Nota preliminar sobre o texto

O texto que segue é uma primeira versão dum futuro artigo baseado na pesquisa da minha tese de doutoramento sobre a política da musealização da tecnologia no New York Museum of Science and Industry (NYMSI). A tese, em catalão, pode-se consultar aqui:

http://www.tdx.cat/handle/10803/129394

O texto ainda está numa fase muito preliminar quer no que se refere ao conteúdo quer no que se refere ao estilo, ou seja... num momento ótimo para receber feedback!

A intenção inicial foi focalizar o artigo sobre a questão da política da "interatividade" desde o cruzamento dos *museum studies* e a história da ciência e da tecnologia.

Em maio de 2015 apresentei a minha pesquisa sobre a política da interatividade no NYMSI num simpósio do grupo 'Matières a Penser' (http://matap.hypotheses.org/) e fui convidado a participar numa *special issue* que os coordenadores próximamente vão propôr num jornal de história da ciência sobre a temática das *spatial inscriptions of science* (ver descrição embaixo).

Nos próximos meses vou trabalhar na reescritura do texto para melhorá-lo e para adaptá-lo à abordagem da *special issue*.

O vosso feedback vai ser muito importante para o meu trabalho dos próximos meses e por isso agradeço-o imenso!

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Putting science on display in spaces deliberately aimed at a public use and by means of devices and artifacts created to this end, is never a neutral enterprise.

The universal exhibitions or the Uranias of the 19th century, science museums such as the Deutsches Museum in the 1900s, the Palais de la Découverte in the interwar or the Exploratorium in the 1960s each testify to a specific way of conceiving and promoting science and its role in society. Behind each intiative we find a range of actors moved by different convictions: from the great figures of science and industry in the newly founded German Empire at the end of the nineteenth century, to the scientists, administrators and politicians involved the reorganisation of research in 1930s France, and to a physicist suffering from maccarthyist campaigns. The creation of each new structure, whether temporary or permanent, for putting science on display reflects a particular configuration usually involving scientists, administrations, science popularizers, museum and exhibition experts, media representatives and different publics.

The spatial organisation of exhibitions, the arrangement of exhibited objects, the architecture of museums and temporary structures, as well as their material and symbolic inscription in the city are indicative of the evolving relations of science, science policy and popularisation. The workshop brings together specialists from history of science, history of art, museum and urban studies and curators to study three types of spaces (the university,

the science and/or technology exhibition, the dome) within the scientific, social and political context of their making.

The workshop aims to built upon and contribute to recent historiographical developments in the history of science, of scientific museums and of popular culture, in particular the body of work concerned with the visual and material cultures characteristic of scientific work and communication, as well as the study of scientific spaces. It also hopes to stimulate a conversation between historical issues (19th and 20th centuries) and contemporary concerns and configurations.

Science in Action: the Politics of Hands-on Display at the New York Museum of Science and Industry

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In 1938, the New York Museum of Science and Industry published an illustrated promotional booklet called *Science in Action*, which presented visitor participation and the experience of putting science into action by pressing buttons as central to its self-fashioned image.[1] Contemporary observers described how children shouted and ran from button to button at the museum's floor, which increasingly resembled a playground and abandoned the ideal of corporal restraint and reverential silence of the bourgeois museums of the exhibitionary complex.[2] In March 1940, journalist Jane Cobb described the museum as "heaven on earth for small boys":

> It's nice to go up there on Saturdays and Sundays and holidays and hear the place echoing with their shouts and with the counterpoint of maternal voices saying "Robert, come away from there. Remember what Mother told you" [...] They shout 'Leonard is a dope!' into the whispering gallery. They push the buttons that revolve the gears and univeral joints and other complicated elements of machine physiology and say proudly: 'How's that?'.[3]

Museum studies have stressed the importance of performativity and embodied practices of visiting. Tony Bennett, among other scholars, has analyzed the political significance of a whole range of nineteenth-century visual regimes aimed at creating a self-regulating citizenry.[4] But the cultural and political significance of the twentieth-century removal of the 'please don't touch' signs, and the shift towards the playful and tactile

[1] New York Museum of Science and Industry (1938), *Science in Action*, Philadelphia, New York Museum of Science and Industry.
[2] Bennett, Tony (1995), *The Birth of the Museum: History, Theory, Politics*, London, Routledge.
[3] Cobb, Jane, "Living and Leisure", *The New York Times*, March 3, 1940, p. 109.
[4] Bennett, Tony (2010), "Civic Seeing: Museums and the Organization of Vision", in MacDonald, Sharon (ed.), *A Companion to Museum Studies*, Oxford, Wiley-Blackwell, pp. 263-282; Bennett, Tony (1998), "Speaking to the Eyes: Museums, Legibility and the Social Order", in MacDonald, Sharon (ed.), *The Politics of Display: Museums, Science, Culture*, London, Routledge, pp. 25-35.

exhibition regimes of what the New York Museum of Science and Industry called "science in action" is yet to be globally addressed in historical terms.[5]

Rivers of ink have been spilled on 'interactivity' in contemporary science museums, yet this much celebrated or criticized concept is rarely looked at in historical perspective.[6] The pedagogical and political connotations we attach today to the concept of "interactivity" as applied to science museums seem to have coalesced around the 1970s' Science Centers. Many times, the Exploratorium in San Francisco is considered the departure point of a new hands-on approach in science museums, linked to progressive politics and the participatory museum movement.[7] But push buttons and other hands-on forms of display have a much longer and complex history.[8] Recent scholarly attention is increasingly being devoted to a genealogy of 'interactivity' that explores its pedagogical, psychological and political contexts.[9]

This papers aims at being a contribution towards this genealogy of 'interactivity'. By looking at the changing politics of display at the New York Museum of Science and Industry, this paper argues that the boom of hands-on exhibits in the interwar years had nothing to do with a rhetorics of democratic empowerment. Instead, the analysis of how the political agenda of the different promoters of the New York Museum of Science and Industry was embedded in the displays suggests two main contexts in which to understand its politics of hands-on display: on the one hand, the social paternalistic ideology of the vocational education movement and the ideas on innovation of the early sociology of invention; on the other hand, the corporate marketing strategies and the behavioural approach to mass communications in the context of the rise of a new cultural industry and the fierce cultural battle over science and technology in the 1930s.

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[5] Andrew Barry has addressed the issue of the contemporary politics of interactivity in science museums in terms of neoliberal governmentality and conceptions about citizenship. However, history is absent from his account (Barry, Andrew (2001), "On Interactivity", chapter 6 of *Political Machines: Governing a Technological Society*, London, The Athlone Press, pp.127-152).

[6] Witcomb, Andrea (2006), "Interactivity: Thinking Beyond", in MacDonald, Sharon, *A Companion to Museum Studies*, 353-361, Malden, Blackwell.

[7] Hein, Hilde (1990), *The Exploratorium: the Museum as Laboratory*, Washington DC, Smithsonian Institution Press.

[8] Alison Griffiths shows how hands-on displays and other techniques, which she labels "immersive", have been extensively in use for a long time before the twentieth century in museums and other sites. However, the book doesn't go beyond the accumulation of examples and it fails to relate them to their particular pedagogical, museological and political contexts (Griffiths, Alison (2008), *Shivers Down Your Spine. Cinema, Museums, and the Immersive View*, New York, Columbia University Press).

[9] Rader, Karen A.; Cain, Victoria E. M. (2014), *Life on Display: Revolutionizing U.S. Museums of Science and Natural History in the Twentieth Century*, Chicago, University of Chicago Press; Corral, Gustavo (2015), *Planificación y materialización del nuevo esquema expositivo del Museo de Historia Natural de Londres: una perspectiva histórica (1968-1981)*, PhD Dissertation, Bellaterra, Universitat Autònoma de Barcelona; Kohlstedt, Sally (2010), *Teaching Children Science: Hands-on Nature Study in North America, 1890-1930*, Chicago, University of Chicago Press.

Although its existence is not widely known, the New York Museum of Science and Industry was active for 20 years in producing and reproducing popular images of the relationship between men and machines.[10] It was inaugurated in 1927 as the Museum of Peaceful Arts in the 7th and 8th floors of the Scientific American Building, in Bryant Park. It changed its name in 1930 into the New York Museum of Science and Industry while in the 3rd and 4th floors of the Daily News Building, and it was close to being renamed as "Science Center" when it moved in 1936 to the ground floor of the Rockefeller Center. Its institutional unstability allowed significant changes in its display techniques as the museum changed promoters and sites. The three following sections will follow its urban deambulation and will analyze the different politics of hands-on display at the three different sites of this wandering museum at the heart of Manhattan.

'Mechanical Wonderland': Hands-on Display between Vocational Education and the Sociology of Invention

The Museum of the Peaceful Arts had been planned before World War I by New York City's scientific, industrial, financial and engineering elites, but the project was only resumed in 1924 when the Taylorist industrialist Henry Towne, one of the incorporators, died and left a conditional bequest for the establishment of an industrial museum.[11] Among the first incorporators there were bankers such as Jacob Schiff and Frank Vanderlip, inventors such as Nikola Tesla and Thomas Edison, industrialists such as Charles Schwab, Charles Coffin or Elbert Gary, and engineers linked to the American Society of Mechanical Engineers such as Calvin Rice or Henry Towne himself. Towne was the President of Yale and Towne Manufacturing Company and had been an active

[10] On the history of the New York Museum of Science and Industry, see: Sastre-Juan, Jaume (2013), *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)*, PhD Dissertation, Barcelona, Universitat Autònoma de Barcelona. Partial accounts can be found in: Riley, Philip (1977), *The Museum of Peaceful Arts (The New York Museum of Science and Industry), the Period 1912 to 1941*, unpublished manuscript addressed to Robert P. Multhauf, Library of the National Museum of American History, Washington DC; Rhees, David (1993), "Corporate Advertising, Public Relations and Popular Exhibits: The Case of Du Pont", in Schroeder-Gudehus, Brigitte, *Industrial Society and its Museums*, Langhorne, Harwood Academic Publishers, 67-75; McGrath, Patrick (2002), *Scientists, Business and the State, 1890-1960*, Chapel Hill, University of North Carolina Press; Niquette, Manon; Buxton, WIlliam (2009), "'Sugar-Coating the Educational Pill': Rockefeller Support for the Communicative Turn in Science Museums", in Buxton, William (ed.), *Patronizing the Public: American Philanthropy's Transformation of Culture, Communication and the Humanities*, Lexington, Lexington Press, pp. 153-194.

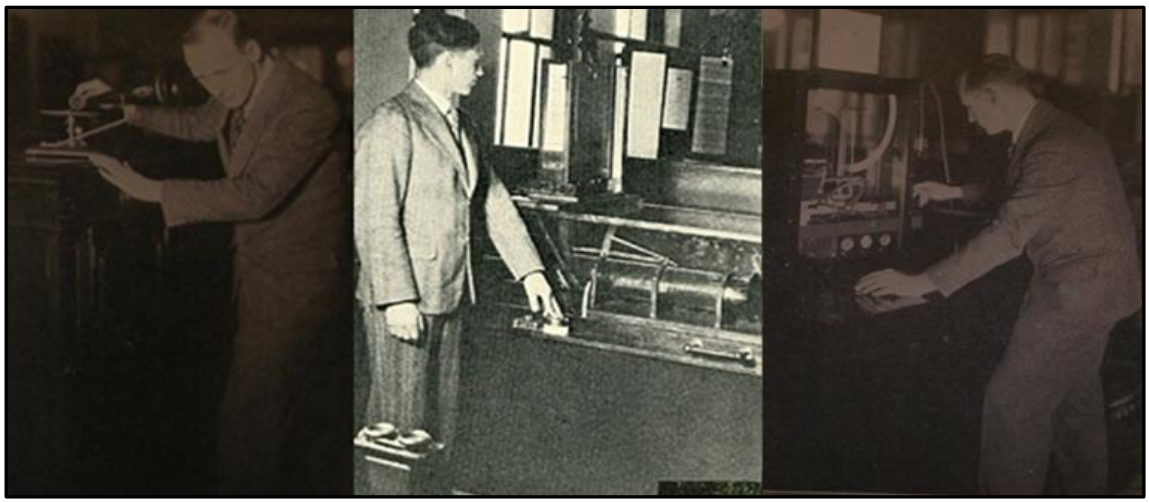
[11] Kunz, George (1912), "The Projected Museum of Peaceful Arts", in *Proceedings of the American Association of Museums, Records of the Seventh Annual Meeting Held in New York City, June 4-7 1912*, Charleston, American Association of Museums.

promotor of scientific management, vocational education and the preservation and musealization of industrial heritage.[12]

Under the presidency of gemmologist and Tiffany's vicepresident George Kunz the museum began hiring personnel, assembling an eclectic collection, and planning its fundamental structure. Carl Mitman, who was curator of technological collections at the Smithsonian Institution's US National Museum, was hired for six months as provisional Director to develop a plan for the museum.[13] And Joseph Roe, professor of industrial engineering at the New York University, and a fervent Taylorist who headed the conservative Society of Industrial Engineers, was hired as curator of the machine tools section.[14] After several reports from study trips to learn from European industrial museums, the preliminary plan included a division of the museum according to the most thriving branches of industry in the New York region in order to foster industrial education, and a big machine tools section in order to celebrate the role of engineers and American inventiveness in the construction of the nation.[15]

When the museum opened its doors in 1927 at the 7th and 8th floors of the Scientific American Building, the small and provisional exhibition combined the sequential display of a historical collection of machine tools, on the one hand, with an eclectic array of visitor-operated machines, models and devices. At the Museum of the Peaceful Arts, visitors could manipulate an old phonograph, activate a model of a wind tunnel, manually inspect an enlarged model of a telephone or operate Eli Whitney's original milling machine.[16]

[12] Jones, Russell Douglass (2001), *Engineering History: The Foundation of Industrial Museums in the United States*, PhD Dissertation, Cleveland, Case Western Reserve University, pp. 191-198.
[13] On the contemporary unsuccessful efforts to create an industrial museum within the Smithsonian Institution, in which Mitman participated, see: Molella, Arthur (1991), "The Museum that Might Have Been: The Smithsonian's National Museum of Engineering and Industry", *Technology and Culture*, 32:2, 237-263.
[14] "Museum of Peaceful Arts Selects Machine Tools for First Section of Exhibit: Its Collection Increases Rapidly under New Program", *Museum News*, March 1, 1928, 5:18, p. 1.
[15] Rice, Calvin; Mitman, Carl; Roe, Joseph (1926), "Preliminary Recommendations for the Museum of the Peaceful Arts, New York City: Report to the President and Board of Trustees of the Association for the Establishment and Maintenance for the People in the City of New York of Museums of the Peaceful Arts", New York Historical Society Manuscripts Collection.
[16] Watts, Mary, "A Tourist in New York: Wonders Revealed by a Visit to the Museum of the Peaceful Arts", *New York Evening Sun*, July 9, 1928, Volume I, Museums of the Peaceful Arts Records, DL, SIL.



[Fig 1. Promotional photographs depicting ideal visitors pressing push buttons and manipulating exhibits at the Museum of the Peaceful Arts, 1929]

The hands-on approach of many European industrial museums was a fundamental source of inspiration for the new American museums of science and industry.[17] In a booklet and film promoting the need for transplanting industrial museums to the United States, Charles Gwynne, member of the executive committee of the Museum of the Peaceful Arts – and vicepresident of New York's Chamber of Commerce – claimed that "the basic departure of new from old" at the "museums of the new age" was that "visitors there handle the exhibits".[18]

As suggested by historian Eve Duffy, the hands-on approach at the Deutsches Museum, which coexisted with the monumental static exhibition of decontextualized machines as masterpieces fostered by the engineers of the VDI, had to do with Oskar von Miller's interest in increasing the consumption of electricity by acquainting the public through push buttons with the new domestic appliances.[19] However, the first context for hands-on display at the Museum of the Peaceful Arts had more to do with the promotion of invention and vocational education that was the rationale behind institutions such as patent museums or the Conservatoire Nationale des Arts et Métiers.

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[17] Sears and Roebuck's magnate Julius Rosenwald repeatedly claimed that the first inspiration for creating an industrial museum in Chicago came to him after seeing his son happily pushing buttons for hours without getting tired at the Deutsches Museum (Pridmore, Jay (1996), *Inventive Genius: The History of the Museum of Science and Industry,* Chicago, Museum of Science and Industry).

[18] Gwynne, Charles (1927), *Museums of the New Age: A Study of World Progress in Industrial Education*, New York, The Association for the Establishment and Maintenance in the City of New York of Museums of Peaceful Arts, p. 23.

[19] Duffy, Eve (2002), *Representing Science and Technology: Politics and Display in the Deutsches Museum, 1903-1945*, PhD Dissertation, Chapel Hill, University of North Carolina; Duffy, Eve (2007), "Oskar von Miller and the Art of Electrical Exhibition: Staging Modernity in Weimar Germany", *German History*, 25:4, p. 526.

The first Director of the Museum of the Peaceful Arts, physicist Fay C. Brown, argued that "an exhibit is attractive when the visitor can operate it himself by pressing a button, turning a crank, pulling a string, or going through various manipulations with his hands, feet, mouth and eyes".[20] According to him, dynamic exhibits were superior to static ones in increasing attention and avoiding visitor fatigue "because of the variety of muscles that are brought into play and because throughout he [the visitor] is conscious of his own participation".[21] But these psychological reasons, based on rule of thumb observation and with only vague passing references to general principles of pedagogy such as "knowing by doing", were subordinated to the ultimate pedagogical goal: understanding the inner workings of the mechanism.

The rhetorics of the first promoters stressed the museum as a means of providing technical education to the working classes through the active manipulation of mechanisms. George Kunz, the President of the museum, conceived it as a tool for improving the country's industrial efficiency and preparedness for war[22] and also for morally uplifting and disciplining the working classes:

> [the industrial museum] will visually educate men in every walk of life, more especially mechanics, artisans, textile workers and others giving them a knowledge of the industry, at the same time creating in them a desire to perfect themselves in their own lines and, as you know, when a man is interested in his profession he is likely to be a good workman. A good workman is rarely out of employment and hence is not discontented as is the poor workman who, being frequently out of employment, is more apt to be dishonest.[23]

This approach was closely related to the social paternalistic ideology of the vocational education movement, which conceived manual training and technical education as a way of moral uplift and social control at a time of deep social unrest. Many of the first promoters of the Museum of the Peaceful Arts, like Henry Towne, Frederic Pratt or Charles

[20] Brown, Fay C. (1928), "Visual Education in the Museum of Science and Industry", reprinted from *The Educational Screen*, October, Scrapbook [p. 154], box 14, F.C. Brown Papers, AC, NMAH.
[21] Brown, Fay C. (1928), "Building a Museum to Human Specifications", reprinted from *The Scientific Monthly*, March, 25, p. 200, Scrapbook [p. 128], box 14, F.C. Brown Papers, AC, NMAH.
[22] Kunz, George (1917), "Industrial Museums and Efficiency", *Science*, 45:1161, pp. 297-301.
[23] George Kunz to Colonel Arthur Woods, February 11, 1926, folder 196, box 20, Record Group 2E, Rockefeller Family Archives, RAC. George Kunz thought that the museum would have "an anti-radical socializing effect" (cited in: Jones, Russell Douglass (2001), *Engineering History: The Foundation of Industrial Museums in the United States*, PhD Dissertation, Cleveland, Case Western Reserve University, p. 161).

Richards, had been leading figures behind the National Society for the Promotion of Industrial Education, all of them related to the corporate-oriented engineering class, organized around the American Society of Mechanical Engineers.[24]

This link between moral uplift and manual training can be seen in the museum's promotional photographs. The pictures show an ideal visitor who is almost always a young white male engaged in serious and attentive hands-on examination of a machine or pushing buttons in order to understand some scientific or technical principle (see Figs. 1 and 2). They visually point to the classroom or workshop context of vocational education, and the visitor appears as a student learning through manipulation. Entertainment is secondary. When kids appear, they are always accompanied by the pedagogical character of an adult teacher who mediates with the exhibits, and their bodily behaviour, as that of the adults, is the restrained body-language of learning rather than the excitement of fun. Women only appear as seducing -or rather as being seduced- by a masculinized technology.[25]

[Fig. 2. Promotional photographs of visitors at the Museum of the Peaceful Arts, 1929. The image at the left shows a visitor manipulating an Eli Whitney's original milling machine]

At the root of this visual representation of the ideal visitors lays an anthropological optimism towards human perfectibility that fits within the paternalistic liberal reform assumptions of the promoters linked to the National Society for the Promotion of

[24] For a thorough analysis on the links between the first industrial museums in the United States and the vocational education movement, as well as their shared ideological agenda, see: Jones, Russell (2001), *Engineering History: The Foundation of Industrial Museums in the United States*, PhD dissertation, Case Western Reserve University. On the ideology of American engineers in the two first decades of the twentieth century, see: Noble, David (1977), *America By Design: Science, Technology, and the Rise of Corporate Capitalism*, New York, Knopf.

[25] On the co-construction of technology and masculinity in the United States, see: Oldenziel, Ruth (1999), *Making Technology Masculine: Men, Women and Modern Machines in America, 1870-1945*, Amsterdam, Amsterdam University Press.

Industrial Education. Director Fay C. Brown assumed that there was a "deep-seated desire on the part of both young and old to obtain an understanding of the basic principles and ideas involved in our mushroom scientific and industrial development" and considered that an exhibition was good if it culminated in "questions, library reading and a certain amount of activity on the part of the visitor".[26]

This certain amount of activity could even be invention. Another explicitly targeted public of the Museum of the Peaceful Arts was the "ordinary inventor", and hands-on tinkering in the workshop is another important context in which to understand its visitor-operated approach.[27] Ironically enough, at a time when invention was being more and more centralized in big industrial laboratories, the first museums of science and industry in the United States initially conceived themselves as institutions that would help enhancing invention and, as a consequence, industrial productivity. Fay C. Brown was proud of the fact that the museum acted during its first years as a technical information service for manufacturing companies and individual inventors:

> Manufacturers have discovered here new and better ways to do their work. Research men and inventors have found assistance. Home builders have obtained new ideas. Merchants have made many inquiries. [...] And so, if we do our work well, we should expect the business of the country to be materially increased.[28]

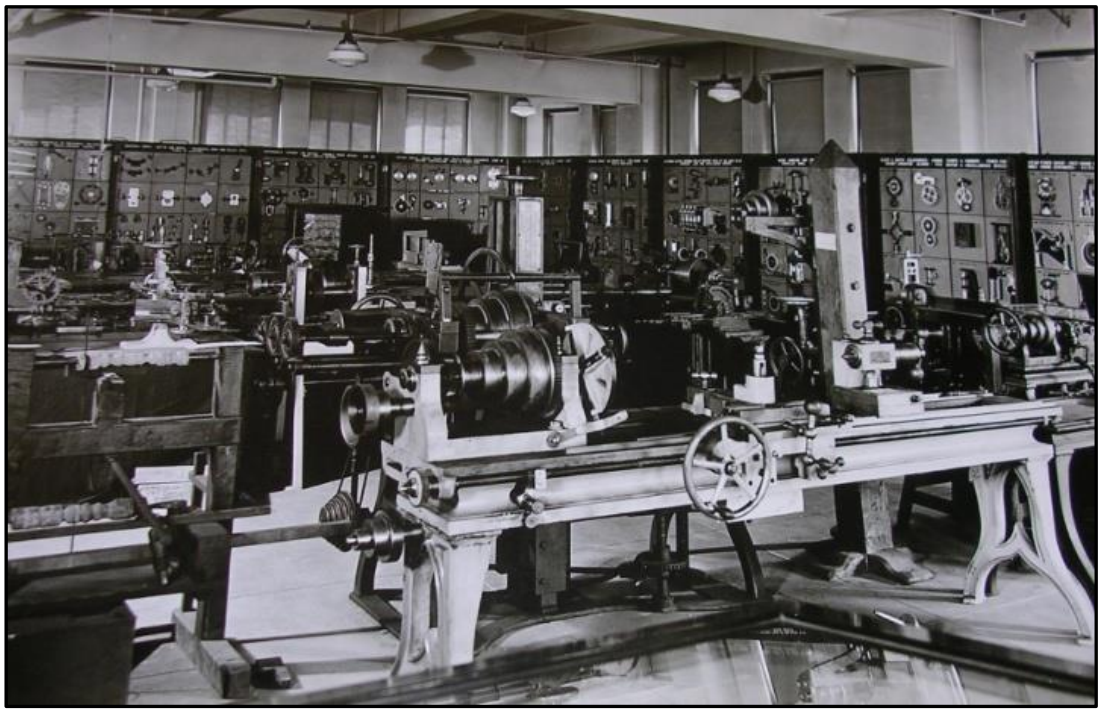
Brown argued that the sequential display and hands-on study of historical collections at the Museum of the Peaceful Arts would train the perceptive ability of future

[26] Brown, Fay C. (1928), "Visual Education in the Museum of Science and Industry", reprinted from *The Educational Screen*, October, Scrapbook [p. 154], box 14, F.C. Brown Papers, AC, NMAH.

[27] On the long tradition of links between technological display and discourses on invention, see: Endersby, Linda Eikmer (1999), *Expositions, Museums and Technological Display: Building Cultural Institutions for the 'Inventor Citizen' in the Late 19th Century United States*, PhD Dissertation, Massachusetts Institute of Technology.

[28] Brown, Fay C. (1929), "The Use of the Industrial Museum as Seen by the Construction Engineer", reprinted from *The Stone & Webster Journal*, March, p. 10, Scrapbook [p. 131], box 14, F.C. Brown Papers, AC, NMAH. He expresses similar ideas about the economic role of the museum in: Brown, Fay C. (1928), "The Museum Can Help Business: Study of Industrial Growth Inspires New Ideas", reprinted from *Nation's Business*, March, Scrapbook [p. 34], F.C. Brown Papers, AC, NMAH. In his 1928 report to the trustees he mentioned the high number of requests received and technical problems solved: "One industrial research laboratory director designed several pieces of testing equipment on the basis of one of our exhibits. Another research engineer desired to order a modification of one exhibit for ten factories. An instructor in a Polytechnic Institute copied a design for studying the vibration of cams and crankshafts, based directly on the stroboscope exhibit. [...] After an executive of one company visited the Museum he wrote us that they were starting a new line of manufacture based on findings here" (Brown, Fay C. (1928), "Director's Report for the Meeting of the Board of Trustees", folder 6, box 2, F.C. Brown Papers, AC, NMAH).

inventors by acquainting them with all the technical combinations so far tried and the ways in which they had gradually evolved. He argued that "a stimulating historical museum will do much to promote sane invention and particularly to carry over the fruits of invention in one field to related fields".[29] This way of thinking echoed the work by contemporary sociologists of invention, such as Abbot P. Usher or Seabury C. Gilfillan (himself a curator at the Chicago Museum of Science and Industry), who argued that technical innovation was a gradual and collective evolutive process of recombination through analogy in order to meet social needs.[30]



[Fig 3. The crowded room which displayed the Mechanical Wonderland (on the back) and the chronologically-arranged historical collection of machine-tools (on the front) at the Museum of the Peaceful Arts, circa 1929]

This view on the innovation process was embedded in the arrangement of the displays (see Fig. 3). It can be seen in the syntax of the room which housed the Machine Tools Exhibit (the lathes in the front, sequentially arranged in chronological order) and

[29] Brown, Fay C. (1928), "The Industrial Museum", in Wile, Frederic (ed.), *A Century of Industrial Progress*, New York, Doubleday, Dorian & Company, p. 568.
[30] McGee, David (1995), "Making Up Mind, the Early Sociology of Invention", *Technology and Culture*, 36:4, pp. 773-801. For an insightful analysis of the links between this early sociology of invention and the first American industrial museums, see: Jones, Russell Douglass (2001), *Engineering History: The Foundation of Industrial Museums in the United States*, PhD Dissertation, Cleveland, Case Western Reserve University, chapter 4. On Abbot P. Usher and Seabury C. Gilfillan as historians of technology, see: Molella, Arthur (1990), "Mumford in Historiographical Context", in Hughes, Thomas; Hughes, Agatha (eds.), *Lewis Mumford: Public Intellectual*, New York and Oxford, Oxford University Press, 21-42.

the Mechanical Wonderland (the panels in the background). The grid-like syntax of the operating exhibits showing the basic elements of machines in the Mechanical Wonderland was analog to that of a periodical table, or, better, an alphabet. One would say that the panels at the background gave the visitor the alphabet and the grammar that, so tot speak, would allow him to read the crowded sentences of the sequential discourse in the front. Acquainted with the basic tools provided by the Mechanical Wonderland, and trained by observation and manipulation of historical machines in the evolutionary patterns of invention, young inventors would collectively be better equipped to find and implement new patterns of innovation, just as painters visited art museums to learn the techniques of the old masters and get inspiration for new developments.

The early politics of hands-on display at the Museum of the Peaceful Arts has therefore to be understood in the contexts of vocational education and the assumed economic role of the museum as a center of invention. On the one hand, the working classes would learn by manual training a useful hands-on knowledge that would keep them away from vice, crime and political subversion. On the other hand, inventors could see displayed in front of them and manipulate all the past combinations they needed to spur the spark of innovation.

A 'Technical Coney Island'?: Dynamic Exhibits and the Social Consequences of Science

When the renamed New York Museum of Science and Industry opened its doors in 1930 in the 3rd and 4th floors of the Daily News Building, the visitors found there less visitor-operated exhibits. Some of them, like science journalist John O'Neill, deplored this change:

> Under Dr. Brown the museum seemed to favor dynamic exhibits, exhibits that did things for you. Under Dr. Richards' regime it seemed to me that increased emphasis was placed on static exhibits, ship models and locomotives in glass cases, and some of the old favorites were missing, some of the devices the public could operate.[31]

[31] John O'Neill to Orestes H. Caldwell, January 9, 1935, folder 4, box 2, F.C. Brown Papers, AC, NMAH.

The redefinition of the role of hands-on display was the direct result of an internal debate on the social function of industrial museums, which ended up in 1931 with the forced resignation of Fay C. Brown and the promotion to directorship of Charles Richards, an engineer involved in industrial education who had been the President of the American Association of Museums between 1923 and 1927. Fay C. Brown was perfectly aware of the reason behind his dismissal:

> No question has been raised about the wisdom of any expenditure. There has, however, arisen a difference of view as to the policy of the museum. The Director has adhered to the view that the museum should be devoted primarily to the raising of the level of technical understanding of the general public through an intriguing exhibition, whereas the officers of the Board have favored primarily the presentation of the sociological implications as a result of technical advancement.[32]

The growing pressure of the Depression's "rumble of discontent" questioned the 1920s ideology that had linked applied science and the free enterprise system as the key to abundance and progress.[33] In this context, the board of trustees considered that technical instruction was not enough, and that intervening in the debates over science and technology and spreading a message about progress was badly needed to ensure social stability. According to Richards, museums of science and industry had not only to teach the scientific and technical knowledge underlying modern machine age civilization, but had also "to set forth in some measure the social and economic implications of industrial progress".[34]

This shift of emphasis was reflected in Richards' new plan for the museum, based on the conclusions of his very influential survey of European industrial museums.[35] While the original plan had imagined a museum divided in sections according to the most thriving branches of industry in the New York region in order to appeal to the specialized

[32] Brown, Fay C., "Four Year Progress Report on New York Museum of Science and Industry", February 20, 1931, p.1, folder 2, box 3, F.C. Brown Papers, AC, NMAH.
[33] McGrath, Patrick (2002), *Scientists, Business and the State, 1890-1960*, Chapel Hill, University of North Carolina Press; Bix, Amy (2000), *Inventing Ourselves Out of a Job? America's Debate over Technological Unemployment, 1929-1981*, Baltimore, Johns Hopkins University Press; Kennedy, David 1999, *Freedom from Fear: The American People in Depression and War, 1929-1945*, Chicago: University of Chicago Press.
[34] Richards, Charles (1934), "The Museum of Science and Industry", *Museum News*, April 15, 1934, 11:20, p. 6.
[35] Richards, Charles (1925), *The Industrial Museum*, New York, MacMillan.

working classes, the new plan that was implemented at the Daily News Building was aimed at achieving a global understanding of industrial society as a whole for the disoriented and disgruntled layman of the machine age. The new structure of the museum would be organized according to human needs (transportation, shelter, clothing, etc.) and would portray the historical evolution of the increasingly sophisticated technical means used to satisfy them.[36] The new permanent sections, which were inaugurated between 1931 and 1932, followed a historical and technologically determinist narrative that unfolded in evolutionary sequences.

This approach was already clear in the first pilot exhibition inaugurated in September 1930: *Men and Machines*. The exhibition intended to avoid being "a hodgepodge of mechanical wonders" and strove to display the objects "in its proper logical order. The museum will have a plot as thrilling in its implications as a Broadway drama".[37] This plot was basically the progress from barbarism towards civilization through technology. First, the visitors went through three rooms which showed, through panels, photo-murals and habitat groups, the prehistoric shift from the "tool-less age" into the "age of tools", the development of "the age of handicraft" and finally the modern "age of machines". After this broad historical panoramic, the second part of the exhibition displayed the industrial history of the United States since 1780. By walking past cronologically arranged originals and models of a Parsons turbine, an Ericsson engine, the first electricity power-station in New York, a Corliss Engine, or Eli Whitney's milling machine, the visitors could retrace the steps of progress in metallurgy, machine construction and transformation of energy in the United States.

[36] "Report of the Exhibit Committee, Museums of the Peaceful Arts", attached to: Calvin Rice, F.C. Brown; Charles Richards to the Trustees of the Museums of the Peaceful Arts, February 21, 1930, folder 1, box 3, F.C. Brown Papers, AC, NMAH.
[37] "Museums of the Peaceful Arts to Show Man's Rise", New York Times, August 31, 1930, p. 19.

[Fig 4. Interior view of the New York Museum of Science and Industry at the Daily News Building during the inaugural exhibition *Men and Machines*, 1930. Down and to the left: Whitney's milling machine]

The exhibition took its name from a contemporary book by Stuart Chase.[38] But unlike the book, which critically assessed the role technology played in the social ills of the Machine Age, the exhibition was a triumphalist hymn to industry. Fay C. Brown, who was about to leave the museum but was still in charge when the exhibition was inaugurated, described the exhibition as conveying the following message:

> Is the Machine Age in any way responsible for the present business depression? It is the lack of intelligence which brings on business depressions. The machine is not responsible [...] Our trains continue to run, our airplanes continue to fly, our automobiles continue to fill our ever-widening roads, our buildings climb higher and higher and nowhere can you find people really suffering from hunger or lack of clothing [...] Our Machine Age is merely convalescing or readjusting and we shall soon wake up hungry for breakfast and work and play.[39]

[38] Chase, Stuart (1929), *Men and Machines*, New York, Macmillan.
[39] Brown, Fay C, "How Machines Affect Business and Life", transcript of a radio broadcast, WOR, September 27 1930, folder 5, box 8, F.C. Brown Papers, Archive Center, National Museum of American History, Smithsonian Institution.

This message went hand in hand with a technological determinist approach. In the line of contemporary attempts at rewriting the history of the United States from the point of view of the development of the Machine, the exhibition presented technology as an autonomous and unstoppable historical force which produced "social consequences" –and had no social roots.[40] This naturalization of the mechanization process at a time of deep social and political conflict seeked to instill to the masses the idea that the fight against the dominant social relations built around technology was in fact a childish and useless rebellion against the inner force of natural progress, the same that had been responsible for civilizing man and releasing him from his precarious natural state.

But how to put these 'social consequences' of science and industry on display? Hands-on exhibits, closely tied to vocational education, didn't seem to offer a solution. Charles Richards favored a return to the visual in the form of charts and textual labels:

> The gradual influences of newly developed spinning and knitting machinery upon basic social, labor and economic conditions are shown by charts and texts [...] For instance we show by this method that the Whitney gin, invented in 1794, has made it possible for one unit of machinery to pick from the cottonseed 400 times as much lint cotton in one day as was formerly picked by one man, and by this reduction in labor has converted the Southern States into virtually one vast cotton field.[41]

Technological relics such as Eli Whitney's milling machine were no longer displayed in the hands-on atmosphere of the Scientific Exhibit Building. At the Daily News Building, Whitney's milling machine was not only to be admired as a singular reverential building block of the nation or understood in its technical principles through

[40] Charles Beard is the paradigmatic example of this historical approach. See, for example: Beard, Charles; Beard, Mary (1927), *The Rise of American Civilization: The Industrial Era*, New York, MacMillan; Beard, Charles (ed.) (1928), *Whither Mankind: A Panorama of Modern Civilization*, New York, Longmans Green; Beard, Charles (1930), *Toward Civilization*, New York, Longmans Green. On the politics of technological determinism in museums of science and industry in the US, see: Jones, Russell Douglass (2001), *Engineering History: The Foundation of Industrial Museums in the United States*, PhD Dissertation, Cleveland, Case Western Reserve University; Wallace, Michael (1996), "Progress Talk: Museums of Science, Technology and Industry", in Wallace, Michael, *Mickey Mouse History and Other Essays on American History*, Philadelphia, Temple University Press, pp. 76-85.

[41] "Textile Art Traced Through Centuries", *New York Times*, November 15, 1931, p. N3. Although he believed that charts and other textual labels were the only way to visualize the social consequences of science and industry in a museum, Charles Richards had serious doubts about their pedagogical effectiveness: "...much of the exposition must be presented in the form of printed statements and charts, and although these may be prepared so that he who runs may read, it is true that he who walks in a museum seldom reads" (Richards, Charles (1934), "The Museum of Science and Industry", *Museum News*, April 15, 1934, 11:20, pp. 6-8).

manipulation, but it was mainly to be perceived as a fundamental historical actor that triggered social changes in a chain of progress. And it had to be achieved through visual methods. An anonymous proposal favored the display of the milling machine within a tridimensional diorama-like historical "habitat group":

> Eli Whitney's milling machine might therefore be shown with a model of Whitney near it examining the musket parts which he was turning out by the first mass production system in America, i.e., Eli Whitney's milling machine then becomes an incident to the beginning of the interchangeable principle in manufacture which perhaps has been the greatest key to America's industrial supremacy.[42]

The proposal, however, was never implemented, and the preferred method of display ended up being textual information in charts and panels that complemented an evolutionary sequence of exhibited objects. Eli Whitney's milling machine played a completely different role as a sign within the display narrative of *Men and Machines* than the one it played at the Machine-Tools section of the Scientific American Building (see Figs. 2 and 4). At the Daily News Building it was part of a group of objects and it was accompanied by a text. Now it was part of a a progressive narrative of technological determinism that was communicated through the performativity of what Tony Bennett calls evolutionary walking, on the one hand,[43] and through the textual information expliciting the social consequences of technological advance, on the other.

Unfortunately, there is almost no visual evidence left of the charts and labels that accompanied the exhibited objects at the permanent sections of the museum at the Daily News Building, but the close connection between the staff at the New York Museum of Science and Industry and Waldemar Kaempffert suggests that they might have been influenced by the Vienese style of pictorial statistics. Kaempffert adopted the Isotype method of pictorial statistics developed by his cousin Otto Neurath as the most suitable exhibition technique to visualize the social implications of the machine age inventions. The Chicago Museum of Science and Industry commissioned charts, maps and pictorial statistics to Viena's Museum of Society and Economy, and hired Rudolph Modley, one of

[42] "The Industrial Museum Should...", folder 1, box 7, F.C. Brown Papers, Archive Center, National Museum of American History, Smithsonian Institution.
[43] Bennett, Tony (2004), *Pasts Beyond Memory: Evolution, Museums, Colonialism*, New York, Routledge.

Neurath's assistants, as curator of the Social Sciences Division.[44] In New York, Ann Reed Langstroth, who had been member of *Survey Graphic*'s editorial board and had analyzed Neurath's Museum of Society and Economy during her Franklin Institute-funded European tour to study industrial museums, was hired in 1930 as consultant in "social interpretation of the museum exhibits".[45] And Rudolph Modley mentioned in 1935 that the New York Museum of Science and Industry was being supplied of "pictorial charts" by half a dozen graphic designers working under a Works Progress Administration program.[46]

Nonetheless, even if visual exhibition techniques were preferred, push buttons and dynamic exhibits did not disappear from the museum's halls. Their status, however, became much more ambiguous and problematic. Besides the decrease of the political significance attached to manual training, another factor that had brought Richards to question the hands-on approach were children, who were perceived as a problem both in logistical and epistemological terms.

With the move to the more central venue of the Daily News Building, the New York Museum of Science and Industry became a magnet for kids, who spent the weekend afternoons playing with its push buttons, levers and cranks. The museum staff were greatly concerned about the annoyance to other visitors and the heavy damage caused to visitor-operated exhibits by the crowds of unrestrained children. At a first moment, the solution found to prevent the museum from becoming a huge playground was to systematically turn away all the kids unaccompanied by adults who crowded the museum halls by the hundreds, but it finally adopted the deterrent measure of establishing a five cents entrance fee on Saturdays and Sundays.[47]

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[44] On the exportation, appropriation and depoliticization of pictorial statistics in the United States, and the key role played in this process by the journal *Survey Graphic* and Rudolph Modley's company Pictograph Corporation, see: Charles, Loïc; Giraud, Yann (2013), "Economics for the Masses: The Visual Display of Economic Knowledge in the United States (1910-1945)", *History of Political Economy*, 45:4, 567-612. The collaboration between the museums in Chicago and Viena was as short-lived as Kaempffert's ambitious program. The financial problems caused by the economic crisis and Kaempffert's resignation due to his political differences with the board of trustees led to the suppression of the Social Sciences Division, the end of the collaboration with the museum in Viena and the abandon of the project of musealizing the social consequences of technology (Mann, James (1988), *Engineer of Mass Education: Lenox R. Lohr and the Celebration of American Science and Industry*, Tesi Doctoral, New Brunswick, Rutgers University, p. 270).

[45] "Personnel", folder 3, box 7, F.C. Brown Papers, AC, NMAH; "Report of Exhibit Committee", November 19, 1930, folder 1, box 3, F.C. Brown Papers, AC, NMAH.

[46] Modley, Rudolf (1935), "Facts Told Pictorially", *New York Times*, September 15, 1935, p. XX6.

[47] "Minutes of Exhibit Committee Meeting", October 24, 1930, folder 1, box 3, F.C. Brown Papers, AC, NMAH. The following figures give an idea of the size of the phenomenon: "On October 25 the attendance was 1059, and over 250 children unaccompanied by adults were turned away on the first floor by the elevator captain and some 240 in the elevator corridor on the fourth floor. On November 1 the attendance was 1100; over 400 children were turned away in the afternoon on the

This would become a recurring headache among museum curators in the new dynamic science museums. Some years later, Waldemar Kaempffert kept insisting on the Janus-faced nature of push buttons and warned of "the danger that mere "stunts" may crowd out truly educational demonstrations and that in overdoing von Miller's principle a museum of science and industry may degenerate into a technical Coney Island".[48]

For Charles Richards the logistical problem went hand in hand with an even worse epistemological problem: to what extent were push buttons and other operating exhibits pedagogically useful for kids? Richards' concern about the museum degenerating into a "technical Coney Island" brought him to search for more scientific advice. Fay C. Brown had been loosely inspired by the general psychological assumptions taken from consumer culture and advertising that were being widely appropriated as pedagogical paradigm in museums.[49] But Charles Richards resorted to academic behavioural psychology, which at that time was increasingly being applied to museum evaluation and visitor reaction studies.[50]

In 1932, Richards approached psychologist Edward Robinson of the Yale Institute of Human Relations, who had pioneered visitor reaction studies. In the context of an emphasis in museums' accountability and professionalization of the staffs, Robinson aimed at establishing the public education programs of museums on the grounds of the experimental and quantitative approach of behavioural psychology.[51] Both Richards and Robinson shared the opinion that more empirical studies were needed in order to scientifically address many unanswered questions such as the pedagogical suitability of push buttons for children.[52] In December 1932, the Carnegie Corporation allocated a grant

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first floor. About 750 were turned away on November 8, with a total in the museum of 1353. On november 15, a rainy day, the attendance was 1138, and about 400 were turned away" ("Report of Exhibit Committee", November 19, 1930, folder 1, box 3, F.C. Brown Papers, AC, NMAH). In fact, Frank Jewett, who became President of the New York Museum of Science and Industry in 1935 convinced the Rockefeller Foundation of the need for establishing an entrance fee to the museum on the grounds that keeping vandals away was a must "for the satisfactory functioning of a dynamic as distinguished from an essentially static type of museum" ("New York Museum of Science and Industry: Report sent to Trustees of Museum on its Operations, 1936", folder 3118, box 262, Record Group 1.1., Rockefeller Foundation Archives, RAC).

[48] Kaempffert, Waldemar, "Science: The Evolution of the Scientific Museum. An Event in New York Points to the Trend Toward the Dynamic Exhibit", *New York Times*, February 16, 1936, p. XX6.

[49] Cain, Victoria (2012), "Attraction, Attention, and Desire: Consumer Culture as Pedagogical Paradigm in Museums in the United States, 1900-1930", *Paedagogica Historica: International Journal of the History of Education*, 48:5, pp. 745-769.

[50] Rader, Karen A.; Cain, Victoria E. M. (2014), *Life on Display: Revolutionizing U.S. Museums of Science and Natural History in the Twentieth Century*, Chicago, University of Chicago Press.

[51] Robinson, Edward (1928), *The Behavior of the Museum Visitor*, Washington DC, American Association of Museums.

[52] Charles Richards to Frederick Keppel, June 22, 1932, folder 1, box 266, series 3A, Carnegie Corporation Records, Rare Books and Manuscripts Library, Columbia University.

of 2,000 dollars to the New York Museum of Science and Industry for "experimental studies in museum education", and psychologist Arthur Melton started a two-year research at the museum aimed at establishing which were the most effective exhibition techniques for a museum of science and industry.[53]

In his article "Distribution of Attention in Galleries in a Museum of Science and Industry", Melton claimed that dynamic displays were pedagogically justified. He described several experiments performed at the museum. One of them analyzed what was the best position in which to place labels so that they received more attention time. Another one studied how the increase in attention towards a machine that had been put in motion entailed a reduction of the time devoted to adjacent exhibits.[54] One of the experiments compared the effectiveness of automatic and manual operation of exhibits. Melton added a lever to three out of five different electrical demonstrations that were initially set into motion by an automatic system, so that visitors could now activate them on will. The result showed that visitors spent more time in front of the visitor-operated exhibits and that, in this particular case, dynamic exhibits were pedagogically useful, since "the manual operation stimulated interest of the type museums are attempting to foster. The cranks were not just gadgets to turn; they heightened interest to such an extent that more label reading was done".[55]

But the fact that the educational role of push buttons was legitimized by behavioural psychology didn't put an end to Richards suspicion, in particular concerning children. According to him, while natural history and art museums provided moral and aesthetic education to all ages, "for children below the average mental age of 13 and 14 the museum of science and industry will always present a fascinating spectacle and the more the number of operating exhibits the more it is liable to become a gorgeous playground"[56]. This led him to believe that the best option to avoid the museum becoming a "technical Coney Island" would be to clearly segregate children and adults and to adapt dynamic

[53] "Payment of a Fellowship in Aid of Research of Museum Education", December 29, 1932, folder 1, box 266, series 3A, Carnegie Corporation Records, RBML, CU. Melton had already worked at the Buffalo Museum of Science: Melton, Arthur (ed.) (1936), *Experimental Studies of the Education of Children in a Museum of Science*, Washington DC, American Association of Museums.
[54] Melton, Arthur (1936), "Distribution of Attention in Galleries in a Museum of Science and Industry", *Museum News*, June 1, 14:3, pp. 6-8.
[55] *Ibidem*, p. 7.
[56] Richards, Charles (1934), "The Museum of Science and Industry", *Museum News*, April 15, 1934, 11:20, p. 6.

exhibits to the special needs of children, as it was done at the Children Gallery of London's Science Museum.[57]

For adults, as Waldemar Kaempffert warned, push buttons and dynamic exhibits were certainly useful aids for attracting attention and teaching dynamically some scientific or technical principle, but they were clearly not enough for visualizing the social consequences of science and industry.

> To push a button and see a model elevator rising in its shaft and automatically slowing down and leveling itself before stopping at a floor is well enough. But we must not forget the economic effect of the elevator. It made the skyscraper possible and thus created Chicago's Loop and New York's financial center. Also it created a problem in transportation. When a single huge structure discharges 50.000 office workers on the sidewalk at 5 o'clock a problem is presented that must be solved by subways and buses. The museum should not ignore that problem. [58]

The use of push buttons would be a mere ornamental technique if it was not subordinated to the sequential display of the exhibits and to the reading of labels and charts containing pictorial statistics, aimed at conveying the idea of technology as an autonomous and unstoppable historical force.

'There is Nothing Funny about the Tools of Capitalism': Push Buttons, Mass Communications and Corporate Display

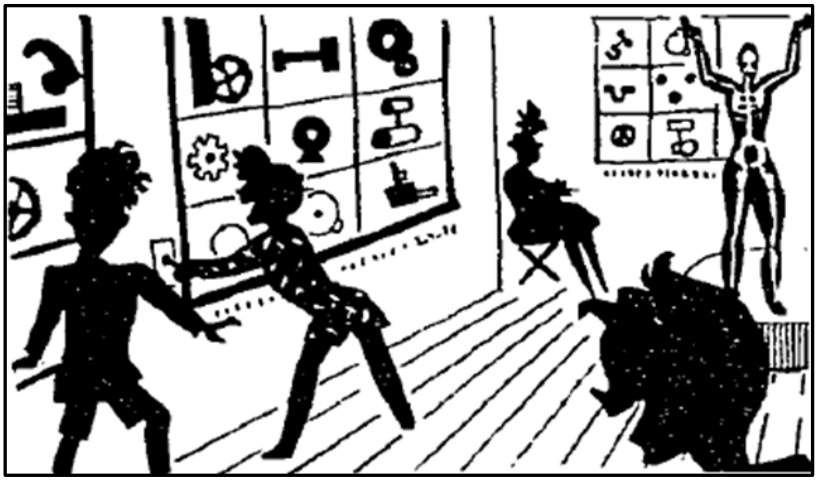
On February 11 1936, the New York Museum of Science and Industry was reinaugurated in the brand-new Rockefeller Center. The success of the 1934 Chicago Century of Progress Exposition as a loudspeaker for the corporate views on science and industry prompted a joint effort by the Rockefeller Foundation, the Carnegie Corporation and a part of the corporate scientific elite aimed at convincing the managers of the Towne bequest to release all its money to the museum so that it could be established on permanent grounds. Physicist Frank Jewett, who was director of the Bell Laboratories and

[57] *Ibidem*.
[58] Kaempffert, Waldemar, "Science: The Evolution of the Scientific Museum. An Event in New York Points to the Trend Toward the Dynamic Exhibit", *New York Times*, February 16, 1936, p. 26.

vicepresident of ATT, and had been the President of the Scientific Advisory Committee of the Chicago's Exposition, was the man chosen for the task of transforming the museum.

Under his presidency, the board of trustees lost Taylorist engineers and incorporated high rank executives of science-based corporations such as the presidents of IBM and General Electric. Exhibit designer Robert P. Shaw, who had worked with Jewett in Chicago, replaced Charles Richards, by then old and ill, as the Director of the museum, which became mainly focused in the spectacular presentation of the latest products developed in industrial laboratories through temporary corporate exhibitions that were added to the permanent sections that had been developed in the Daily News Building and turned the museum into "an ever changing show". [59].

Push buttons were fully embraced again and became the center of the subjective experience of the visit and the self-presentation of the New York Museum of Science and Industry, which promoted itself as a "hall of motion", described by contemporaries as a ludic playground.[60] Promotional cards highlighted fingers, push buttons and smiling faces and, significantly, *The New York Times* chose to illustrate the chronicle of the reinauguration ceremony with a photograph of Albert Einstein pushing buttons at the museum.[61]



[Fig 5. Fingers and smiling faces are the key to the visual representation of young visitors to the New York Museum of Science and Industry at the Rockefeller Center which illustrated the abovementioned 1940 chronicle for *The New York Times* by Jane Cobb (n. 3)]

[59] Rhees, David (1993), "Corporate Advertising, Public Relations and Popular Exhibits: The Case of Du Pont", in Schroeder-Gudehus, Brigitte, *Industrial Society and its Museums*, Langhorne, Harwood Academic Publishers, 67-75.
[60] "Scientific Items Gleam in New Home: Buttons Do All the Work. Levers, Pulleys and Many Other Devices Respond to Touch of Visitors at Preview, New York Times, February 11, p. 25.
[61] "A Great Scientist Visits a New Museum in New York", *New York Times*, February 16, 1936, p. RP1.

Dynamic exhibits regained preponderance at the museum in ways that departed from the vocational education approach at the Scientific American Building. The politics of hands-on display at the Rockefeller Center was closely tied to the corporate display that flourished in the 1933-34 Chicago Century of Progress Exposition. The big science-based corporations had reacted to the Depression and to Roosevelt's victory by launching a huge public relations campaign that transformed the exhibitionary culture of the 1930s.[62] Huge amounts of money were spent on the Chicago and New York's World's Fairs and other itinerant exhibitions aimed at winning the hearts of the population in an urgent battle for cultural hegemony.[63] Industrial designers were called in to design a streamlined "new philosophy of showmanship" which, according to Frank Jewett, had to spread through "a quiet and unconscious schooling" the idea that "every new bit of scientific knowledge acquired is an addition to the strength of the social structure and not a revoutionary threat to the existing order".[64]

Dynamic exhibits played an essential role in the corporate showmanship of the 1930s. The army of behavioural psychologists, sociologists and advertising experts that had been hired to study visitor reaction at the Chicago Century-of Progress Exposition concluded that pushbuttons were one of the most efficient exhibition techniques for achieving the corporate goals. In line with Arthur Melton, they argued that movement of exhibited objects and audience participation were the two essential tools for attracting the attention of the "average visitor", understood as passive and malleable, in the behavioural terms that the marketing and advertising experts were using to assess mass audiences.[65]

The New York Museum of Science and Industry adopted the corporate conception of a mass audience and imported exhibition techniques from World's Fairs and commercial exhibitions.[66] The political interest of the Humanities Division of the

[62] Rydell, Robert (1993), *World of Fairs: The Century-of-Progress Expositions*, Chicago, University of Chicago Press.
[63] Kuznick, Peter (1994), "Losing the World of Tomorrow: The Battle Over the Presentation of Science at the 1939 New York World's Fair", *American Quarterly*, 46:3, pp. 341-373. For an analysis of science popularization as cultural hegemony, see: Nieto-Galan, Agustí (2011), "Antonio Gramsci Revisited: Historians of Science, Intellectuals, and the Struggle for Hegemony", *History of Science*, 49:4, 453-478.
[64] Rydell, Robert (1985), "The Fan Dance of Science: American World's Fairs in the Great Depression", *Isis*, 76:4, p. 532. Frank Jewett's political agenda for the science museum had also to do with reducing social unrest by presenting the existing social order as the most efficiently adapted to the technical constraints of the machine age (Jewett, Frank (1935), *The Place of the Science Museum: An Address Before the Commercial Club of Chicago Outlining the Place of the Science Museum in the Modern Industrial Community*, New York, Bell Telephone Laboratories).
[65] Marchand, Roland (1998), *Creating the Corporate Soul: The Rise of Public Relations and Corporate Imagery in American Big Business*, Berkeley, University of California Press.
[66] Shaw, Robert (1939), "New Developments in Science Museum Techniques and Procedures", The Scientific Monthly, 48:5, pp. 443-449.

Rockefeller Foundation on the mechanisms of mass communications turned the New York Museum of Science and Industry into an experimental laboratory in exhibition techniques.[67] The Rockefeller-funded survey of exhibition techniques at the 1939 New York and San Francisco Fairs concluded that "the theory that operating exhibits are the most effective was put into practice at the Fairs, as 77% of the exhibitions were of an operating type" and that "in our age of speed and motion the visitor expects mechanized displays which tell him a particular story in the simplest way possible".[68] Accordingly, push buttons and the visitor's "natural urge to see or set things in motion" became central in the new exhibition techniques developed by the museum's new Exhibit Research Department, like the "Progressive Exhibit Method", which was applied to the electrotechnology division.[69]

Kids became the center of the photographic promotional representations of the ideal visitor, which no longer depicted technically inclined adult men inspecting machines, but boys and girls playing and pushing buttons in a ludic context. Children were no doubt a targeted - and many times captive - public of the New York Museum of Science and Industry, but their iconographic use has to be understood within a shift in the perception of what was the ideal public and the political function of the museum, which in turn caused a redefinition of the politics of hands-on display.

[67] Sastre-Juan, Jaume (2013), *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)*, PhD Dissertation, Barcelona, Universitat Autònoma de Barcelona; Niquette, Manon; Buxton, WIlliam (2009), "'Sugar-Coating the Educational Pill': Rockefeller Support for the Communicative Turn in Science Museums", in Buxton, William (ed.), *Patronizing the Public: American Philanthropy's Transformation of Culture, Communication and the Humanities*, Lexington, Lexington Press, pp. 153-194; Gary, Brett (1992), *American Liberalism and the Problem of Propaganda: Scholars, Lawyers, and the War on Words, 1919-1945*, PhD Dissertation, University of Pennsylvania.

[68] New York Museum of Science and Industry (1940), *Exhibition Techniques: A Summary of Exhibition Practices*, New York, New York Museum of Science and Industry, p. 21.

[69] Shaw, Robert P. (1939), "The Progressive Exhibit Method: A New Technic in the Field of Science Presentation", *American Journal of Physics*, 7:3, p.165.

[Fig. 7. Left: Children manipulating exhibits at the electrotechnology section of the New York Museum of Science and Industry, 1939. Right: Children having fun at the communications section of the New York Museum of Science and Industry, 1948]

This renewed emphasis in push buttons reveals a profound change in the conceptualization of visitors and in notions of social control. Now the workers and the paternalistic rhetorics of social reform which had been closely tied to the first politics of hands-on display at the museum disappeared in favour of an "average public" defined by advertising's behavioural approach to mass communications. The same children that were seen as a logistical and epistemological problem at the Daily News Building were not only wellcome at the Rockefeller Center, but considered the visual representation of the ideal average visitor. Whereas Charles Richards used the Children's Gallery as an example of the segregation between children and adults that dynamic museums should adopt, the new Director of the museum, Robert P. Shaw, considered it a model that could be applied to the museum as a whole:

> The best thing at the Science Museum was the Children's Room. I felt that this was misnamed as it should have been called by some more appropriate title such as 'The Museum's Room of Modern Display' [...] these exhibits were crowded most of the time and not only were instructive for children but for adults as well.[70]

[70] Shaw, Robert (1937), *Report on Studies of Palace of Discovery, Paris International Exposition, Museums of Science and Industry and Other Exhibitions in Europe*, folder 3119, box 262, Record Group 1.1., Rockefeller Foundation Archives, RAC, p. 71.

While Charles Richards placed the age limit below which the hands-on approach of the museum was useless in 14 years, Shaw conceptualized visitors within the framework of the "14-year-old theory", widespread in the advertising world, which assumed that anything beyond the reach of a 14-year-old kid –the age in which most people left school- would never appeal the average public. And whereas former Director's Fay C. Brown's defense of hands-on display appealed to rational adults with a genuine interest in learning, now the educational pill had to be sugar-coated according to behaviourism's characterization of human nature in order to communicate the desired message to a more or less passive and idiotic public. In a revealing metaphor, the new Director of the museum, the exhibit designer Robert P. Shaw, argued that "designing a popular exhibition is somewhat like bathing a dog. One feels that a bath would be good for the dog. The dog, an individualist, has other ideas".[71]

The malleability and socialization process of children represented the playfulness and the ludic instinct that was the key to the 1930s corporate politics of hands-on display.[72] According to the advertising psychology that museums were appropriating, having fun and participating in the show was the best method for overcoming sales resistance, seducing the customer/visitor and winning his heart so that he finally buys the product/message. The Director of the Buffalo Museum of Science, Carlos Cummings, argued in 1939 that visitor-operated exhibits were better than automatic ones because "when an observer voluntarily participates in a performance and becomes a part of it, he is to a very much greater degree interested in the outcome, which he unconsciously assumes he personally is responsible for and consequently proud of".[73] Cummings wondered how push buttons contributed to "the manner and extent to which our visitors [...] may be called upon to become an actual part of the exhibits and, as a feature of this cooperation, how the play instinct inherent in all of us may be properly directed and utilized to the best advantage of all concerned".[74]

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[71] New York Museum of Science and Industry (1940), *Exhibition Techniques: A Summary of Exhibition Practices, based on Surveys Conducted at the New York and San Francisco World's Fairs of 1939*, New York, Museum of Science and Industry, p. 25.

[72] For an analysis of the social construction of childishness in relation to science, see: Onion, Rebecca (2012), *Science and the Culture of American Childhood, 1900-1980*, PhD Dissertation, University of Texas at Austin. For an analysis on how playfulness was mobilized in exhibitions in ambiguous ideological ways in the 1930s, see: Michael Tymkiw, "Den Körper spielerisch erkunden. Die Ausstellung 'Wunder des Lebens' in Berlin 1935 und ihr Nachleben," in: *"Erkenne Dich selbst!" Strategien der Sichtbarmachung des Körpers im 20. Jahrhundert*, ed. Sybilla Nikolow (Cologne: Böhlau, 2015), 318–340.

[73] Cummings, Carlos E. (1940), *East is East and West is West: Some Observations on the World's Fairs of 1939 by One Whose Main Interest is in Museums*, Buffalo, Buffalo Museum of Science, pp. 168-169.

[74] *Ibid.*, p. 163.

The fact is that during the politically conflictive decade of the 1930s, the New York Museum of Science and Industry directed this play instinct, by means of dynamic exhibits, towards popularizing a particular point of view on science, technology and the social relations around them: that science made jobs, that technology was an autonomous progressive historical force, or that privately-owned monopolies were the most efficient and only natural way of managing technical systems like the telephone network.

A nice example to illustrate the political performative dynamics of the apparently insignificant gesture of playfully pushing a button in the 1930s can be found in Westinghouse's promotional film "The Middleton Family", in which an average American family from Muncie, Indiana, visits the company's pavilion at the 1939 New York World's Fair.[75]

[Fig. 8. Still frame of *The Middleton Family*, 1939. Treadway (left) and Makaroff (right) argue in the presence of Babs while Bud plays with the operator's station of the conveyor belt of a continuous strip steel mill in the Hall of Power of the Westinghouse Pavilion at the New York World's Fair]

In the scene shown in Fig. 8, Jim Treadway (the one to the left) and Nikolas Makaroff (the one to the right) passionately argue about technological unemployment. Jim Treadway is the all-American guide of the Westinghouse pavilion and claims that science and automation –that is Westinghouse- create jobs. Nikolas Makaroff is a communist abstract painter of European origins who is dating Babs, the daughter of the Middletons (the one to the right). He claims that machines such as the conveyor belt of a continuous-

[75] The film can be found at: https://archive.org/details/middleton_family_worlds_fair_1939.

strip steel mill that the young Bud, the son of the Middletons, is manipulating are taking the jobs away. At that time, outside the Westinghouse pavilion, the conveyor belt was a contested object, the center of a political controversy about technological unemployment at the factory, the streets and the Capitol.[76] The film reproduces this debate in a simplified way according to Westinghouse's point of view. Each of the characters saw in the operator's station of the conveyor belt a different machine. Jim Treadway saw in it a force of progress and ultimately the creation of new jobs. Makaroff saw in it a diabolical device that embodied the contradictions of capitalism. Finally, for Bud Middleton, it was simply a toy.

During the discussion, Makaroff scornfully expresses his disdain of the visitors who are enjoying their visit, since for him "there is nothing funny about the tools of capitalism". And here, by linking politics and the new playful embodied practices of visiting built around pushbuttons, Westinghouse scriptwriters hit the point. It is actually the fun of pushing buttons and the charming personality of Jim Treadway what ultimately makes young Bud Middleton abandon his initial skepticism –the sales resistance- and accept Westinghouse's way of seeing science and the world –the product.

Participation and fun became a political tool of persuasion in world's fairs and museums of science and industry after a decade of psychological experimentation on the behaviour of mass audiences. By adopting the behavioural advertising approach of big science-based corporations, the New York Museum of Science and Industry set itself to promote the idea of a static political reality through the dynamism of its exhibits, to promote social passivity through a rhetorics of participation.

Conclusion: From Inventor Workshops to Consumer Playgrounds

Ainda não escrevi as conclusões, que vão resumir os conteúdos do texto e profundizar nas seguintes ideas:

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The changing politics of hands-on display at the NYMSI was related to changing views on science, technology and social control. From inventor workshops to consumer

[76] Bix, Amy (2000), *Inventing Ourselves Out of a Job? America's Debate over Technological Unemployment, 1929-1981*, Baltimore, Johns Hopkins University Press; London, Daniel Hart (2014), "Outside the World of Tomorrow: New York Labor and the Public Sphere in the 1939-1940 New York World's Fair", *Journal of Urban History*, pp. 1-17.

playgrounds. That is, from a focus on the economic role of ordinary inventors in improving the "useful arts", to the marriage of "science and industry" in corporate industrial laboratories. And from the liberal reform assumptions that understood social control as discipline and moral uplift to the behavioural management of public opinion and large audiences. The twentieth-century shift from the visual regimes of what Tony Bennett calls "civic seeing" towards new tactile regimes of "playful touching" is politically important and deserves further attention.