka in 1970. Courtesy of the Osaka Prefectural Expo 1970 Commemorative Park Office.

Library of Congress Cataloging-in-Publication Data

Names: Canadelli, Elena, 1977– editor. | Beretta, Marco, editor. | Ronzon, Laura, editor. | Smithsonian Institution Scholarly Press, publisher.

Title: Behind the exhibit : displaying science and technology at world’s fairs and museums in the twentieth century / edited by Elena Canadelli, Marco Beretta, and Laura Ronzon.

Other titles: Displaying science and technology at world’s fairs and museums in the twentieth century | Artefacts series ; v. 12.

Description: Washington, D.C. : Smithsonian Institution Scholarly Press, 2019. | Series: Artefacts: Studies in the History of Science and Technology ; volume 12 | Includes bibliographical references and index. | Smithsonian Institution Copyright 2019

Identifiers: LCCN 2018034218 | ISBN 9781944466220 (paperback) | ISBN 1944466223 (paperback) | ISBN 9781944466237 (online) | ISBN 1944466231 (online)

Subjects: LCSH: Science—Exhibitions. | Technological innovations—Exhibitions. | Exhibitions.

Classification: LCC Q105.A1 B46 2018 | DDC 507.4—dc23 | SUDOC SI 1.2:EX 4

LC record available at <https://lccn.loc.gov/2018034218>

ISBN-13 (print): 978-1-944466-22-0

ISBN-13 (online): 978-1-944466-23-7

Printed in the United States of America

© The paper used in this publication meets the minimum requirements of the American National Standard for Permanence of Paper for Printed Library Materials Z39.48–1992.

Volume 12

Managing Editor

Martin Collins, Smithsonian Institution

Series Editors

*Robert Bud, Science Museum, London**Bernard Finn, Smithsonian Institution**Helmuth Trischler, Deutsches Museum*

The latest in the Artefacts series, *Behind the Exhibit* examines scientific heritage and narratives behind public display of scientific artifacts in national and international exhibitions and science museums throughout the twentieth century. Developed from the Artefacts XX conference, convened 20–22 September 2015 at the Leonardo da Vinci National Museum of Science and Technology in Milan, during Expo Milan 2015, this volume brings together museum curators and historians of science and technology to present case studies from the United States, Europe, Russia, and Japan. What emerged is a study of the tension between basic science and technological applications, the multilayered role of history, the appearance and disappearance of artifacts, and the search for a balance between entertainment and education.

Elena Canadelli is an assistant professor in history of science and naturalistic museology at the University of Padua and associate editor at *Nuncius: Journal of the Material and Visual History of Science*.

Marco Beretta is a professor of history of science at the University of Bologna.

Laura Ronzon is head of collections and curators at the Leonardo da Vinci National Museum of Science and Technology in Milan.

Contributors: Nobumichi Ariga, Francesco Barreca, Marco Beretta, Andrée Bergeron, Charlotte Bigg, Elena Canadelli, Bernard Finn, Robert Friedel, Claudio Giorgione, Tina Kubot, Cathleen Lewis, Allan A. Needell, Pedro M. P. Raposo, Arne Schirmacher, and Jaume Valentines-Álvarez



Smithsonian Institution
Scholarly Press

<https://scholarlypress.si.edu>

ISBN (print): 978-1-944466-22-0

ISBN (online): 978-1-944466-23-7

<https://doi.org/10.5479/si.9781944466237>