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Making fun of the atom: Humor and pleasant forms of anti-nuclear resistance in the Iberian Peninsula, 1974–1984

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Abstract

In the mid-1970s, the fascist-leaning dictatorships in Spain (1939–1977) and Portugal (1933–1974) fell. Closely linked to the 1973 oil crisis, debates over energy and technology policies became very prominent during the ensuing political redefinition of both countries. Two decades after the first international agreements between the Iberian regimes and the United States for the development of nuclear programs, a myriad of movements of social resistance to nuclear technology emerged in dialogue with anti-nuclear organizations in other European countries. Fun and playfulness have been used for top–down popularization and banalization of nuclear technologies since the 1950s, but here pleasant forms of resistance also played a central role in contesting national energy plans, expert discourses, and vested interests. This article explores what we call "anti-nuclear fun," the use of amusement, play, and humor as political and epistemic tools to familiarize society with the exceptional and daily risks of the "peaceful atom."

KEYWORDS

anti-nuclear movement, counter-culture, dissident experts, emotions of protest, Portugal, scientific ignorance, Spain

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1 | INTRODUCTION

In 1958, the traveling exhibition *Atoms for Peace* landed in Spain. The leaflets of the exhibition welcomed the "most brilliant promise of a happy life such as we could never imagine or enjoy."[1] In Madrid, Bilbao, and Barcelona visitors could have a good time while inspecting a true atomic pile from Oak Ridge National Laboratory, a CP-5 training reactor from the Argonne National Laboratory, a portable nuclear reactor "to produce energy in any place in the World," a prototype of a Cobalt bomb for radiotherapy treatments, Geiger counters, and uranium samples. In addition, there were models of a nuclear-fueled merchant vessel and the Shippingport nuclear power plant and a diorama of a cow with more than 800 colored lightbulbs illustrating the invisible path of radioisotopes from the grass all the way to the milk the cow produces.[2] The most impressive attraction, however, were the "Magic Hands," two mechanical arms used to handle radioactive materials in laboratories and power plants. The public could examine them and be amazed by several demonstrations. During the inauguration of the exhibition on May 19, a woman in a lab coat manipulated these arms to place a lit cigarette between the lips of a woman wearing white trousers and a tight-fitting white shirt in a vaguely futuristic atmosphere.[3] This was not the first time the "Magic Hands" were on display. Two years earlier, visitors of *The Peaceful Uses of Nuclear Energy* exhibition in Hiroshima—many of them survivors of the A-bomb—had been asked to use these same arms "to pick up a brush and write *heiwa* (peace) and *genshi ryoku* (nuclear energy)."[4]

This is just one example of how display and play were used to promote and banalize nuclear technologies in the Iberian Peninsula and beyond.[5] Following the official launch of the Atoms for Peace program in 1953, such strategies were part of the energy policies of the United States and most European governments, including the long-standing dictatorships leaning towards fascism in Portugal (1933–1974) and Spain (1939–1977). The opposite, however, is also true. Entertaining activities and amusement were used to contest nuclear objects, discourses, and policies, especially during the 1970s and 1980s. What role did they play? In which ways did emotions beyond awe and fear participate in the making or unmaking of nuclear landscapes? How was grassroots humor intertwined with nuclear fear? How were pleasant forms of anti-nuclear resistance produced, circulated, and appropriated? Can they be understood as an epistemological tool?

This article seeks to answer these questions by analyzing what we call "anti-nuclear fun": the modes of pleasure, enjoyment, and humor (whether sarcastic, ironic, absurd, naïve, or macabre) used by anti-nuclear groups and individuals to raise awareness of the dangers of nuclear technologies.[6] Often in direct dialogue with other far more serious means of activist politics, anti-nuclear fun became one way of spreading counter-discourses about scientific matters and sharing lay expertise as a kind of antidote to the banalization and legitimation of civil uses of uranium. Anti-nuclear cartoons, lyrics, or humorous magazines, among many other elements of anti-nuclear fun, played a significant role in epistemological struggles over nuclear energy and scientific authority while familiarizing society with the multiple layers of nuclear risk. In this sense, this article offers a counter-point to the other papers in this special issue that insightfully explore the historical use of displays, entertainment, and fun to render nuclear power banal in

[1]Translations of quotes into English are ours. Unless otherwise noted, the original quotes are in Spanish. U.S. Embassy (Madrid), [1958], *Átomos para la Paz* [leaflet], Càtedra Especial d'Enginyeria Nuclear Ferran Tallada (CEENFT), UI 00354, Archive of the Escola Tècnica Superior d'Enginyeria Industrial de Barcelona, Barcelona, Spain, hereafter ETSEIB Archive.

[2]U.S. General Consulate, Átomos para la Paz, Nov. 20, 1958, CEENFT, UI 00354, ETSEIB Archive; U.S. Foreign Service, Letter to Damian Aragonés, Jan. 12, 1959, CEENFT, UI 00354, ETSEIB Archive.

[3]See "Aplicaciones atómicas," in NO-DO, 1958. On official newsreels and discourses on nuclear medicine and energy in Spain and Portugal, see Medina-Doménech & Menéndez-Navarro, 2005; Schmidt, 2003.

[4]Tanaka, 2011; Zwigenberg, 2012, p. 13.

[5]Other examples in the following decades are: in the 1960s, the Spanish translation of a chapter of the comic "Bruno et Sophie au pays de l'atome" in *Correo de la UNESCO* (J. Castan & Commissariat à l'Énergie Atomique, 1968), the exhibition *A Ciência e a Técnica Atómica na URSS* (Atomic Science and Technology in the USSR) at the Lisbon International Fair in 1978 (organized with the support of the Embassy of the USSR), and the stickers and popularization materials "Nuclear Today, Solar Tomorrow" of the Asociación Española de la Industria Eléctrica (UNESA, Spanish Association of Electricity Industries) and the Fórum Atómico Español (FAE, Spanish Atomic Forum) during the 1980s.

[6]We do not use the term "fun" in the restricted sense of activities associated with mass production and consumer entertainment, which are characteristic of the "American fun" found in amusement parks like Coney Island. Other terms such as "amusement," "joy," "pleasure," "play," "joke," or "humor" are used throughout this article to categorize (and highlight different aspects) of anti-nuclear fun.

different contexts and by different means, such as agnotology, embodied practices of visiting, naturalization, nationalization, and domestication.[7]

Amusement and humor have been common ways of doing politics as well as popularizing the sciences for a long time.[8] But awareness of the horrific dangers these technologies could present gave anti-nuclear fun a particular (often extreme) shape, usually taking the form of dark, humorous feelings. Recent work provides good examples of how satire and irony were part of the tense (and often violent) history of anti-nuclear protest in Europe.[9] Yet, the role of fun in anti-nuclear protest has not been considered in detail. This is our goal here. Our aim is not to write a historical overview of anti-nuclear resistance in the Iberian Peninsula, but to focus on the entanglement of politics, technology, and fun in grassroots anti-nuclear movements.[10] In this sense, we want to bring the rich perspectives of "passionate politics" and "social movement emotions" to the field of the history of science and technology to explore the significance of emotion in the history of resistance to nuclear technologies.[11] Outstanding work by Helena Flam, Debra King, James M. Jasper, Jeff Goodwin, and Francesca Polletta shows that cognition and affect as well as macro- and micro-politics cannot be separated when studying social responses to science policies.[12]

This article focuses on the decade of the strongest anti-nuclear contestation, 1974–1984, in the Iberian Peninsula (which coincides with the period of the strongest resistance to nuclear power plants in Europe, for example, to those in Wyhl, Malville, Brokdorf or Plogoff). We have brought together examples *from* Portugal and Spain (the countries in the Iberian Peninsula apart from Andorra and the British territory of Gibraltar) and refrain from talking about the case *of* Spain or *of* Portugal (as if they were well-defined or definable cases) or writing an international comparative history of anti-nuclear movements. This decision reflects: the political history of these countries during the 20th century (in particular during the 1970s);[13] the (historiographical) need to think beyond nation-centered analytic frameworks;[14] and, last but not least, our aim to highlight the local and transnational character (and self-identity) of the anti-nuclear movement in the Iberian Peninsula. Like in other European contexts, many anti-nuclear activists in Spain and Portugal conceived their struggles in local terms and as transcending nation-state borders. Anti-nuclear networks, meetings, activities, maps, as well as the news sections of magazines often assumed an Iberian framework. Alongside anti-statist approaches (especially from the left-libertarian movement) and nationalist arguments (especially in Catalonia and the Basque Country in Spain), the nature of nuclear technologies and radioactive things also provided justification for considering a non-national approach. After all, some nuclear power plants and waste sites were expected to be located near borders (e.g., Almaraz and Aldeadávila), and the main transnational rivers that cross the peninsula were (or were to be) nuclearized (i.e., Tagus, Douro, and Guadiana).[15]

[7]On the concepts of "banal" and "banalization" in the history of nuclear technology and the social sciences, see the Introduction of this special issue, Sastre-Juan & Valentines-Álvarez, in press.

[8]Concerning science popularization, see, for instance, the overviews by Nieto-Galan, 2016 (especially pp. 52–80 and Chapter 3); Bowler, 2009 (especially pp. 34–38, 192–193. Humorous cartoons appear in Bowler's book when the popularization of atomic theories and technologies is discussed).

[9]See, for instance, Hecht, 1998, pp. 234–239; Tompkins, 2016, pp. 153–155, 190, 220. On entertainment, skepticism, and sarcasm in the nuclear arms race, see Augustine, 2012, pp. 87–88, 91; Boyer, 1985, pp. 18–19, 243–265; Szasz, 2012, pp. 96–98.

[10]More institutionalized groups and political parties involved in anti-nuclear debates have not been considered in this paper because their strategies rarely relied on emotions such as joy, pleasure, or humor. This is true, for instance, for the right-leaning green party in Portugal, the Partido Monárquico (Monarchist Party), which promoted both political conservatism and environmental conservationism and opposed the construction of large dams and nuclear power plants. See Nave, 2000, pp. 86–116; Pereira, Carvalho, and Fonseca, 2016, especially pp. 299–300.

[11]Emotions in social movements such as joy, pleasure, excitement, and mirth (and the laughter they can provoke) besides or in relation to fear, anxiety, shame, or anger have been discussed in Goodwin, Jasper & Polletta, 2001 (see, especially, Barker, 2001) and Flam & King, 2005 (see, especially, Flam & Kleres, 2015; Wettergren, 2005).

[12]On the social and cultural construction of emotions of protest (and on how more constructed and cognitively processed emotions can be the most relevant to politics), see, for example, Goodwin, Jasper, & Polletta, 2001, especially pp. 6–22.

[13]For a discussion of the usefulness of the Iberian Peninsula as a historiographical framework, see González-Fernández, 2015.

[14]For an overview on transnational history of technology, see Vleuten, 2008. Specifically on nuclear technologies and protest in a transnational perspective, see Kirchhof & Meyer, 2014.

[15]On the interest and limitations of international comparative history of anti-nuclear movements (and their impact on nation-state energy planning), see Nelkin & Pollak, 1981; Rucht, 1995. For a comparative analysis of narratives and images (especially those of press agencies) of nuclear technologies (especially weapons) in earlier decades, see van Lente, 2012. We are aware, however, that other transnational or trans-urban frames (e.g., Catalonia–France or Barcelona–Lyon) may also be useful for exploring our epistemological arguments.

The next section of this article briefly introduces the political and nuclear contexts in Spain and Portugal during the 1970s and 1980s, paying special attention to the rise of counter-culture and anti-nuclear movements. The following four sections explore the concept of "anti-nuclear fun" and to what extent it served to "de-banalize" nuclear technologies. In order, the sections deal with the form and production, the circulation, the content, and epistemological role of anti-nuclear fun. After the concluding remarks, a Note on Sources describes the diverse materials we immersed ourselves in, ranging from underground magazines and street posters to stickers and other sources that are usually overlooked in the history of science and technology. We are acutely aware that amusement and humor are rooted in specific socio-cultural contexts and that it can be difficult to translate (verbal and visual) humor into other languages and media (here, into English and by means of an academic text with a limited number of figures).[16] We have selected the best examples from a large compilation of material in order to illustrate our points and help the reader to understand (and feel) anti-nuclear fun—and perhaps smile or even laugh from time to time.

2 | THE CONTEXT: POLITICS AND NUCLEAR ENERGY

During the mid-1950s, international agreements between the United States and the governments of Portugal and Spain for the development of national nuclear programs prompted the establishment of the respective national Nuclear Energy Boards. This was followed by the installation of the first experimental reactors in Madrid in 1956 and Sacavém (Lisbon) in 1961 and the construction of the first commercial nuclear power plant in the Iberian Peninsula (Zorita, Spain), which came into operation in 1968.[17] At that time, two more nuclear power plants were under construction in Spain (Garoña and Vandellós I), and Portuguese authorities commissioned reports to decide the final location of the country's own power plant (in Ferrel). From the beginning of the 1970s (and especially after the 1973 oil crisis), the two Iberian dictatorships, with the support of the main electricity companies and associations of industrialists, promoted ambitious new energy plans to ensure (and encourage) industrial growth and electricity consumption. Nuclear energy played a key role in these programs, particularly in Spain. As many as 36 second- and third-generation nuclear reactors were planned, and some regions, such as the Basque Country, Catalonia, Aragón, and Extremadura, were to host several.[18]

The Carnation Revolution in Portugal (April 1974) and the death of Spanish dictator Francisco Franco (November 1975) gave rise to many hopes and political projects, only comparable in extent to the time around the proclamations of the Portuguese and Spanish republics (in 1910 and 1931). In the context of the international oil crisis, old utopias and new models of society seemed to be achievable after four decades of constant physical and cultural repression and, associated with these ideals, a number of debates on science, technology, and energy development emerged in the streets, publications, universities, and parliaments.[19] Nuclear programs occupied a prominent place in these debates, among other reasons because they were seen as direct legacies of "electro-fascist" policies as well as the final "landing" in the Iberian Peninsula of the U.S. capitalist economy led by Westinghouse and General Electric.[20] During this politically volatile period in both countries, ecological and anti-nuclear resistance contributed to the rise of new social movements and overlapped with feminism, the gay liberation movement, student protests, radical pacifism, the anti-NATO mobilization, and left-libertarian rebirth.[21] Engaged journalists and engineers also supported this

[16]The activities and objects of anti-nuclear fun did not (and do not) excite and produce happiness in everyone. However, the depiction of apocalyptic post-nuclear landscapes in newspaper cartoons or punk music could make (frightened or concerned) people laugh or dance. On visuals and emotions, see Flam & Doerr, 2015.

[17]Gaspar, 2011; Herran & Roqué, 2012; Ordóñez & Sánchez Ron, 1996; Pereira, Fonseca, & Carvalho, 2018; Rubio & Torre, 2017.

[18]Rubio & Torre, 2017, pp. 250–254.

[19]Books on ecology, energy, and technology experienced a publishing boom at the time, and Ivan Illich, Murray Bookchin, André Gorz, and other authors were quickly translated into Spanish and Portuguese.

[20]The concept "electro-fascism" was also used by other anti-nuclear movements in Europe (in particular in France following writings by André Gorz/Michel Bosquet in *Le Sauvage* in 1975). However, the concept had a deeper dimension in Spain and Portugal due to the political history of both countries. CANC contra el electrofascismo, 1977, *Ajoblanco*, no. 22, p. 16; M. Gaviria, 1979, Del agua al átomo. Ideología y decadencia del electrofranquismo, *Alfalfa*, Issue: "La Cara Oculta de la Energía," pp. 6–11. See also Pereira, Carvalho, & Fonseca, 2018, especially pp. 513–514.

[21]Barca & Delicado, 2016, especially pp. 519–520; Carmona, 2012, pp. 448–478; Macaya, 2019; Madeira, 2016; Ordás García, 2015, pp. 408–438.

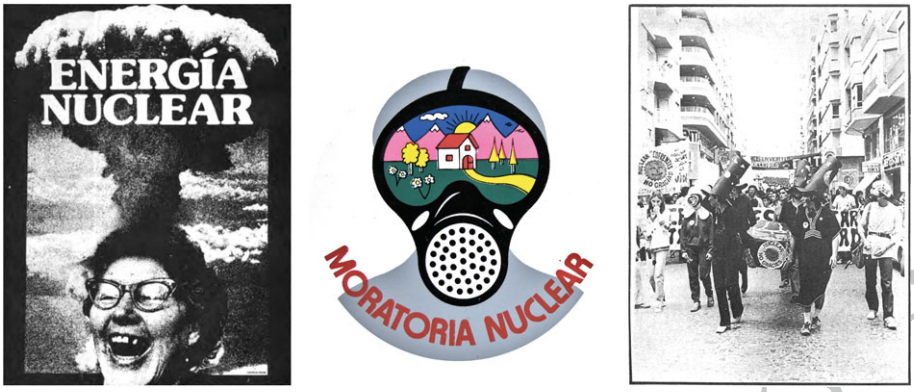

FIGURE 1 Dark, humorous feelings and joyful utopian landscapes within the anti-nuclear movement. Left: *Alfalfa*, 1979, Issue: "La Cara Oculta de la Energía," p. 26. Biblioteca de Catalunya (Barcelona); Center: Moratoria nuclear, ca. 1979, Stickers. 1204 (C), 550 (P), Ad1204, CRAI Pavelló de la República, Universitat de Barcelona; Right: *Bicicleta*, 1978, no. 22, p. 32. Biblioteca de Catalunya (Barcelona)

political wave and devoted journalistic investigations, research, and spare time to the popularization of nuclear physics and informing people about the health hazards of radioactivity.[22]

Although there had been information campaigns, publications, and legal allegations of administrative irregularities by groups of neighbors, priests, and the local governments of towns near planned nuclear power plants in the early 1970s, fierce anti-nuclear resistance erupted during and after the collapse of the dictatorships.[23] Just weeks after the Carnation Revolution, the Movimento Ecológico Português (Portuguese Ecological Movement, MEP) was created in Lisbon. At its first general meeting, the group proposed a campaign for a nuclear moratorium and called for public debate before the start of works on the nuclear power plant in Ferrel. Other local groups soon formed, in particular the Grupo Autónomo de Intervenção Ecológica do Porto (GAIEP), which started an active editorial project and participated in the first National Meeting on Energy Policy, organized by the main Portuguese association of engineers, in November 1975.[24] In Spain, more than 60 organizations from across the country convened at the School of Forestry Engineers in Cercedilla (Madrid) in 1977 with the aim of creating a federation of ecological movements. Groups of ecologists, neighbors, and workers established after Franco's death held meetings with reinvigorated engineering, academic, and student associations. After lengthy discussions, owing to the diverse backgrounds of participants (albeit mainly left-wing), only one unanimous agreement was reached: to launch a campaign against nuclear policies at the state level, which soon became a vast movement in support of a nuclear moratorium (Figure 1, center). It did not take long for cross-border networks to be created, for example to oppose to uranium mining programs.[25]

The practices of resistance of anti-nuclear movements took many forms all across the Iberian Peninsula. The case of the nuclear power plant in Lemoiz in the Basque Country illustrates the repertoire of anti-nuclear collective action:[26] a signature collection campaign reached 150,000 signatures; leaflets, pamphlets, and articles were published; local governments made complaints against licenses; neighbors marched; fishermen and farmers issued pleas; intellectuals and

[22]On the remarkable cases of Afonso Cautela, Delgado Domingos, Santiago Vilanova, and Josep Puig, see Barca & Delicado, 2016, especially pp. 506–507, 514–517; Cabré, Carbonell, Puig & Vilanova, 1981; Pereira et al., 2018, pp. 514–515, 524. On the (changing) role of engaged experts and counter-expertise in France, see Topçu, 2006, 2013.

[23]In Spain, lawyers, engineers, and sociologists started to spread criticism of nuclear energy during the final years of the dictatorship. This was achieved through associations of ecologists and independent magazines, such as the Asociación Española para la Ordenación del Medio Ambiente (following the Benidorm Manifesto of 1974) and *Triunfo* ([1962]–1982). In addition, local actors played a key role in the birth of the Spanish anti-nuclear movement at the time. In Portugal, since there were no nuclear power plants nor public announcements regarding construction, until the fall of the dictatorship, opposition to nuclear technologies focused on the non-proliferation of nuclear weapons. Accornero, 2009, pp. 45–63; Garcia, 2008; López Romo & Lanero Táboas, 2001, especially p. 751.

[24]Madeira, 2016, pp. 59–63.

[25]For a case study on cross-border exchange in protest against uranium mining, see Kirchhof, 2014.

[26]On the theorization of repertoires of collective action and social movement repertoires, see Tilly, 1978; 2006, pp. 179–208, 51–55.

professional associations signed manifestos; there were hunger strikes, general strikes, and strikes by the workers of the nuclear plant; dockworkers refused to unload nuclear materials; roads were blockaded; public buildings and churches were occupied; protests took the form of reductions in electricity consumption and objections to paying electricity bills; there was direct action against property, sabotage; and so on. Three workers and two chief engineers of the nuclear power plant were killed in violent action by armed group ETA.[27] But, of course, there was also an extraordinary showing of peaceful demonstrations, carnivalesque parades, folklore dances, bicycle rides, music festivals, plays for children, as well as lots of other amusement to contest nuclear programs. Only one month after the Three Mile Island accident in Harrisburg, PA (March 1979), 100,000 people gathered in the streets of Bilbao and shouted the transnational motto, "Más vale hoy activos que mañana radioactivos" (Better active today than radioactive tomorrow). When it started raining, the crowd changed their chant to "Más vale hoy mojarse que mañana atomizarse" (Better to be wet today than to be atomized tomorrow). In other Iberian demonstrations, protesters staged a lively "funeral of the deceased atom" in the form of a street march (Figure 1, right), wore masks or fancy dresses representing skeletons that startled casual observers, carried enormous puppets of smiling suns or mutant flies, or showed banners with humorous messages such as "Tired of living? Say 'yes' to nuclear energy," or "Let's change nuclear energy for sexual energy."[28]

Across Europe and the United States, anti-nuclear fun was part and parcel of anti-nuclear resistance, often amidst a harsh escalation of social tension. The *Clown Atomique*, for example, was on tour "against Malville" through all of France, and tongue-in-cheek Cold War cartoons by Ron Cobb traveled the world.[29] The fact that the most successful icon of these struggles was a smiling sun and not an atomic mushroom is significant. Like in other countries, grassroots movements in the Iberian Peninsula understood pleasure and humor as important ways of doing politics. With but a brief delay relative to countries such as France, the spirit of May 1968, ideas of the New Left, and counter cultures boomed after the fall of the dictators and influenced anti-nuclear activists, especially younger ones (Figure 1, left).[30] As we will see, amusement helped to spread critiques of nuclear policies as well as the technocratic, capitalist, and patriarchal model of society they were taken to imply. At the same time, anti-nuclear fun was used to promote alternative ways of living based on energy saving, disarmament, self-management, and those "free energies" derived from the sun, wind, tidal forces, or anaerobic biogas production. As anti-nuclear activist Evelio Gómez observed, after some 40 years of repression of body and mind by regimes of the far right, many people wanted to know about everything, explore new ways of living, and—above all—have a great time.[31]

3 | THE FORM AND THE MAKING: THIN THINGS IN EVERYDAY SPACES

Pins and stickers, cartoons and posters, board games and comics of both pro- and anti-nuclear fun can be understood as "thin things" that are as much a part of the history of nuclear technology as the more studied "thick things," such as nuclear bombs and reactors.[32] These mundane objects and practices allowed nuclear technologies to be ever present, in the same way, as Michael Billig notes, as flags, songs, images, sports, or small words like "we" make nationalism banal.[33] There was an essential difference, however.[34] Whereas pro-nuclear fun could act as an "unmindful

[27]Fernández Soldevilla & López Romo, 2012, pp. 243–254; Lemoiz, 1972. On the co existence of non-violent and violent action in other contexts, see Tompkins, 2016, pp. 147–195.

[28]*Bicicleta*, 1978, no. 22, p. 32; *Bicicleta*, 1980, no. 33, p. 19; *Margarida i altres herbes*, 1977, no. 2, pp. 7–8; Garcia, 2008, p. 96.

[29]*La Gueule Ouverte*, 1977, no. 186, pp. 2–3.

[30]The importance of joy in counter cultural politics was highlighted in influential contemporary works such as Cohn-Bendit & Cohn-Bendit, 1969, especially p. 112; Roszak, 1969, especially p. 229. Well-known ecologist Alfonso del Val stated in 1978: "In their meetings, [ecologists] must go for discussing, joking, partying, making alternatives based on the unheard but possible things that others couldn't even imagine" (*Alfalfa*, 1978, no. 8, p. 6).

[31]Interview with Evelio Gómez, January 2018.

[32]The concept of "thick thing"—which is not incompatible with material/spatial thinness—has been proposed by Ken Alder in Alder, 2007.

[33]Billig, 1995.

[34]Although we have mentioned some examples in a previous footnote, an in-depth study of pro-nuclear fun (and its dialogue with anti-nuclear fun) in Spain and Portugal is beyond the scope of this paper. The aforementioned Spanish stickers "Nuclear today, Solar Tomorrow" from the 1980s are one example of this dialogue. They depict a smiling sun with a red nose shaking hands with a smiling atom—a clear reaction to the pervasive anti-nuclear smiling sun (on pro-nuclear strategies by the FAE, see Sánchez-Vázquez & Menéndez-Navarro, 2015). We have not encountered examples of direct reactions in the opposite direction.

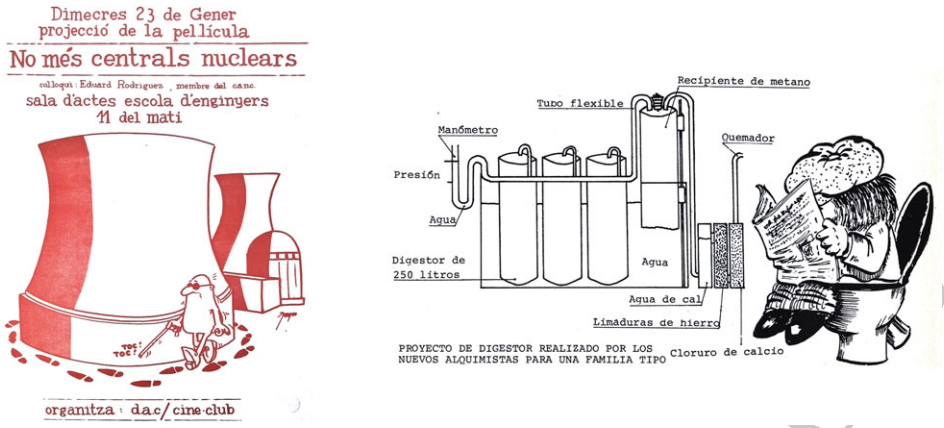

FIGURE 2 Everyday spaces and activities of anti-nuclear fun. Left: Cine-Club Enginyers, "No més centrals nuclears," [1980], Posters, 2204 (C), CRAI Pavelló de la República, Universitat de Barcelona; Right: The weird man, by Evelio, and a biogas project, by the U.S. "New Alchemists," in *Ajoblanco*, 1977, Special Issue "Energías Libres," p. 64. Biblioteca de Catalunya (Barcelona)

reminder" of envisaged prosperous nationhoods or—one might say—"nuclearhoods," the aim of anti-nuclear fun was the opposite: to act as a "mindful reminder" that nuclear technology was neither natural, benign, innocent, nor harmless.[35]

By virtue of their small size and trivial or ephemeral nature, "thin things" allowed anti-nuclear debates to reach more contexts than articles by lay experts, scientific reports, heavy tomes, or tedious conferences. In other words, anti-nuclear fun allowed the points and questions raised in anti-nuclear articles, reports, books, and conferences to circulate widely, for example in the street, in the pub, in schools, at work, or at home. In the street, graffiti on walls, posters on phone booths, stickers on notebooks, and badges on jackets warned and informed the public about national nuclear programs and private vested interests. LPs and cassettes playing in pubs described the catastrophic scenarios to be expected after a nuclear meltdown or roughly explained how radioactivity can spread through a rainout. At the time, a wide range of bands and musicians composed anti-nuclear lyrics, from hard rock (such as Leño), punk (Residuos Nucleares), feminist punk (Las Vulpes), heavy (Barón Rojo), rock (Miguel Rios), folk (Al Tall), and protest songs (Pedro Barroso) to the eschatological (and scatological) vaudeville of the popular La Trinca trio.[36] In schools and in universities, staff and student associations organized local exhibitions. Further, film clubs such as the *Cine-Club* of the Barcelona School of Industrial Engineering showed international films about nuclear struggles, radioactive waste, and dystopian landscapes (Figure 2, left). In workplaces, "ecological calendars" on desks or in factory lockers provided reminders of family birthdays as well as nuclear anniversaries.[37] In homes, sarcastic cartoons in ecological magazines could make the reader on a sofa roar with laughter, and at night the whole family could play board games, such as adaptations of the Game of the Goose or Chutes and Ladders (in which, if landing on square 112, one was sent back to the hospital square "for those big mussels that you ate near Vandellós nuclear plant").[38] In the bedroom, "The plumber of the power plant" (in Catalan) and other poems by Teresa Rebull were read before the lights were switched off, and "ecological tales" collected through a children's story contest helped

[35]"Banal nationalism," "unmindful reminders," and the associated adjectives "natural," "benign," "innocent," and "harmless" have been borrowed from Michael Billig, 1995, pp. 6–7, 16–17 and 58.

[36]We specifically refer to the songs "Este Madrid," Leño, 1978, "Lemoniz," and "38 años," Residuos Radioactivos, ca. 1983, "Central nuclear," Las Vulpes, 1983, "Hiroshima," Barón Rojo, 1983, "Antinuclear," Miguel Ríos, 1983, with reminiscences of "No-Nukes" concert at Madison Square Garden in 1979), "Nuclears? No, gràcies," Al Tall, 1979, "Em Ferrel," Pedro Barroso, 1979, and "Mama caca," La Trinca, 1983. Other popular singers and bands were part of the line-up at anti-nuclear festivals, such as Pau Riba, Santi Arisa, Elèctrica Dharma, Orquestra Plateria, Aute and flamenco *cantaor* Camarón de la Isla. On the role of music in anti-nuclear movements in other European regions, see Eyerman & Jamison, 1998, pp. 140–160.

[37]*Pela Vida*, 1978, no. 4, p. 2; *A Urtiga*, 1980, no. 9.

[38]*El Ecologista*, 1980, *2*(8–9), pp. 42–43.

to lull daughters and sons to sleep.[39] Even in the bathroom, zines, leaflets, and comics with ugly anti-nuclear anti-heroes such as Gustavo were available for "toilet reading" (Figure 2, right).[40]

The presence of anti-nuclear fun in daily life, from public spaces to the most private spheres, not only stemmed from its materiality, but also from how it was made. In contrast to the mainly centralized and top-down production of pro-nuclear fun, the making of anti-nuclear fun was atomized and bottom-up (or bottom-to-bottom). It was created through self-organized, unpaid, and do-it-yourself (DIY) practices typical of grassroots movements and counter-cultural editorial projects.[41] The issue "Energías Libres" (1977), for instance, was published by the widely read counter-cultural magazine *Ajoblanco* and became a reference point for ecological groups in Spain and Portugal. Young activists used their editing, formatting, writing, and drawing skills—acquired in schools of art and design or while making underground comics—assisted by old IBM typewriters, photocopiers, Indian ink, scissors, and glue. In the resulting 68-page publication, a strange bearded man with a flat cap presents graphics, tables, technical designs, and blueprints about alternative technologies in amusing scenes. For example, he uses a magnifying glass to light a cigarette; he reads about the transformation of biomass into biogas while sitting on the toilet (Figure 2, right); or he flips the bird to a scarecrow in a top hat representing—the reader is informed—those technocrats who "assume the right to be our legal guardians" and design technology that is contrary to "human happiness and fulfilment."[42]

Anti-nuclear joy and entertainment was spread by self-funded and collaborative associations, ranging from amateur theatre companies in rural villages and neighborhood organizations in big cities to regional and trans-regional networks. This diversity is illustrated by the posters of anti-nuclear festivals in Catalonia. For example, a neighborhood association in Poble-sec in Barcelona celebrated the Jornades de Reflexió, Gresca i Acció (Days of Reflection, Fiesta and Action) in 1978. The local anti-nuclear group of Seva (a small town near Barcelona) organized a Great Confetti Dance Party with the band Explosion in 1979. That same year, the Comitè Antinuclear de Catalunya (Anti-Nuclear Committee of Catalonia, or CANC) organized the International Day against Nuclear Energy in Barcelona, an occasion for one of the biggest demonstrations in Europe as well as many other activities such as dance, theatre, exhibitions, book stands, films, live music, puppets, and children's entertainment by popular folk-singer Xesco Boix. Even though the night program of activities at this international event in Catalonia was suspended in solidarity with Basque anti-nuclear activists following the news that a protester, Gladys del Estal, had been killed by police during a demonstration, anti-nuclear fun carried on at subsequent meetings.[43]

Self-funded anti-nuclear fun also helped to finance anti-nuclear organizations and their activities. Many posters, postcards, envelopes, calendars, pins, reflective stickers for bikes, and other anti-nuclear "merchandise" economically supported these movements. For instance, the ecological groups of Porto, Coimbra, Caldas da Rainha, Pernes, Lisbon, and Lagos organized a design contest (with symbolic prizes for the winners) with the aim of making and selling posters, stickers, and other items to cover the costs of what became the biggest anti-nuclear event in Portugal: the three-day Festival pela Vida, Contra o Nuclear (Festival for Life, Against the Nuclear) in Caldas da Rainha in February 1978. Some of the most popularly acclaimed and politically engaged singers in Portugal performed at the festival for free, including Sérgio Godinho, Fausto, Vitorino, and even Zeca Afonso, the composer of the iconic song "Grândola, Vila Morena," which had been used to signal the start of the Carnation Revolution.[44]

Ends and means were inseparable, and the making of anti-nuclear fun was usually itself enjoyable. Even activities that one might expect to be tedious and boring were organized so as to be enjoyable, to "move" the movement, and

[39] *Userda*, 1977, Special Issue: "DDT," p. 8; *Mostra-recull*, 1983.

[40] Gustavo and other characters by cartoonist Max appeared in the monthly underground magazine *El Víbora*, which sold hundreds of thousands of copies each month in the early 1980s. Max, 1981; *Butifarra!*, 1977, Special Issue: "La Alternativa Ecológica," pp. 6–8 (in collaboration with *BIEN* and *Userda* editors). On anti-nuclear underground "comix" in the United States, see Szasz, 2012, pp. 89–114.

[41] DIY technology and play in grassroots movements in the 1970s and 1980s are still under-researched topics. For an overview in other contexts, see Pursell, 2015.

[42] *Ajoblanco*, 1977, Special issue: "Energías Libres," p. 10.

[43] In the Basque Country, an anti-nuclear celebration was organized in Erandio only days after the death of Gladys del Estal, and, in the following years, anti-nuclear children's parties were organized in the eponymous Gladys Park in Donostia (San Sebastián). *BIEN*, 1979, no. 6, pp. 5–6.

[44] Extensive accounts of this festival were published in ecological magazines such as *A Urtiga* (1978, no. 1).

were based—according to participants—on the "reciprocal emotions" of conviviality, solidarity, and friendship.[45] For instance, the crystalline waters of the beaches in Agua do Seixo attracted attendees to summer camps organized by MEP and the Lisbon Anti-nuclear Committee. Around the same time, the collective adventure of cycling hundreds of kilometers—from Perpignan in France towards the site of the planned nuclear plant in Ascó in Southern Catalonia—encouraged many to participate in a tiring information campaign to tell remote towns about the consequences of uranium mines, power plants, and nuclear waste transportation.[46] Amusement did not lessen the perceived gravity of nuclear policies, nor diminish the importance of challenging them. Maybe for this reason organizers sometimes reminded potential participants that they were not there solely for fun, nor just for a holiday.[47]

4 | THE NETWORKS: THE CIRCULATION OF RESISTANCE TO TECHNOLOGY

Iberian anti-nuclear fun was part of transnational anti-nuclear fun as much as the Iberian anti-nuclear movement was part of a transnational anti-nuclear movement.[48] Alongside news, technical documentation, and ecological magazines, anti-nuclear humor, songs, and comics circulated freely across borders. This network was maintained through collective and personal contacts, meetings, publications, and trips to France, Denmark, and other European countries to obtain films, fanzines, and direct information. José Carlos Marques, one of the main activists behind GAIEP, recalls that his exile in France allowed him to be in touch with counter cultural and humorous ecological magazines, such as *Hara-Kiri Hebdo* (the forerunner of *Charlie Hebdo*).[49] In addition to direct contact, Iberian ecological groups maintained a more or less close relationship, continuous correspondence, and exchange of publications with several groups abroad, for example in Switzerland, Italy, the United States, and Japan.

Much of the "foreign fun" was simply copied and translated.[50] Other material, by contrast, was "appropriated" with major changes and adaptations for local contexts (as we will see in the next section with the Asterix comics). Covers of *Userda* (1981) as well as other magazines featured Pierre Brauchli's *Babylon Heute* (1979), in which the cooling tower of a nuclear power plant morphs into Bruegel's *Tower of Babel*. Anti-nuclear publications often contained humor copied from elsewhere: the comic "Superman in Ascó" in issue 10 of CANC's journal *BIEN* and the cartoon "Switch to the Sun. No Nuclear Nower" in issue 2 of MEP's journal *Frente Ecológica*, for example, were directly "transferred" from numbers 262 and 54 of French magazine *La Gueule Ouverte* (1972–1980). The uninhibited and jocund style of *La Gueule Ouverte*, which opposed the Super-Phénix reactor in Malville, was a model for Iberian ecological magazines, in particular for a group known as TARA and its editorial child *Alfalfa*.[51]

TARA (the Spanish acronym of Self-managed Radical Alternative Technologies) was formed by a group of friends who lived in the Balearic Islands, at the time an international haven for hippy communes. One by one, young scientists and lay men and women (in the process of becoming lay experts) joined the project. TARA was publicly launched during the ground-breaking International Week of Ecological Solidarity celebrated in Ibiza in June 1977. One month later, it participated in the International Anarchist Days in Barcelona (Jornades Llibertàries Internacionals), which mainly took place in Gaudí's Park Güell. TARA was in charge of the debate on ecology and energy and presented the results of its technological projects. The nearly half a million visitors of the Days had the chance to see—probably for

[45] See chapters by Ron Eyerman, Erika Summers-Effler, and Silke Roth in Flam & King, 2005; Goodwin, Jasper, & Polletta, 2001, Pt. Four.

[46] A human chain between Ascó and Vandellós was organized some years later. The punk fanzine *NDF* (1985, 7, s.p.) wrote cynically: "The action was carried out and it was quite funny, even though you didn't show up because you were getting drunk within the four walls of any bar."

[47] *Pela Vida*, 1980, no. 20, p. 1.

[48] See, for example Kirchhof & Meyer, 2014; Tompkins, 2016, especially pp. 67–111.

[49] Fagundes & Nunes, 2017, pp. 16–17 (interview with José Carlos Marques).

[50] As many contributions were by anonymous or unknown authors, finding the original sources is often difficult. Signatures under or the language of untranslated contributions imply that much of the "fun" material was of foreign origin. But even when the author and the original source can be found or inferred, it is difficult to fully reconstruct the paths of these materials. Oral testimony has helped us to reconstruct some of these paths.

[51] Tompkins, 2016; Vrignon, 2015.

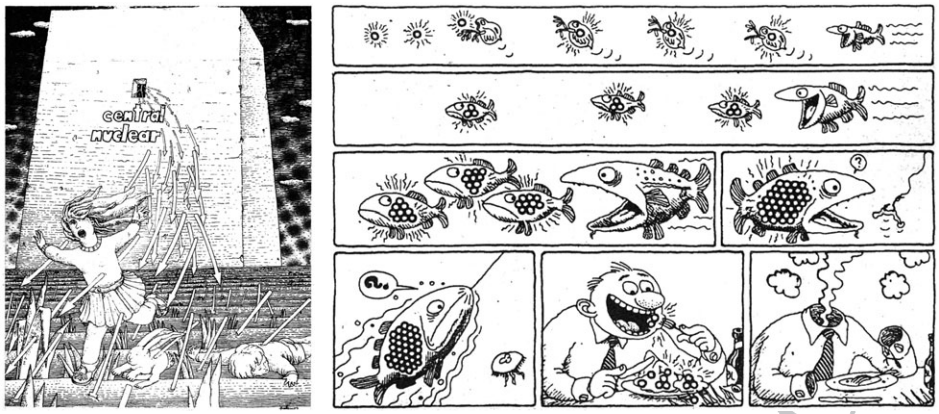

FIGURE 3 Transnational anti-nuclear fun in *Alfalfa* magazine. Left: *Alfalfa*, 1978, 4, p. 29; Right: *Alfalfa*, 1977, 2, p. 27. Biblioteca de Catalunya (Barcelona)

the first time—a solar panel, a geodesic dome, and a windmill that supplied electricity to the dome.[52] Shortly after, TARA started to publish the magazine *Alfalfa*. The scope and objectives of the journal were influenced by travels and contacts with ecological activists from the peninsula and abroad, especially France. The editorial office in Boqueria street (in Barcelona's old town) became a meeting point for ecological activists, gay activists, conscientious objectors, and counter-cultural artists, and it regularly received a large number of ecological publications. These included *La Gueule Ouverte*, *Écologie*, *Le Sauvage*, *Apre-Hebdo*, and *La Baleine* from France; *Undercurrents*, *Resurgence*, *The Ecologist*, and *Practical Self-Sufficiency* from the U.K.; *Science for the People*, *Not Man Apart*, *Mother Earth News*, and *WISE* from the United States; and *Viver e Preciso* from Portugal. On the office shelves, one could also find old illustrations that had been bought in the second-hand markets, a humor book by Ron Cobb, and design books with circus acrobats and paper dolls from 19th-century publications.

Many of these publications served as direct sources for a biting and funny magazine, even though translations of texts, comics, and cartoons might not always have done justice to the hilarity of the sources. For example, issue 2 of *Alfalfa* borrowed a comic strip by Danish vignettist Claus Deleuran from issue 19 of *Undercurrents*, which offered a macabre explanation of the accumulation of radioactivity in the trophic chain (Figure 3, right). Further inspiration was drawn from *La Gueule Ouverte*: small scenes, awkward animals, silhouettes, and surreal drawings borrowed from the French magazine freshened up the issues of *Alfalfa* alongside comical anti-nuclear cartoons by regular contributors such as Philippe Petit-Roulet (known for his big-nosed characters) and Jean Caillon (known for his crazy rabbits on bikes) (Figure 3, left).[53] Yet, *Alfalfa* could also count on the collaboration of anonymous designers and well-known local draughtspersons (in particular Mariscal, who later came to international attention for designing the official mascot of the 1992 Barcelona Olympics). In turn, sometimes their works for *Alfalfa* illustrated the pages of *La Gueule Ouverte* and other magazines such as *Alternativa* from Porto.[54]

Anti-nuclear fun was not limited to the circulation of materials, but also entailed the appropriation of transnational counter cultural forms, languages, and aesthetics. An issue of *Alfalfa* might begin with a collage of a colorful van Gogh painting superimposed on dark industrial silhouettes and end with a fake postcard of Gaudí's Sagrada Família with wind turbines at the top of its towers. Graphics, tables, and scientific data were adorned with funny figurines, awkward motives, and clippings from newspapers. A brief article entitled "Nuclear Security" was introduced

[52]Carmona, 2012, p. 174; Zambrana, 2000, p. 143. See also the journal of the International Anarchist Days, *Barcelona Libertaria*, and *Ajoblanco*, 1977, no. 25, p. 38.

[53]Cf., for instance, nos. 51, 183, 189, 199, 225 of *La Gueule Ouverte* with nos. 4, p. 29; 8–10, p. 55; 8–10, p. 71; 2, p. 27; 8–10, p. 82 of *Alfalfa*.

[54]To take one example, a drawing by Picanyol in *Alfalfa* (1977, no. 1, p. 12) of Death "tagging" a wall with a scythe to read "Ecology, no!" also found its way into *Alternativa* (1978, no. 4, Issue: "Especial Nuclear", p. 13).

by the picture of a smug male body builder, and the international nuclear news section was presented by Harpo Marx. From the outset, the editors of *Alfalfa* were mindful not to turn the magazine into a nuclear apocalyptic cemetery overcrowded with crosses and skulls.

Finally, before discussing its content, we would like to comment on another dimension of the circulation of anti-nuclear fun, namely, the making of "soft," "free," and "autonomous" technologies as alternatives to nuclear energy. "It is possible to live life enjoying the construction of a [new] world," TARA counseled in their first publication.[55] In nearly all issues of *Alfalfa*, TARA devoted several pages to instructions and technical drawings for assembling kits such as solar ovens and fridges, thermal collectors, methane anaerobic digesters, and turbine blades. Many of the instructions and figures were translated or directly copied from French and English publications (such as the magazines *Écologie* and *Undercurrents* and the books *La Face cachée du soleil* and *Radical Technology*). Other designs were improved—both in terms of cost efficiency and environmentally—after crafty TARA members had tested them in Ibiza, in Barcelona, or in the collective project La Granja Autònoma (Autonomous Farm) in the countryside. *Alfalfa* thrived on collaboration with some of Spain's most renowned environmental thinkers, nuclear policy specialists, and pacifists (such as Mario Gaviria, Pedro Costa Morata, and Vicens Fisas) and could rely on the help of engaged science students and young professionals with left-wing convictions, who were critical of the promotion of nuclear energy by the Communist Party (such as Jaume Serrasolses, a biologist, and Joaquim Corominas, an engineer trained at Berkeley, the campuses of which were a hotbed of Californian counter culture and international scientific dissidence).[56] *Alfalfa* also encouraged readers to try to construct these gadgets and share their own technical changes and improvements with the journal. Publishing a counter-cultural magazine, promoting an anti-nuclear information campaign, or building a DIY solar oven could be enjoyable and fulfilling activities.

5 | THE CONTENT: EVERYDAY FUN VERSUS DAILY RISKS

But what lay behind the objects and activities of anti-nuclear fun? Which discourses did they embody? Beyond fun, what did they spread? Undoubtedly, fun spread fear. The "extreme imagery" of worst-case nuclear scenarios was not absent from contestations of the atom in anti-nuclear fun. Images of mushroom clouds, explosions and gas masks, skulls and skeletons, mutant animals and sick children, and apocalyptic desert landscapes pervaded anti-nuclear performances, popular lyrics, artworks, and counter-cultural collages in the Iberian Peninsula just as they did in the United States and other contexts, as Spencer Weart has pointed out.[57] However, contrary to Weart's analysis, it seems anti-nuclear fear was in the main not an irrational emotion borne out of popular misinterpretations of experts' reports and data. In fact, nuclear fear was generally a well-founded social reaction. In the year of the Chernobyl accident (1986), philosopher Günther Anders similarly argued, "We have been accused of 'sowing panic' by those who still consider [Klemens von] Metternich's old slogan to be valid: 'The first duty of the citizen is to remain calm.' Yes, it is true, we are sowing panic, we even make a profession of it. For anyone who thinks that the danger resides in the panic rather than in the danger against which we are trying to warn those who are afraid of being afraid, this distorts the truth and deliberately blinds his/her fellows."[58] Anti-nuclear fun was often scary, attentive to the need to be scared, and dramatized the hidden threats that justified feelings of panic and anxiety. In the year of the Harrisburg accident (1979), the folk band La Bullonera released the song "El verrugón atómico" (The Atomic Wart) which animated people to dance to the sound of traditional instruments, and the following lyrics: "¡Qué buenas son las multinacionales, porque nos traen centrales nucleares! No hay que temer: el miedo es 'inorancia,' dicen los sabios que

[55] *Ajoblanco*, 1977, Special Issue: "Energías Libres," p. 5.

[56] In the early 1980s, Corominas and Serrasolses were behind the creation of the cooperatives Ecotècnia (in 1981) and Trama Tecnoambiental (in 1982), which became global reference points in the fields of wind and solar energy, respectively. For an international contextualization of grassroots engineering activities, alternative technologies, and "green business," see Jamison, 2004.

[57] Weart, 1988. Jeff Hughes, 2012, pp. 498–504, has offered a critique of Weart's use of "nuclear fear" as a monolithic and passive concept.

[58] Anders, [1986].

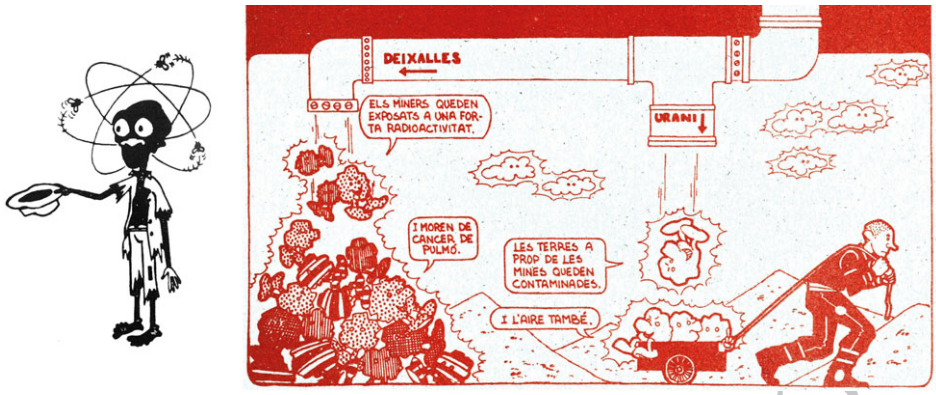

FIGURE 4 Examples of anti-nuclear fun informing people about the inevitable global effects of nuclear technologies. Left: *BIEN*, 1980, 9, p. 8. Biblioteca de Catalunya (Barcelona); Right: Smiling radon and uranium, in Viñoles, J. C. & Gipsy, 1979, 6. CEDOC (Universitat Autònoma de Barcelona)

viven en Arkansas" (What good are multinationals, as they brought us nuclear plants! Don't be afraid: fear is 'ignorance,' the wise men from Arkansas say).

In *Being Nuclear*, Gabrielle Hecht highlights historically (and historiographically) overdone "nuclear exceptionalism" while making clear that hers is not "an accusation of 'atomic alarmism.'"[59] Catastrophic visions of the explosion Q5 of an H-bomb, a radioactive leak, or a nuclear meltdown were ever present in anti-nuclear fun. However, the anti-nuclear movements of this period did not only focus on apocalyptic scenarios. They also drew attention to more quotidian threats associated with a wide range of nuclear things, seeking to include spaces other than bomb test sites and the barbed wire perimeters of nuclear power plants in nuclear landscapes. Uranium mines, nuclear waste dumps, and railway lines especially were in the sights of the anti-nuclear movement.[60] Anti-nuclear fun followed the same lines. A good example is the comic *La comèdia nuclear* (The Nuclear Comedy, 1979) produced in a tiny village in Lleida (Catalonia) with very limited print run.

In a humorous way, the comic outlined "the long chain of installations and transports" needed to produce nuclear energy: A character in the costumes of a detective, sailor, industrialist, scientist, gangster, clown (etc.) takes readers into a range of nuclear environments and introduces them to the theories of physics, engineering designs, and chemical treatments with the help of imaginative metaphors and examples. The first chapter, "Fuel production," highlighted the hard and hazardous work conditions of miners due to the effects of radium and radon (Figure 4, F4 right); the following chapter, "Reactors," raised some of the risks associated with the "'normal' operation" of a nuclear power plant (especially for workers and water ecosystems in the surroundings); and the third chapter, on "Waste," highlighted the time scales and cost of managing radioactive waste (including decommissioned plants). Two pages mapped the future nuclear geography of Catalonia in terms of mines, ports, and nuclear power stations, and advertised the "The Great Spanish Nuclear Circus. The Most Dangerous One All Over Europe. Thirty Plants in Less Than Twenty Years. Today. In the Bull Ring. Compulsory Admission." It also depicted a seal using its nose to juggle with five little power plants. In the end, *La comèdia nuclear* noted the scientific uncertainties as "obscure points" and made clear that nuclear energy was above all a political option favored by vested interests and resource racketeering. The main character stands next to petrol pumps labeled with the names of local winds and says: "Until they find a way to put a counter between the sun and us, they keep on choosing the nuclear option."

[59]Hecht, 2012, quote on p. 15. On other approaches to the reciprocal relationship between nuclear "exceptionalism" and "banalization," see Sastre-Juan & Valentines-Álvarez, in press.

[60]For many well-documented books and articles about uranium mining in the Iberian Peninsula (by activists, journalists and scientists), see Cabré, Carbonell, Puig, & Vilanova, 1981; *Pela Vida*, 1981, nos. 28–29.

Like this comic, anti-nuclear fun explored other impacts of large nuclear systems beyond the effect of radioactivity and paid special attention to geopolitics, global and national economies, local development, and social autonomy. Let us explore them in turn through brief examples. Concerning geopolitics, anti-nuclear fun routinely drew attention to the economic and political meddling of the United States in Spain and Portugal. Stickers exemplify this. One depicted a Flintstones-styled nuclear plant which read (in English) "Made in USA," while others spread mottos such as "Nor Carter nor Suárez, nor 'Nucleares'" or "'Nucleares' in the ranches of Suárez" (Adolfo Suárez was prime minister of Spain from 1976 to 1981). In a special issue devoted to relations between Spain and the United States in 1975, the humorous magazine *Butifarra!* similarly did not omit nuclear matters. Its front cover depicted a man in a T-shirt decorated with the Francoist national motto "Una, Grande y Libre" (One, Great and Free) holding a Coca-Cola bottle on his head and sitting on a U.S. nuclear power plant next to a Westinghouse laundry machine.

Other geographic entanglements were also highlighted, in particular those with African economies. A cartoon in an article about the distribution of Namibian uranium extracted by Rio Tinto Zinc Corporation provides a disturbing example: a starving African man whose head is surrounded by orbiting flies (as though they were electrons) extends a hand holding a hat to ask for money (Figure 4, left).[61] The re-creation of real ads underlined how state agencies and the main political parties forming national and regional governments (especially the Union of the Democratic Centre, Spanish Socialist Workers' Party, Basque Nationalist Party, and Convergence and Union in Catalonia) would be at the service of the vested interests of the big banks and the energy sector (such as Banco de Bilbao, Banco Hispano Americano, and Caixa de Barcelona, and the electrical companies FECSA and Iberduero, respectively).[62] Q6

In addition, anti-nuclear articles and fun often criticized the mantra "nuclear power plants create jobs" and the impoverishment of traditional farming and fishing communities in areas where nuclear reactors were to be installed. In Spain, a collective of artists from Zaragoza, the capital city of the region of Aragón, created a wall graffiti depicting the same wall in the same rural town, but the new "wall" showed statistical graphics about the potential effects of the projected nuclear power plant in Escatrón next to a queue of women, men, and children leaving the area.[63] Other murals and drawings focused on changes in local environmental conditions and the increase in radioactivity levels near nuclear power plants. One drawing in an anti-nuclear magazine depicted a fish in a coffin lying on a seabed while another one said "Now that we have hot water, who would think of passing away?" And another portrayed a horse skeleton quietly ploughing farmland in front of a (as yet unexploded) nuclear plant.[64]

Finally, the anti-nuclear movement often warned that "nuclear security" and "national security" could create a particular everyday and normalized nuclear state of emergency.[65] A special comic issue of the anarchist zine *La Lletra A* (1983) summed up the fears of activists as follows (in Catalan): "The nuclear issue is a political issue"; "it means surveillance zones, centralization, militarization, technocracy, social control, hierarchy and danger."[66] Many comic strips in this special issue directly referred to (and reinforced) these arguments. In fact, one, entitled "Aquell enigmàtic Egipte" (That Enigmatic Egypt), appears to be a humorous parody of the "nuclear pyramid" Lewis Mumford described in *The Myth of the Machine*.[67] Many other examples exist, for example a collage depicting armed soldiers sitting on the cables of high voltage pylons like Alfred Hitchcock's ravens or the false apology *La nucléarisation du monde* (1980), which was immediately translated into Spanish and Portuguese by post-situationist Jaime Semprún, who

[61] *BIEN*, 1980, no. 9, p. 8.

[62] *La controversia nuclear (1979–1981)* contained several humorous vignettes on this subject. For instance, it reproduced an image of a farmer in a beret who has to eat a dish of little nuclear reactors and worms "cooked" by the Nuclear Safety Council and "salted" by Iberduero electrical company (p. 52; see also, pp. 92, 129, and 169). Concerning "fake ads," see also the Special Issue of *La Lletra A* (1983).

[63] *Andalán*, 1976, no. 95, p. 4.

[64] *BIEN*, 1981, no. 14, p. 21; *BIEN*, 1978, no. 2, p. 8.

[65] Joseph Masco brilliantly developed this argument by focusing on the effects of nuclear weapons in U.S. politics in Masco, 2006.

[66] More examples can be found in *BIEN*, particularly in no. 5 (1979) and no. 9 (1980).

[67] Mumford, 1970 p. 303.

satirically defended nuclear programs as they became an insurmountable barrier to individual and collective freedom.[68] The first edition of this book announced "it will teach nothing about how a nuclear power plant works, but everything about the extent of our ignorance."[69]

6 | THE EPISTEMOLOGICAL EFFECT: LAUGHTER TO COUNTER IGNORANCE

Besides widening social understanding of nuclear technologies (as discussed above), grassroots anti-nuclear movements frequently called into question the politically mediated construction of ignorance and sowed distrust of experts and scientific certainty, especially (and quite understandably) when scientific numbers and conclusions were (or could be) used to legitimize nuclear policies.[70] These epistemological issues were not only addressed through textual arguments and technical data based on dissident scientific and lay expertise, but often also by producing emotions as more or less deliberate ways of responding to (or circumventing) regulated ways of knowing. Anti-nuclear groups used metaphors such as icebergs, Venetian masks, and detectives in amusing ways to criticize what they called the "kidnapping of information" by state agencies and electricity companies, for example through the imposition of secrecy on draft reports and projects.[71] But they contested more than the concealment of knowledge: activists mocked other strategies that were deployed by civil servants to banalize nuclear technologies; ridiculed technical reports that concluded that nuclear power plants were safe, clean, and cheap; and poked fun at the uninformed opinions of pro-nuclear politicians, at the advertisements of nuclear companies, and at the techno-optimist discourses of public figures in the media.[72] Activists reproduced claims like "Watching TV increases radiation levels as much as having a nuclear power plant in your neighborhood (Portuguese ex-minister of Industry Walter Rosa in 1977)" (in Portuguese) in their counter-media.[73] Some magazine sections—for example "El Ecologista Furioso" (The Furious Ecologist) in Madrid-based magazine *El Ecologista*—were designed specifically to provoke bursts of laughter (along with jocose commentary) in response to such statements. At the same time, anti-nuclear activists used humor to respond to media accusations that they were spreading lies and distorting public opinion, as illustrated by irreverent texts such as the "Rosary to Praise Saintly Nuclear Energy in Reparation for the Blasphemies."[74]

Cartoons were especially effective in the fight against ignorance and in casting doubt on scientific authority. Four cartoons illustrate this point. In the first example, a power plant is the tip and a bomb the submerged part of an iceberg (making "visible" the secret entanglement of Atoms for Peace with military programs) (Figure 5, center). In the second example, a smiling businessman in a suit and tie extends his right hand to offer a little power plant, while his other hand is hiding "smelly" nuclear waste. In the third example, a wise man donning mad hair and a suit stares at us and shouts, "Risks have been calculated. Trust us!" And in the final example, one scientist says to another, "For technical reasons, alternative energies cannot play a relevant role." The latter answers, "For technical reasons, radioactive

F5 Q14

[68] *BIEN*, 1979, no. 8, p. 1. The collage was reproduced from *La Gueule Ouverte* (1978, no. 239, p. 7), which in turn borrowed from a book by Swiss illustrator Martia Leiter, 1978.

[69] Semprún, 2007.

[70] On these issues in current historiography and sociology of science, see Porter, 1995; Proctor & Schiebinger, 2008; Wynne, 1992. Other ways of approaching ignorance, for example, as an inevitable part of scientific endeavors, have not been considered; see Gross & McGoey, 2015. Although some emotions, such as surprise and hope, have been considered by Gross & McGoey, the entanglement of ignorance with other emotions remains a fertile topic.

[71] Rebull, 1979, pp. 154–165.

[72] See, for instance, the remake of the popular comic *Mortadelo y Filemón* in *El Ecologista*, 1980, *2*(6), pp. 6–7.

[73] *Raiz and Utopia*, 1977, Spring (reproduced in *Pela Vida*, 1986, nos. 61–62, p. 1).

[74] The anti-nuclear movement also deployed reverence. In addition to offering anti-nuclear preaching and sermons, the priest of Ascó, Mossén Redorat, celebrated a particularly pious *Via Crucis* (Stations of the Cross) to "pray for all the victims of the nuclear oppression" (from Catalan). We have decided not to include such activities under the rubric of amusement or leisure (even though the priest traveled from far away to celebrate mass in anti-nuclear festive picnics, using a yoghurt pot as a holy chalice before puppeteers performed anarchist stories). S.n., 1983, *La Lletra A*, no. 9; L. Granell, 1976, Las centrales no son negociables, *Andalán*, no. 124, p. 16; Garcia, 2008, pp. 148–151.

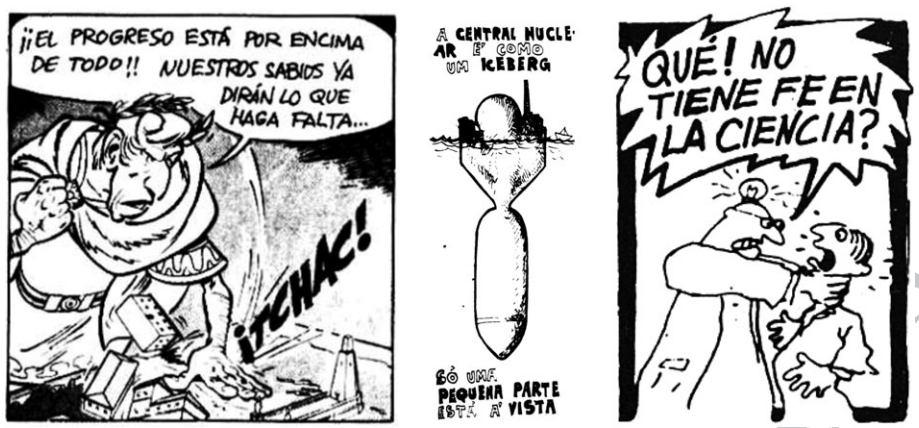

FIGURE 5 Anti-nuclear images, experts and epistemological battlegrounds. Left: *Asterix y las nucleares*, 1981, p. 5 & *Astèrix i la central nuclear*, [1980, s.l.: s.n.], p. 2. CEDOC (Universitat Autònoma de Barcelona); Centre: *Pela Vida*, 1978, 2, p. 1. Biblioteca Nacional de Portugal (Lisbon); Right: *BIEN*, 1979, 8, p. 18. Biblioteca de Catalunya (Barcelona)

waste cannot be removed safely," to which the former responds, "What? Have you no faith in science?" (Figure 5, right).[75]

Such commentary on how and why we know (and how and why we ignore) was also present in the comic *Asterix y las nucleares*, a (fake) remake of the famous French original by Goscinny and Uderzo. In 1980, German activists had copied excerpts from Asterix volumes and changed the speech bubbles to tell the story of nuclear resistance in a sea-side village of "indomitable Gauls" in Armorica (Brittany). Anti-nuclear groups in the Basque Country and Catalonia immediately produced Spanish and Catalan translations.[76] One year later, another ecological collective adapted the comic to the Spanish political context, removed jokes that made no sense outside Germany, injected further doses of sharp irony and sarcasm, and added new relevant themes from the nuclear debates. These included the role of state engineers and labor unions in electricity companies, the persistence in the use of the rhetoric of progress, the use of the label "terrorist" to discredit civil disobedience, and even the importance of transnational networks and fun in anti-nuclear politics. Moreover, the new version included an epilogue with images of the actual resistance in the form of protests, blockades, and barricades, of villagers and activists in Plogoff (Brittany), as well as of the use of brutality by the state some months earlier. Once more, anti-nuclear fun was not at odds with matters of grave importance and surfaced in (and was informed by) confrontations. The authors of the remake asked readers: "Spread, pass, photocopy, and reproduce it as strips in your newspaper, magazine.... Show it to your parents (or to your kid)."[77]

The story of *Asterix y las nucleares* starts as follows: Multinationalis convinces Julius Caesar of the benefits of the *atomus-crackers* (nuclear power plants) in the form of profits, control of plebeians, and centralization of the Empire. After responding to the doubts of his councilors ("Our savants will say whatever is required!"; Figure 5, left), the Emperor announces in the Roman Forum: "Senators, technicians are already working. The project is running. It is time to start a mass propaganda campaign in the media. The slogan: The atom is safe. *Atomus-cracker* is progress." Later, Caesar repeats that "today, we need to distinguish between the things the masses need to know and the ones they must ignore," while the pirates secretly transport the reactor and radioactive materials to the Gaul village. When the villagers learn about the plans of the Romans, they ask their druid Getafix what an *atomus-cracker* is. Once the wise elder (perhaps representing the role of dissident expert) has explained the risks of this "evil power," everybody

[75]Respectively from *Pela Vida*, 1978, no. 2, pp. 1, 4; *BIEN*, 1979, no. 9, p. 5; *La controversia nuclear*, p. 213; *BIEN*, 1979, no. 8, p. 18. See also: *BIEN*, 1978, no. 2, p. 14; *BIEN*, 1983, no. 27, p. 26. Some cartoons were the work of renowned cartoonists such as R. Cobb, I.D. Coop, Perich, and Cesc.
[76]*Asterix y la central nuclear*, 1980 (in German: *Asterix und das Atomkraftwerk*, 1980).
[77]*Asterix y las nucleares*, 1981, p. 1.

says at once, "Never ever!" And the knowledge of activists and lay experts may be reflected in another passage: After Asterix and Obelix are released from detention in Rome, the lawyer approaches them and says, "Hats off to you. You wax eloquent!"

The comic retained some of the usual hilarious themes of the Asterix series: Obelix's urge to attack the Romans, chief Vitalstatistix's love of food and naps, the brawls between the ironmonger and the fishmonger (after the former asks, "What's better, rotten fish or contaminated fish?"), and so forth. But new themes were also introduced: a new "psychological war" with population surveys as well as caveman clubs, a rebellion of the black slaves charged with building the power plant (after they switch labor unions), and the emancipation of female villagers who ask for their right to drink the magic potion and to participate in anti-nuclear politics. (At one point, Impedimenta asks the women who are attending what seems to be a Victorian tea party: "Are you happy with your role in this comic?") The comic ends the same way as most Asterix's stories, namely, a banquet under the stars. But this time, fellow anti-nuclearists from all over the world are invited: characters from Hispania, Helvetia, or a Native American *Harrisbonum* share, respectively, their experience of resistance in Lemoiz, their doubts about the suitability of referendums, or their uneasiness at having humiliated the Great Manitou. At the large round table laden with plenty of roast boar, Vitalstatistix finally proclaims, "But it isn't about always being worried. We cannot forget to live!," to which the bard Cacofonix responds, "And if we do it with imagination, poetry, music, so much the better!" And the authors probably Q19 thought, "And with comics like Asterix, better still!"

7 | CONCLUDING REMARKS

Along with anxiety or anger, pleasure and mirth were part of the repertoire of emotions available to the anti-nuclear movements that blossomed in Portugal and Spain around the fall of the dictatorships in the mid-1970s. By taking a wide range of visual, audio, and textual forms, "anti-nuclear fun" could carry debates about nuclear policies into many public and private spheres, into urban and rural contexts, and to as many audiences. These enjoyable forms of resistance acted as "mindful reminders" of the health, environmental, and social risks of nuclear technology that were concealed in official representations. Cartoons, graffiti, comics, humorous exhibitions, or music for children conveyed otherwise unpublicized information, nuclear contents and counter-discourses with the aim of not rendering the nuclear banal, natural, or acceptable.

Anti-nuclear fun was intimately entangled with both politics and epistemology and in dialogue with other modes of collective action of activists (including of lay experts and dissident experts). In this sense, anti-nuclear fun was an inseparable part of the continuum of methods and practices of anti-nuclear protest.[78] It was "informed fun" that paid special attention to the global and local implications of nuclear technologies in daily life, in the economy, and in politics, coupled to an awareness of the exceptional risks associated with a nuclear catastrophe.

Shaped by the fear and violence that was part and parcel of nuclear history, anti-nuclear fun was also indebted to the vibrant counter-cultural aesthetics of the period. The everyday and amusing items of protest associated with anti-nuclear fun were mainly produced by non-hierarchical and decentralized grassroots groups and were barely visible and "legible" to official institutions, to borrow a term from James C. Scott. (How could one track DIY stickers, demo tapes, magazines, or board games?) In this sense, anti-nuclear fun call to mind Scott's "everyday forms of resistance" that "make no headlines."[79]

Anti-nuclear "thin things" as cheap and ephemeral as a cartoon in a fanzine or small acts of resistance as subversive and "innocent" as a joke to ridicule politically mediated ignorance played a role in creating a climate of broad

[78]On the notion of a "continuum" of instruments, actors and agencies that participate in the popularization (and making) of science: Shinn and Whitley, 1985.

[79]Scott, 1985, especially pp. xvii, 28–48, 1990, especially pp. 136–182. In exploring "testament to human persistence and inventiveness" in social resistance, Scott focused more on the subversive meaning of occasional carnivals and fêtes than on everyday humor, playfulness, and laughter as part of this legacy. Some examples of humor and laughter as cultural resistance in the horrific contexts of colonial plantations and concentration camps are described in Price, 1992, pp. 36–42, and Rubió Cabeceran, 2010 [1939].

antipathy and opposition to nuclear technologies. This, in turn, played a major role in the partial halting of national programs for nuclear energy in the period after 1973. In Portugal, no nuclear power plant was ever built, and in Spain "only" 10 of the 39 planned commercial nuclear reactors were eventually put into operation, after the National Energy Plan was re-drafted in 1978–1979 and a (partial) nuclear moratorium was officially enacted in 1984 (despite the huge economic costs this imposed on society to compensate electricity companies).[80] As recent literature highlights, emotions of protest—including pleasant emotions—cannot be regarded as micro-level phenomena; they are entangled with macro-politics, including techno-politics.[81]

In *Living My Life* (1931), anarchist Emma Goldman wrote, "I did not believe that a Cause which stood for a beautiful ideal … should demand the denial of life and joy. … If it meant that, I did not want it. I want freedom, the right to self-expression, everybody's right to beautiful, radiant things."[82] Four decades later, a desire to enjoy life found expression in the multifarious groups that resisted nuclear technologies and contested the national grandeur and technocratic "radiance" of Spain and Portugal—to borrow the metaphor of Gabrielle Hecht.[83] In 1978, a poster demanding a nuclear moratorium showed most of the planned nuclear power plants, mines, and facilities on a map of the Iberian Peninsula, but also depicted hundreds of tiny figures fleeing a menacing landscape and comically jumping into the sea in search of a better, even a brilliant future.[84]

Note on sources

Thanks to current archival policies of preservation, digitalization, and accessibility which are broadening the material culture of contemporary societies, we have been able to consult many primary sources, ranging from stickers, pins, posters, and fanzines to magazines. We would especially like to mention the collection of stickers, pins, and posters preserved (and partially digitalized) at the CRAI Pavelló de la República (Universitat Autònoma de Barcelona), the Fundación Sancho el Sabio (Vitoria-Gasteiz, Basque Country), and the Biblioteca-Arquivo Ephemera (Lisbon), which hold items with grassroots origins and anti-nuclear themes and mottos from the 1970s and 1980s. The vast and one-of-a-kind collection of underground fanzines and counter-culture comics at the Documentation Center of Communication (CEDOC, Universitat Autònoma de Barcelona) was also very helpful. We have mainly selected publications (or self-published documents) that focus on nuclear technologies beyond nuclear weapons and apocalyptic landscapes. In particular, we have studied *La Lletra A* (1982–1986), *El Víbora* (1979–), *NDF. Niños Drogados por Frank Sinatra* (1983–1987), *La Cabra. Ateneu Popular 9 Barris* (1983–[1988]), and *Alerta. Portaveu de Terra Lliure* (1984–1995), which respectively were attached to anarchist, gay liberation, punk, neighborhood, and armed groups.

This work has benefited immensely from consulting the books and large collections of magazines (published by some of the main Iberian ecological and anti-nuclear organizations) at the Biblioteca de Catalunya (Barcelona), the Biblioteca Nacional de Portugal (Lisbon), and the Centro de Documentação 25 de Abril (Coimbra, Portugal). The following are the main books, comics, and magazines (issues between 1974 and 1984) consulted:

Books & Comics

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[80]Pereira et al., 2018; Sánchez-Vázquez & Menéndez-Navarro, 2015. Official sources have estimated government compensation costs totaling €5.7 billion, as reported in Los consumidores saldan 19 años después la moratoria nuclear, 2015.

[81]See, for example Flam & King, 2005.

[82]Goldman, 1970, p. 56.

[83]Hecht, 1998.

[84]CANC, 1978, *Moratòria Nuclear* [Poster], 1210 (C), CRAI Pavelló de la República, Universitat de Barcelona, Barcelona, Spain.

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Interviews

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