Engaging Science, Technology, and Society

The Shapes of Dissent: Masculinities, Protest, and Nuclear Expertise

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Abstract[1]

Scholars have paid significant attention to the role of gender in social movements, especially in the women's health and other feminist protest organizations. Gender issues have been less studied in other social movements, such as the anti-nuclear movement, and when they have, then almost always with a focus on the role of women. This paper explores the role of men and the performance of masculinities in protests against civilian nuclear energy. During the 1970s–1990s, activists performed three distinct forms of protest (sabotage, counter-information, and counter-expertise) in dissent against Superphénix, an experimental nuclear reactor built in Creys-Malville, France. This paper looks at how these different forms of protest were grounded in traditional Western views of masculinity, especially virility and paternalism. By comparing and contrasting counter-expertise in the anti-nuclear and the women's health movement, the paper argues that anti-nuclear counter-expertise was less about providing an alternative view of nature, than personally discrediting official experts in a fight of "man against man" (Lewontin 1968, 2). Finally, it reflects on the consequences of these types of confrontational masculinity on the possibility of science-based dissent.

Keywords

gender; masculinity; social movements; counter-expertise; nuclear energy; anti-nuclear movements; women's health movement; protest; dissent

Introduction

> If you find plutonium downstream of Malville, I'll cut my balls. (Attributed to the director of the Creys-Malville nuclear plant, "Communiqué," December 18, 1990)

> You don't ask Dr. Frankenstein to write a pamphlet against monsters. (Lehmann 1989)

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Protest against civilian nuclear energy in Europe during the 1970s–1990s took many shapes, including public marches, petition signing, site occupations, visual satire, song writing, infrastructure sabotage, counter-information, legal action, and counter-expertise. Like other protest movements such as the women's, peace and civil rights movements, anti-nuclear activists drastically enlarged the traditional "repertoires of collective action" (Tilly 2008) by creating new modes of dissent drawn from the cultural and political experimentations of the 1960s (Skenderovic 2012). Scholars have explored in detail the many ways in which for these new movements "the personal is political"—fruitfully analyzing the intersection between gender politics and social protest (Hurwitz and Crossley 2019). Almost all studies on gender and protest have focused on the role of women, most prominently in the women's health movement, but also in the anti-nuclear movement. Perhaps inadvertently, these studies have treated women's modes of protest as a departure from an unquestioned masculine norm. My primary goal here is to start exploring the gendered nature of that norm and how it tied into the performance of masculinities by anti-nuclear activists in Europe in the 1970s–1990s.

To do so, I will examine three forms of dissent (sabotage, counter-information, and counter-expertise) in the anti-nuclear movement's actions against Superphénix—an experimental fast breeding nuclear reactor built in Creys-Malville, France. By examining the role of masculinities in the physical and intellectual confrontations of activists with police forces and state experts, I will attempt to show that the personal was political for many men involved in these actions who envisioned them as a virile contest of "man against man" and as a challenge to the paternalism of state expertise.

This paper explores the social and cultural history of anti-nuclear protest by looking at how activists clashed with representatives of the scientific and political establishments. It reconstructs these clashes—physical, rhetorical, or symbolic—from unpublished and published sources. This paper draws on the ContrAtom papers, an anti-nuclear organization created after Chernobyl in 1986, and the Mouvement de libération des femmes (MLF, Women's Liberation Movement) papers from the Archives contestataires (Geneva); the Supérphenix papers from the World Wildlife Fund-Geneva archives; all the issues of the antinuclear magazine *Anticroche*, as well as personal archives and interviews with antinuclear activists. Since this article is not only about describing the role of these men and women, but about understanding how they made sense of their own engagements, it also relies on various autobiographical narratives. This paper analyses how these protest actions and discourses reflected historically specific and diverse ideals of masculinities, at a time when traditional masculinities were being questioned by second-wave feminism.

Although I will supplement the rich literature on the role of women in anti-nuclear protest by paying attention to what men were also doing, my argument is not about the roles of men per se, but about identifying gendered forms of protest that emerged from and played out the actors' views of masculinity. My examination of these performances of masculinity in the anti-nuclear protests in Western countries follows in the footsteps of other scholars' recent work questioning the universal shape of dissent and the function of science in protest movements. Monamie Bhadra Haines, for example, shows in her study of anti-nuclear activism in India that unlike their counterparts in the Global North, critical scientists in India could not rely on the fiction of a "neutral and apolitical" science to become credible counter-experts. This is because in India "science was not designed to be the grammar of credibility with diverse, multiethnic polities" (Haines 2019, 33). Here I draw attention to the importance of culturally specific, in this case gender-specific, meanings of scientific knowledge in anti-nuclear movements. Taking the gender

dimension seriously within, but also across, different social movements, such as the anti-nuclear and the women's health movements, can shed new light on the connections between the expression of gender and various ideas about the role of scientific knowledge.

Science, Protest, and Gender

There is an abundant literature on the gendering of knowledge in the women's health movement and in the feminist epistemologies that developed in that context (Harding 1986; Haraway 1989; Longino 1990; Murphy 2012). Scholars have also noted the important role of women, often mothers, in resorting to counter-expertise to draw attention to toxic environments (Brown 2007; Newman 2016; Kimura 2016). But little attention has been paid to masculinities in such science-related activism or in science studies more generally (Milam and Nye 2015). The few studies that address the role of masculinities in science-related protest always situate the masculine on the side of the state, as a part of the "hegemonic masculinity" against which activists, both men and women, protested (Connell and Messerschmidt 2005). The historian Gabrielle Hecht shows how French nuclear ambitions were conveyed by "technologists" who were portrayed as "supremely masculine . . . men of action" (Hecht 1997, 37). The rare public debates about nuclear energy organized in France and elsewhere—for example by the authorities of the Isère department in 1976 and by the national television and radio broadcasters in 1980—featured exclusively men as the experts, paternalistically and patronizingly answering questions from a lay audience, including in one case a "scared housewife" (Jobert and Le Renard 2016). Similarly, the historian Kyle Harvey argued that in the eyes of women's peace groups "nuclear politics . . . was men's business, and those men involved in the decision-making process on issues of nuclear security and foreign policy lacked maternal, nurturing, and emotive qualities that women were able to offer" (Harvey 2014, 69). Political scientist Carol Cohn has argued that the American "defense intellectuals" of the 1980s were (and remain) "an almost entirely male world (apart from the secretaries)" committed to formulating "what they call 'rational' systems for dealing with the problems created by nuclear weapons." In other words, for male experts, nuclear disaster was a problem to be "managed rationally" and "scientifically," using a specifically gendered language that eliminated all references to fear, pain, and death—while simultaneously abounding in references to sexual pleasure, intercourse, and orgasm—thus severely constraining the possibility of their being able to imagine alternative solutions (Cohn 1987, 688). Anthropologist Hugh Gusterson analyzed how, in an American weapons laboratory, "nuclear weapons scientists operate in a gendered world in which the mission of the laboratory is coded as masculine, rational, and superordinate," with (women) anti-nuclear activists attacking the "rationalist masculinism of the nuclear state, portraying it as more masculine than rational" (Gusterson 1996, 209–21).

Though not to the same extent, men also dominated the public image of both the immediate post-war nuclear disarmament movements and the anti-nuclear power movements of the 1970s and 1980s (Wittner 2009). This was especially so in comparison to other social movements at the time. Nevertheless, a number of women did play central roles in the later anti-nuclear movements. In France, nuclear physicist Monique Sené founded the Association of Scientists for Information on Nuclear Energy (GSIEN) and biologist Michèle Rivasi the Commission for Independent Research and Information on Radioactivity (CRII-RAD). In Germany, conservative rural as well as feminist urban women took part in the occupation of the construction

site for the nuclear reactor at Wyhl (Engels 2002), and in France, women residents of Plogoff mobilized massively against the planned nuclear site there (Conan and Laurent 2010). The limited visibility of women in "official" roles and in the more urban public demonstrations underestimates their actual role in organizing these movements.

Counterculture (protest) movements were sites where various ideas of masculinity were performed (Binkley 2007). Even though the feminist movements of the 1970s had radically challenged traditional gender roles, these were often left unquestioned in the counterculture movements more generally. As a number of studies have shown, in the counterculture movements, even in the rural communes of the 1970s, men often reinvented masculinities according to traditional gender roles and norms (de Dardel 2007; Conlon 2014). Thus, although male hippies appropriated White and Western feminine codes such as wearing long hair, masculine codes such as displays of aggression, virility, and paternalism remained common in counterculture movements (Milam 2016). Tim Hodgdon's rich study of manhood in two counterculture "tribes" in the San Francisco area during the 1960s and '70s argues that "various kinds of counterculture masculinity formed a continuum of perspectives and practices" (Hodgdon 2007, 4–6). The protest movements were an especially vibrant space where these various ideals of masculinity, traditional and countercultural, were negotiated and performed.

Whereas feminist activists and scholars have produced an articulate discourse about gender and protest that historians can analyze, there are very few testimonies by historical actors reflecting explicitly on masculinity and protest. That is unfortunate for historians, but unsurprising. As part of a majority, numerically and normatively, the men whose protest tactics were aligned with dominant views of masculinity did not feel compelled to make this link explicit. To this methodological difficulty we might add the assumption that the category of masculinity does not carry much explanatory weight because all protest is an expression of strength aimed at confronting and ultimately dominating the opponent. But, in fact, the shapes of protest are much more diverse than this. In the anti-nuclear movements, men and women engaged in a variety of strategies that did not conspicuously rely on the performance of virility and paternalism through the physical and intellectual domination of others. For example, activists used humor, ridicule, and satire through the production of ironic cartoons and irreverent caricatures (Valentines-Álvarez and Macaya-Andrés 2019). In the anti-nuclear movement against Superphénix, Anne-Cécile Reimann, a female schoolteacher in Geneva, wrote numerous songs with playful lyrics that were sung by activists during marches and other protest actions, as well as countless poetic slogans that were featured in bold letters on signs held up during protests (ContrAtom papers, Archives contestataires, 1970s–1990s).

The anti-nuclear missile protests carried out through the Women's Pentagon Action in the US and the Greenham Common in the UK offer further examples of modes of protest that rely on diverse gender encodings. In 1981, in front of the Pentagon building in Washington, DC, women staged an event "powerfully different in its approach to mass political action" according to one of the participants (Russell 1989, 164). This event included a number of symbolic rituals and creative means to make visible the expression of emotions such as fear and grief. The women's actions included "weaving, planting seeds and plants, collective chanting, singing and crying, and a lot of talk about circles, empowerment, and connections" (Harvey 2014, 90). Similarly, at Greenham Common, the women-only encampment opposed nuclear missiles though dance performances, songs, crafts, and poetic slogans (Kerrow and Mordan 2021). These

highlighted the political power of personal emotions about nuclear disasters, rather than dispassionate rationalizations, or physical confrontations. Some women described these forms of protest as based on women's preoccupation with care for others (and for "mother earth"), while others rejected such essentialist arguments and grounded these strategies in feminist theory (Russell 1989; Engels 2002). Overall they reflected very different gender encoding than sabotage, physical clashes with police forces, and discursive confrontations with experts that relied on theoretical and empirical evidence, as this paper will show.

Anti-nuclear activists hotly debated the best strategies to achieve their aims, including symbolic actions such as die-ins (activists laying still on the ground to represent dead bodies following a nuclear accident); the physical occupation of nuclear construction sites; the destruction of electric installations; and the production of empirical counter-expertise (Touraine 1980; Ollitrault 2015). Some women activists were especially critical of the confrontational and destructive tactics adopted by other activists, seeing them as a reflection of the generally "monstrously macho-hierarchical" nature of the protest organizations (Anon. 2018, 133). Some feminist activists rejected traditional scientific expertise altogether, seeing it as a weapon for consolidating male domination (Russell 1989). Some male researchers believed that scientific expertise could be made gender-independent and serve their cause (Touraine 1980), seemingly oblivious to the great extent to which scientific expertise, especially in the fields of engineering and nuclear physics, was dominated by men (Nelkin and Pollak 1982).

Material destruction of technological infrastructures and physical confrontation with law enforcement are just the most obvious examples of masculine forms of protest, what psychologists have described as "protest masculinity" (Broude 1990). To be clear, men and women in the anti-nuclear movements performed elements of traditional masculinity in their protests. "Physical" (or what critics called "violent") confrontation was not reserved to men, nor peaceful protest to women, thus departing from stereotypical gender codes that exclude and render invisible women's use of violence as a form of resistance and self-defense (Dorlin 2017; Lee 2017). Women played, for example, a central role in the violent actions of the Red Army Faction actions, and French "ecofeminist" Françoise d'Eaubonne (she coined the term) participated in the sabotage of the construction site of Fessenheim's nuclear power plant in 1975 (Goldblum 2017; Cambourakis 2018). And not all masculinities were confrontational, destructive, and domineering, as the repertoire of masculinities included the paternalistic, the protective, as well as the grandfatherly caring (Courtine 2011). As recent scholarship on feminism and peace shows, especially the work of political scientist Catherine Eschle, gender identities expressed in protests were always complex assemblages of norms and values and evolved over time (Väyrynen et al. 2021; Eschle 2017). For this reason, this paper is attentive to the multiple dimensions of masculinities and their historical situatedness.

Anti-Nuclear Activism in the City of Calvin

In March 1974, following the OPEC oil-embargo crisis of the previous year, the French Prime Minister Pierre Messmer announced plans for an accelerated development of nuclear power in France. France already had a dozen operating nuclear reactors and a dozen more in construction or in the final planning stage. More than in any other country, perhaps, nuclear power had become a cornerstone of France's technological national identity after World War II (Hecht 1997), so much so that nuclear power became equated with state power. In France, but also elsewhere, confronting nuclear technology was a way to confront state authority.

Five months after announcing its plan, the French government began the public consultation procedure on Superphénix, a new type of nuclear reactor, to be constructed in Creys-Malville, a rural area along the Rhône river and supported by electricity utilities from France, Germany, and Italy. Superphénix was different from all other existing commercial reactors and was envisioned as a public demonstration that this technology was the way to the future (Le Renard 2018). As a newly designed "fast breeder reactor," its core was to be cooled with highly inflammable liquid sodium and would produce large amounts of plutonium that could be used as fuel for the reactor (or for military purposes). Superphénix was more than a nuclear reactor. To the promoters of nuclear energy, its ability to turn nuclear waste into nuclear fuel again was a symbol of nuclear energy's unlimited potential. To the critics, it was a symbol of centralized state power, scientific hubris, and masculine technocracy (see figure 1). Whereas the study of radioactivity in France had initially been associated with women, thanks in part to Marie Curie and her daughter Irène Joliot-Curie, after World War II and the militarization of "atomic energy," nuclear technologies became strongly gendered as masculine in the US and other countries. Physicists like Richard Feynman took the figure of the Catholic male priest as a model for thinking about the experts who should control this technology (Cohn 1987).

In part because of its symbolic meanings and its perceived danger, Superphénix became the focus of unusually strong and transnational opposition from scientists, environmental groups, and individual citizens (Tompkins 2016; Topçu 2013). The largely untested technology of the reactor (at least at that scale), the proximity to cities (60 km to Lyon and 80 km to Geneva), and the possible links to the production of nuclear weapons contributed to the mobilization against Superphénix in several European cities, and especially in Geneva.

But the spatial proximity between Geneva and Creys-Malville does not alone explain the city's exceptionally strong mobilization against the power plant. In the 1970s, Geneva, a city of Calvinist austerity, was also home to a rich counterculture scene and a vibrant squatter community (Gros 1987; ibid., 2004). Numerous civic organizations mobilized around environmental, peace, and women's health issues and often took to the streets to make their protest heard (Giugni 2004). Geneva was one of the first Swiss cantons to introduce women's suffrage (in 1960), long before it was recognized at the national level (in 1971). A system of direct democracy, but also the presence of numerous international organizations in Geneva, including the European headquarters of the United Nations, contributed to a vigorous mobilization of civil society (Rens 1995).

Geneva was also, in a certain sense, an "atomic city" (Strasser 2006), with a complex relationship towards nuclear issues. Although it didn't host any nuclear power plants on its small territory, it was home to CERN, the largest high energy physics laboratory in the world. Built in 1953, after the failure of a popular referendum to ban its construction, it symbolized the power of elite scientists in trying to unlock the "secrets" of the atom. Atomic energy was also on public display in 1955, 1958, and 1961 when the United Nations organized in Geneva its International Conference on the Peaceful Uses of Atomic Energy. Part of the Atoms for Peace program, which attempted to win hearts and minds in favor of nuclear technologies both peaceful and military (Krige 2008), these conferences brought to Geneva popular exhibitions where the public could witness the marvels of nuclear technology, including an operating nuclear reactor showcased by the US government. By 1965, the Swiss government planned to build a nuclear power plant in Geneva, raising fierce opposition from residents led by three local environmental organizations (Duc 2016). In 1977, the Swiss population voted on a national referendum against the construction of any nuclear power plants

in Switzerland (Favez and Mysyrowicz 1987; Kupper 2003). Although the initiative was barely rejected nationally (with 48.8% in favor), it was largely accepted in Geneva, with the 67.4% vote of approval giving a sense of the local support for the anti-nuclear cause (Chancellerie fédérale 2019). Its strong and diverse countercultures and its long history of challenges to nuclear energy go a long way toward explaining how Geneva became a focus of the opposition to Superphénix.

Figure 1. A typical representation in anti-nuclear publications of the masculine nuclear expert in control as an egghead wearing a tie and a white coat, often associated with a symbol of his narrowness of view (here shown wearing blinkers over the eyes). (Wabak & Wabak. c.1994 [unpublished]. Source: Archives contestataires, Genève).

Forms of Dissent: Physical Confrontations and Sabotage

Opposition to Superphénix came from many quarters and took many forms. Before turning to counter-expertise, confrontation, sabotage, and counter-information offer good examples of how protest could be tied to the performance of virility and paternalism. Physical—or what critics called "violent" confrontations (Anon. 1977d)—such as clashes with police forces and sabotage of nuclear installations were the actions most obviously linked to expressions of virility. The cultural history of how virility (or manliness) became an essential component of masculinity is long and complex, and should be understood in relation to prevailing ideas about femininity and the place of women in society (Courtine 2011). The codes of virility, grounded in muscular strength and physical domination, were often attractive because their performance helped men to reaffirm that they were not feminine (or gay), and thus deserved to enjoy all the privileges attributed to men. These practices were even more important for the anti-nuclear activists who opposed mandatory military service for men, because they were often described as "effeminate." As conscientious objectors or those who were able to avoid conscription, they were effectively cut off from what was still a defining source of masculinity in the late twentieth century—enrolment in the military, which marked the passage from adolescence to manhood (Baubérot 2011).

Public protests against Superphénix began as early as 1976, both around the construction site and in nearby cities. On September 17, 1976, the first of many peaceful marches took place in Geneva, ending with a meeting devoted to the victims of the Seveso disaster, which had occurred just a week earlier (Anon. 1976). The next summer, the massive protest on the construction site of Creys-Malville marked a significant change in the scale and character of the opposition. Between 20,000 and 70,000 activists from across Western Europe converged on Creys-Malville. The attempt to occupy the construction site resulted in physical confrontations in the streets of the surrounding small villages, with the police forces, numbering over 2,000, using offensive grenades to disperse protesters (Anon. 1977a). As projectiles flew back and forth, several protesters and policemen were heavily injured. While retreating from the confrontation, a young physics teacher fell on top of an offensive grenade thrown by the police forces and died from his injuries. This tragic event marked the end of any massive onsite protests, and a partial demobilization of the anti-nuclear movement. Activists who favored confrontational tactics realized that their physical strength was no match against heavily armed and well-trained security forces who did not hesitate to use lethal force. The experience of physical domination, especially for men who had constructed their masculinity around the image of physical strength, was experienced as a humiliation by many of them (Tompkins 2016, 147–150), radicalizing some and discouraging others to take action (Anon. 1980).

These activists turned towards other means of confrontation, including sabotage. Even though the acts of sabotage made headline news at the time, little was known about their authors. But three decades later, after the period of limitation for these acts had run out and the archives were opened, some of them began to share their reminiscences of these events. The Swiss engineer Chaïm Nissim was one of them. The older brother of Rina Nissim, a central figure of the Geneva women's liberation movement (de Dardel 2007), he joined thousands of activists in 1975 who occupied the power plant construction site in Kaiseraugst, near

Basel (Jansen 2018, 52). The occupation lasted almost three months and became a breeding ground for the European transnational anti-nuclear movement (Kupper 2003; Tompkins 2016).

Chaïm Nissim shared the disillusionment of other militants following the 1977 protest at Creys-Malville, which he had helped to organize. With two friends, he followed the instructions provided by a Swiss military manual on sabotage of enemy installations and used stolen dynamite to blow up the overhead power lines leading to the Creys-Malville construction site (Nissim 2004, 45; Jansen 2018, 63–65). These dangerous clandestine actions, carried out with his close male friends in the middle of the night, put Nissim in a state similar to deep love, with his senses heightened, he recalled. When the pylon exploded, it felt "like an orgasm on a summer night, before the rain" (Nissim 2004, 53). These acts of sabotage were done not just to weaken the French nuclear project, but also to prove the strength of the saboteurs' manliness. For Nissim and other male activists, anti-nuclear protest was a way of performing masculinity for oneself and towards others, a kind of masculinity that was equated with strength, conquest, and destruction. After successfully short-circuiting a power line, Chaïm told one of his accomplices, "Max, I think you are a man now." The two friends had discussed their doubts about their sexual virility, but once they had destroyed the power lines, Chaïm tried to reassure Max that "being a man, is precisely that" (ibid., 49). Chaïm's sabotage activities culminated in 1982 when he obtained a rocket-propelled grenade from a terrorist group and fired at the Superphénix power plant, then under construction, but without causing much damage. A successful shot would have delayed the construction by several months or even years. As he remembered two decades later, as he held the RPG aiming at Superphénix across the Rhône river, he thought about the two companions who accompanied him on his sabotage actions: "Pedro, it's for you, Antonio, it's also for you that I am here, and need to reach my target. I fire" (ibid., 117). Although the single example of Chaïm Nissim cannot be taken as representative of all men's actions in the anti-nuclear movement, it illustrates how protest activities could be strongly tied to the performance of masculinities, especially those grounded in virility.

Activists such as Nissim were ambivalent towards these performances through physical destruction because they could be interpreted as expressions of masculine violence. After the massive 1977 protest in Creys-Malville, anti-nuclear activists became particularly equivocal about the use of physical force. This was in part for "tactical" reasons because untrained activists were no match for police forces equipped with military gear, but also because the use of violence could alienate public opinion. Fundamental differences were developing between the "violents" and the "non-violents," as activists put it (Anon. 1977b). In numerous discussions, letters, editorials, and other publications male activists—many of whom were conscientious objectors, rejecting the military's monopoly over ideals of masculinity—attempted to draw a line between destruction of material infrastructures and violence towards human beings. For example, in 1980, the anti-nuclear periodical *Anticroche* published a piece "Antinuclear Sabotage: For or Against" discussing the symbolic, political and legal risks of actions which were perceived by some as "violent" (Anon. 1980). The organizers of the Creys-Malville gathering attempted to keep their protest peaceful, but "violent" protesters—apparently all men—escaped their scrutiny, and more than a dozen men of the special French police forces were wounded in the protest (Anon. 1977d). A woman activist, commenting on how male protesters at another anti-nuclear protest in France started throwing stones at the police forces, said that "it was instinctive, the men couldn't resist doing so" (Conan and Laurent 2010).

Culturally speaking, masculinity does not inherently entail the use of violence against property or people; Gandhi's nonviolent protests, for example, were based on ideals of masculinity grounded in the

male's strength to "endure physical duress" and to "bear the violence of the state," not to damage infrastructures or hurt people (Valiani 2014, 506). Sit-ins (and die-ins) were a common form of protest in the West, not only in the American civil rights movement but also in the anti-nuclear movements of the 1970s (Russell 1989). Most men protesting Superphénix adopted nonviolent tactics, in line with counterculture pacifist ideals. But the gendered encoding of these nonviolent activists was not read the same way by all members of society. Far from being seen as a masculine sign of physical and mental strength and control, the nonviolent orientation of young military recruits from the 1960s onward was interpreted by one Swiss military psychiatrist and high-ranking officer as an expression of a frightened masculinity, resulting from the fact of being reared by unduly permissive fathers (Stucki [undated]).

In the 1970s, when Western societies increasingly questioned masculine violence, protest actions gave an ideological legitimacy for men to express their physical strength through the destruction of contested infrastructures and sometimes through violence against representatives of state authority. One anti-nuclear activist observed a "fascination for violence" among other activists, including some women activists (Villiger 2019, 87). Anti-nuclear activists discussing protest tactics juxtaposed the more "feminine," nonviolent, and symbolic actions with the more "manly," violent, and destructive actions (Le Garrec 1980). Men and women took part in both kinds of actions, but their performance meant different things to different activists. Even the same gesture, such as throwing objects at adversaries, could be designed to fall on one side or the other of the gendered divide: female feminists threw soiled diapers at deputies in the Swiss national parliament in 1969 (de Dardel 2007), while male anti-nuclear activists shot steel hex nuts with slingshots at policemen during the 1977 Creys-Malville occupation (Anon. 1977a).

Forms of Dissent: Counter-Information

Anti-nuclear protest also took other, less obviously gendered forms. One of these was counter-information, the attempt by activists to establish different bodies of fact about nuclear safety. The counter-information of the 1970s was a key mode of protest, employed especially by scientist activists. In 1977, anti-nuclear activists organized a "counter-information" campaign "in the villages" surrounding Creys-Malville that included "film screenings, videos, and conference tours with physicists" (Anon. 1977c, 8). As Sezin Topçu has argued (Topçu 2007), most scientists viewed their specific role in the opposition movement as being about the diffusion of "accurate" and "neutral" scientific information concerning nuclear energy, rather than questioning its epistemic, political and social rationales. One commentator explained in a counterculture periodical in 1977 that physicists and engineers resorted to counter-information because they "realized that, whether they deplored it or not, a good part of the public still trust[ed] experts" (Anon. 1977c, 6). These scientists and engineers were thus placed in a delicate position, capitalizing on their public legitimacy as professional scientists, while trying at the same time to convey the message that scientific experts should not be trusted, uncritically.

Their attempts to transform representations of nuclear power safety involved a different idea of masculinity than the physical virility of confrontation with police forces and sabotage of installations, perhaps reflecting the fact that scientists involved in counter-information were mostly of an older generation. The scientists who were members of one of the most active counter-information groups (l'Association pour l'Appel de Genève, APAG) were born between 1918 and 1933, whereas the activists involved in sabotage and violent confrontation of police forces were mostly born in the late 1940s and 1950s.

The efforts of APAG rested on a paternalist attitude towards the public, which was deemed ignorant and in need of instruction about the scientific truth. In this common "deficit model," shared by official nuclear experts and counter-experts alike, the public was considered unable to fully understand technical arguments, let alone scientific disagreements, and thus required the guidance of truly competent experts (Wynne 2006). As one anti-nuclear activist, criticizing the technocratic state's paternalism, put it: "Society is divided between those who know, and those who are to be managed" (Avrillier 1990, 8). For activists it was crucial to discredit the scientists who were active in promoting the "public understanding of science," which essentially meant "public appreciation of the benefits that science provides to society" (Lewenstein 1992). Activists' intense efforts to inform the public about nuclear science and technology mirrored those of official experts: the two sides shared the view that "information" provided by "experts" would suffice to determine public opinion on the issue.

Activists deplored the fact that almost all the "technically competent experts had ties to circles [milieux] directly interested in the construction of nuclear power plants." They claimed that informing the population required the participation of "independent scientists" and an "independent scientific institution" to be created at the European level to evaluate the pros and cons of Superphénix (Anon. 1977c). The construction of the "independent expert" accomplished three things in the debate about nuclear power. First, it prevented the existing critique of the experts and scientists supporting Superphénix from becoming an indictment of science per se. In other words, it deflected the critique of science towards a critique of the corruption of science by special interests, governmental or corporate. In doing so, the notion of the "independent expert" reaffirmed that science—unless it was tainted by conflicts of interest—was an intrinsically neutral enterprise and could thus provide the objective information needed for a democratic deliberation. It limited the question of knowledge bias to that of conflicts of interest while rendering invisible the fact that science expertise and engineering was particularly trusted by men. Second, even though the anti-nuclear scientists admittedly had no experience with the specific technical issues at stake, they positioned the entire scientific community, as long as it was "independent," as a valid source of information on the issue of nuclear power. The simple fact of being a "scientist" would make someone qualified to speak authoritatively on the special issue of nuclear power; this reflected a shared paternalistic attitude among scientists that identified basic science as the foundation of technology. Third, it paved the way not only for a confrontation between traditional experts who supported Superphénix and a new breed of "independent experts," but also and importantly for the emergence of counter-expertise based on original empirical measurements of the consequences of nuclear power.

Some of these scientific activists were well versed in nuclear physics, but even they faced opponents of formidable strength and means in the field of scientific argumentation. A report published by experts working for the consortium running Superphénix, in advance of a public hearing, illustrates the extraordinary reach of their expertise (NERSA 1993). At more than five hundred pages, the report put forth quantitative evaluations of an immense variety of issues, ranging from the most obvious technical ones pertaining to the functioning of the reactor, to risk assessments, to geological surveys, even including surrounding air-traffic maps, detailed sociological studies of the Superphénix personnel, structural studies of the buildings, inventories of the agricultural crops growing around the site, and a detailed breakdown of the residents' diets (70 grams of carrots per day per person). The results of these studies were presented in full-page maps (see figure 2) and through a plethora of graphic presentations of scientific data including bar

graphs, charts, architectural plans, cross-sections, and other kinds of scientific illustration (data visualization virtuosos Jacques Bertin and Edward Tufte would have been impressed). The range of experts required to assemble such a report—physicists, engineers, geologists, sociologists, agronomists, economists, psychologists, and graphic designers—was quite unique and far beyond the means of any activist group. The strategy of "carpet bombing" the discursive landscape with sophisticated visualizations of quantitative information, putting the power to official experts on full display, must have left contemporary readers stunned.

For expert and counter-expert men, masculinity was performed though the establishment of authoritative truth and the personal domination of other men. As one activist put it, "Raymond Avrillier studied the entire safety report of Malville. He is now stronger than the power plant guys" (Ollitrault 2015, 90). In the 1970s and '80s, the expert debates organized in France and Switzerland almost all exclusively featured men, as counter-experts tirelessly pointed out, the official experts had a vested interest in the preservation of nuclear energy plants, which constituted their main source of status and income. But what neither experts nor counter-experts pointed out was the fact that nuclear science and engineering was almost exclusively men's territory, and that both sides derived privilege and power from the situation. In the women's health movement, by contrast, activists were prompt to underline the fact that the medical profession was dominated by men, and thus they campaigned in favor of a better gender balance and, even more importantly, creatively challenged the epistemic grounds on which rested the scientific and medical authority of the medical profession (Morgen 2002; Kline 2010; Nelson 2015).

The anti-nuclear movement pointed to both men and women who resisted their views but portrayed the sexes very differently. In a series of satirical portraits entitled the "The Imperturbables," we encounter "a Swiss housewife, who cooks—as she was taught—with electricity" and "a [woman] democrat who believes that the Atom is in the control of the people." In contrast to these naïve and subservient female characters, sample men include "an optimistic technocrat who has faith in science to solve problems," "a researcher who does not get involved in politics," "a simply respectful citizen," and "one who trusts specialists" (Anon. 1981–1982). Unlike the activists of the women's health movement, anti-nuclear male activists saw expertise as the domain of men alone. As counter-experts themselves—they had no reason to challenge the epistemic foundations of science—it served them well.

When activists reflected on their counter-information efforts, they also used highly gendered imagery. In 1988, after activists testified before a parliamentary commission in Geneva, an anti-nuclear newsletter illustrated the hearing by a short comic strip: an egghead, representing a counter-expert, talks about energy to an impassive deputy, who finally punches him in the face (ContrAtom 1988). Even more explicit was the parody of the Astérix comic series, Astérix and Nuclear Power, published for the first time in 1978 (Spennemann 2015). The Roman empire's attempt to build a nuclear site next to Astérix's small village in Gaul results in numerous battles between Astérix and his male friends and the Roman legions. But in the end, the women in the village revolt against their marginalization until the reluctant village chief turns over to them the invincibility potion prepared by the "men's kitchen," to which the chief's wife replies, "Don't brag about it, science won't rest for much longer exclusively in the hands of men" (Vol and Plagiat 1980, 40).

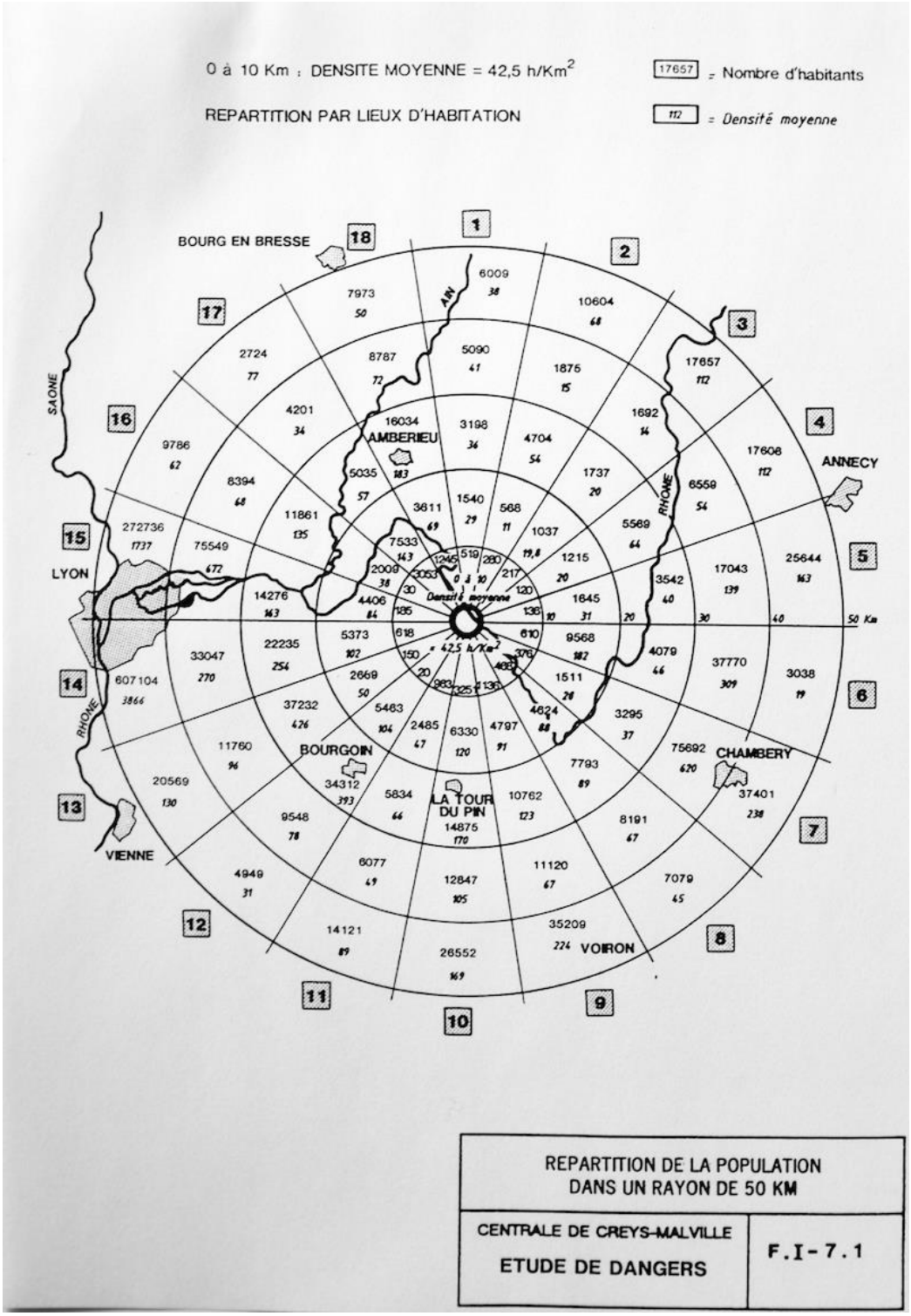

Figure 2. One of many data visualizations included in the NERA's expert report on Creys-Malville, here representing the population density within a 50 km radius of the nuclear power plant (Geneva lies just beyond). (NERSA 1993. "Rapport d'enquête." Source: Archives contestataires, Genève).

Forms of Dissent: Counter-Expertise

Once they realized that they faced a battalion of extraordinary scientific might, anti-nuclear activists turned to a different strategy: the production of original scientific data. Their goal was less about producing an alternative view of nature—although that was certainly an objective—than about destroying the credibility of "nucleocrats," the official experts, as they had previously tried to do with counter-information. As the American geneticist and Harvard professor of biology Richard Lewontin put it in 1968 "Science is a form of competitive and aggressive activity, a contest of man against man that provides knowledge as a side product" (Lewontin 1968, 2).

In protests, gender codes also played an essential role. Many men, but also some women (Krasniewicz 2018), adopted a mode of protest that was more destructive than constructive, entailing a clash against persons in the attempt to gain dominance over them. This strategy was obvious in the case of street protest and sabotage but also—in more subtle ways—for empirical counter-expertise. A decade earlier in the women's health movement, the production of empirical knowledge served a different purpose. The self-help group initiated by Rina Nissim in Geneva, for example, promoted vaginal self-examination to raise awareness among participants about their health, to foster a sense of empowerment, and to develop alternatives remedies that could be adapted to their personal conditions (de Dardel 2007). The larger women's health movement did engage with male-dominated medical practice, sometimes in very personal terms, but counter-expertise was not primarily conceptualized as a weapon of domination, it was a resource to care for oneself and make a political statement. In that sense, counter-expertise contributed to the fact that "the personal is political" as the Women's Liberation movement so aptly put it.

For counter-expert men in the anti-nuclear movement, the political was often personal too, but in a very different way. The personal was a fight of egos, as Lewontin pointed out. Dominating other men was a political contest over who counted as a legitimate scientific expert. Activists attempted to discredit state experts, and state experts did the same with activist counter-experts. A group of antinuclear scientists and engineers (all men), the APAG, produced numerous reports on nuclear safely, but their main message was that official experts could not be trusted. They highlighted the fact that "governments and their experts" had failed to predict the incidents at Superphénix and noted ironically that the Chernobyl accident "never should have taken place, since it had not been foreseen by the experts" (Borel 1988, 3). The indictment of official experts was often personal, as they were mentioned by name.

Governmental and industrial actors followed the symmetrical strategy against counter-experts. As a physicist member of the APAG lamented: "Pro-nuclear organizations did their best to discredit the author of the independent expertise, the Prof. Jochen Benecke, instead of calmly discussing the content of his report" (Lehmann 1989, 8). The President of the Swiss Society of Nuclear Engineers (SOSIN) attempted at length to disqualify Benecke, charging that he was paid to write the report and that he had been an anti-nuclear activist for many years (Anon. 1989). To reaffirm its authority over nuclear matters, in 1995 the Swiss federal government organized a carefully orchestrated debate on the safety of Superphénix. Activists challenged in advance the legitimacy of the state-appointed panel of experts and attempted, with partial success, to have their own experts invited. After the debate, a member of ContrAtom concluded that the debate "had only one consequence: to definitively discredit the experts of the Swiss government" (de Marcellus 1996).

A few weeks after the Chernobyl accident, which took place on April 25–26, 1986, activists from various environmental, peace, and anti-nuclear groups in Geneva announced the creation of ContrAtom. A year later, ContrAtom decided to set up a radioactivity measuring station "for around-the-clock environmental radiation monitoring" for beta rays (ContrAtom 1987, 1). In a transnational coordination with German and French groups, ContrAtom planned to regularly publish the results in the press, because "like the measurements of air quality, the observed results might well hold some surprises!" (ibid.). But the measurements did not show any abnormal level of radioactivity, which the activists attributed to the limited sensitivity of the device, as the meagre budget of ContrAtom did not allow for the purchase of a more precise instrument.

In 1990, ContrAtom contracted with the CRII-RAD (Commission for Independent Research and Information on Radioactivity), a French NGO that specialized in radioactivity monitoring. Also created in the aftermath of the Chernobyl disaster, the CRII-RAD strongly believed that objective science could settle socio-technical issues and focused on providing scientific information to the public and producing new empirical data. Growing out of a grassroots anti-nuclear movement, CRII-RAD continued to have strong ties to local activist groups while anchoring itself in universal science (Brunet 2005). CRII-RAD funded its activities through counter-expertise mandates commissioned by various organizations. The repeated use of the term "independent" and the performance of empirical measurements were key to its political positioning. But once again, the data it produced was mostly used to confront individual nuclear experts and challenge their authority.

In April and July 1990, the CRII-RAD sampled water and sediments from the Rhône, as well as lichens, mosses and soil from around Creys-Malville (CRII-RAD 1990). The levels of the radioisotope Caesium 134, a byproduct of nuclear fission, and Caesium 137 were found to be similar to those measured elsewhere in France. These findings, though perhaps disappointing for the anti-nuclear activists, were exploited by them to pinpoint discrepancies between the CRII-RAD measurements and the official values released publicly by the French Radioprotection Agency (SCPRI). The official measurements of the SCPRI just after the Chernobyl disaster had not detected any Caesium 134 and the values for Caesium 137 were twenty times lower than those measured by the CRII-RAD.

The public performance of radioactive measurements and analysis fostered the identity of the CRII-RAD as a counterpower to the nuclear state. The CRII-RAD concluded its report, widely circulated to the media, with a point that was repeated several times: "The inability to monitor and accurately analyze a situation of crisis strips the SCPRI of all credibility to be in charge of the monitoring and control of nuclear installations in France" (ibid., 1990). The scientific counter-expertise carried out by the CRII-RAD was used less in an attempt at understanding the environmental and health consequences of radioactivity, than in an assault on official experts aimed at undermining their credibility. Perhaps now the question of nuclear energy could be shifted away from technical issues and back to political ones.

The laboratory of the CRII-RAD, headed by the former airline pilot François Mosnier (husband of the CRII-RAD president, Michèle Rivasi), continued its line of attack on the SCPRI and especially its director, the professor Pierre Pellerin, the public face of governmental radioprotection in France after Chernobyl. In 1990, it sampled sediment from the Rhône upstream and downstream of Creys-Malville and sent the samples to be analyzed by an academic laboratory in Germany. The results showed a more than two-fold increase in plutonium downstream, suggesting that Superphénix was secretly releasing radioactive waste

into the river, which would have been illegal under French law. These surprising results made headline news in the local and national newspapers.

The secrecy surrounding the release of radioisotopes from Superphénix made it possible for counter-experts such as the CRII-RAD to occupy the media space with their results in a powerful performance of "independent" scientific expertise. In this space, the contestation between experts and counter-experts, masculinity was expressed as a virile domination over other men, and the confrontation became highly personal. In a letter to the Director of Creys-Malville, Pellerin vehemently challenged the results produced by the CRII-RAD (Pellerin 1990). First, he argued they were not statistically significant since they were based on just two samples (the anti-nuclear groups did not have enough funding to have more samples analyzed). Second, the measured value was lower than the permitted level for drinking water. Third, the isotopic ratio was the same upstream and downstream, indicating that it originated from atmospheric nuclear tests carried out between 1961 to 1963, and was not released from Superphénix, which used plutonium with a much higher isotopic ratio.

The CRII-RAD did not flinch. After all, as the CRII-RAD had previously pointed out, the SCPRI in the person of Pierre Pellerin had demonstrated its incompetence at the time of the Chernobyl disaster, so why should Pellerin be trusted now? The CRII-RAD brushed aside Pellerin's empirical arguments and requested that he provide proof that the SCPRI was actually monitoring plutonium levels. In 1989, the French prime minister had ordered that all measurements of radioactivity in the environment be made public. With this, the CRII-RAD cornered the SCPRI: either it was measuring plutonium levels and not reporting them—thus breaking the law—or it wasn't measuring plutonium levels and could be accused of negligence. As Raymond Avriller, an anti-nuclear activist and elected politician in Grenoble put it in a report calling for the ousting of Pellerin, the SCPRI "demonstrates at least its incompetence, if not its desire to hide the truth." The ante was being upped in the male-against-male fight between the experts and the counter-experts. As Raymond Avriller put it, commenting ironically on the preliminary plutonium results: "I am worried for the integrity of the Chief of the Creys-Malville power plant who told me, a few months ago, 'M. Avriller, if you find plutonium downstream of Malville, I'll cut my balls'" (Avrillier 1990).

Some activists believed that the scientific truth emerging from such confrontations would necessarily turn out to be aligned with their political views. But others cared less about the resulting scientific truth than about destabilizing the overall position of experts and the power it lent to the state. Because, in the end, the discourse over nuclear power was rarely just about nuclear power, but about the kind of society that made it possible. As Chaïm Nissim put it: "The dream [of the anti-nuclear movement] is to introduce a tiny grain of sand, delicately, with love, in just the right place in the squeaking mechanism of nuclear power, of industrial power, of the military-industrial power—let's say, in short of heavy and centralized power" (Nissim 2004, 9). Indeed, "nuclearity," as Gabrielle Hecht put it, was so essential to French national power and identity (Hecht 1997), and to a number of other nations including Switzerland, that it became a privileged target for those who wanted to destabilize the state or transform society more profoundly. Anti-nuclear activism was never only about nuclear power: it was a way of opposing the state and especially its technocratic aspirations (Touraine 1980). Yet, what activists portrayed as a battle against nuclear and state power was almost always a personal contest of "man against man."

Conclusions

The three modes of protest discussed in this paper—sabotage, counter-information, and counter-expertise—all reflected traditional Western views of masculinity. It is rather unsurprising that the sabotage of nuclear installations and the physical clashes with uniformed men reflected confrontational values. More surprising is the fact that counter-information and, even more so, scientific counter-expertise was also grounded in a similarly confrontational view of masculinity. This is where the comparison with the women's health movement is most illuminating.

Beyond their superficial similarities, counter-expertise in the women's health and anti-nuclear movements were fundamentally of different kinds. Part of the difference between the two movements had to do with strategy, i.e., the decentralization of power over women's health care versus the centralization of power over nuclear regulation. These movements also relied on different epistemological commitments. The feminist self-help movement questioned how scientific knowledge was produced by creating "alternative," but still "scientific" investigative practices (Murphy 2004, 126). Overall, the women in this movement kept negotiating the epistemic and political tensions arising from their commitments to alternative as well as orthodox modes of knowledge production. By contrast, this paper has shown how the counter-expertise proposed by anti-nuclear activists worked strictly within the norms and values of institutional science and staked their legitimacy precisely upon this alignment with the scientific institution. But the use of scientific knowledge in counter-expertise was no less gendered in the anti-nuclear movement than in the women's health movement. In the anti-nuclear movement, a specific kind of discourse and protest—confrontational, destructive, domineering, bombastic—can also be understood as a performance of a specific, traditional Western view of masculinity that was shared by official male experts and their opponents. Unlike the women's health movement, which aimed to produce alternative knowledge about the world, the counter-expertise of anti-nuclear protest was about confronting and dominating official experts.

The contradictions that emerged between the counter-experts' measurements and those of "official" experts were not a side effect of their search for the truth, but the *raison d'être* of their empirical investigations. Their target was expertise itself, embodied in the men who represented nuclear expertise. In the view of anti-nuclear activists, experts employed by the state would always support the state's technological choices and oppose alternatives. Thus, for those who hoped to change society's technological infrastructure—which they identified as a major buttress of centralized systems of power—undermining the credibility of state experts was key. As one physicist, a member of ContrAtom, put it: "The resort to experts is characteristic of a risk society in which the citizen is no longer able to understand what is happening to him. These experts enjoy a situation giving them a salary and importance. They are first and foremost interested in keeping the situation as it is" (Lehmann 1989, 2). In other words, it was an illusion to hope that the findings of official scientific experts would contradict technological choices made by the state: "You don't ask Dr. Frankenstein to write a pamphlet against monsters" (ibid., 1989, 9). Even though "Dr. Frankenstein" (the official experts) never suggested to abandon the creation of "monsters" (nuclear power plants), they did, however, occasionally oppose the utilities companies on specific technical points (Foasso 2012; Mehta 2004). Yet, true to Mary Shelley's 1818 novel, *Frankenstein; or, The Modern Prometheus*, where the monster declares to Dr. Frankenstein "You are my creator, but I am your master" (Shelley 1982, 165), nuclear experts seem to have almost all submitted to nuclear technology and never questioned its very

existence. The activists' opposition to nuclear energy in general, thus also challenged the nuclear experts' professional existence.

The tactics of protest in the anti-nuclear and women's health movements do not reduce to "masculine" and "feminine," respectively; nor did men rely exclusively on "masculine" and women on "feminine" tactics. In both movements, men and women drew on a wide repertoire of variously gendered tactics. Moreover, individual activists engaged with variously gendered modes of protest. The activist Chaïm Nissim fired missiles at Superphénix and sabotaged electrical pylons, but he also participated in sit-ins and die-ins, used humor and poetic lyrics, and acted in the traditional political arena as an elected parliamentarian for the city of Geneva (Jansen 2018). The present paper focused mostly on anti-nuclear protest, and it remains a topic for further research to explore how masculinities and protest played out in other protest movements involving science and technology, such as the peace or environmental protests.

The confrontational masculinity expressed by nuclear experts and counter-experts did little to advance the conversation on how scientific knowledge should be situated politically. By hanging on to the idea that scientific knowledge is a neutral weapon in political fights, experts and counter-experts prevented any profound reformulation of the epistemologies of science such as those that emerged in the women's health movement for example. And by embracing a utopian vision of scientific knowledge, aiming at the virile domination of men by other men, and adopting paternalistic masculinities, nuclear experts and counter-experts probably did more to weaken the authority of scientific knowledge than they intended. At a time when we may feel nostalgic about the past ability of science to speak truth to power, it remains to be explored not only what has been gained by the multiple critiques of science since the 1960s, but also what has been lost.

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