# The Atomic Archipelago

The Archipelago of La Maddalena is a group of seven islands and islets located offshore the northeastern corner of Sardinia, on the Italian side of the Strait of Bonifacio. In the early nineteenth century, the archipelago became an important naval station. During the Napoleonic Wars the small Sabaudian fleet established its hub in La Maddalena, and a few decades later the royal navy transformed it into a maritime fortress, with an annexed arsenal. After World War II, the permanence of the Italian navy bases secured the economic future of the islands and the continuity of their military traditions.[1]

The Cold War added another layer to the history of this strategic naval outpost, which is the subject of this book. In 1972, under an executive secret agreement with the US government, Italy allowed the US Navy to install a Naval Support Activity base in the bay of Santo Stefano, where a ship's tender performed refit and repair operations on "fast attack" nuclear submarines associated with the Sixth Fleet.[2] The mission of the Sturgeon and Los Angeles class submarines—the "hunter killers," as they were named, for their ability to chase down the enemy—was to surveil Soviet underwater activities in the Mediterranean.

US and Italian defense officials determined that La Maddalena offered favorable conditions for the installation of a new base due to its
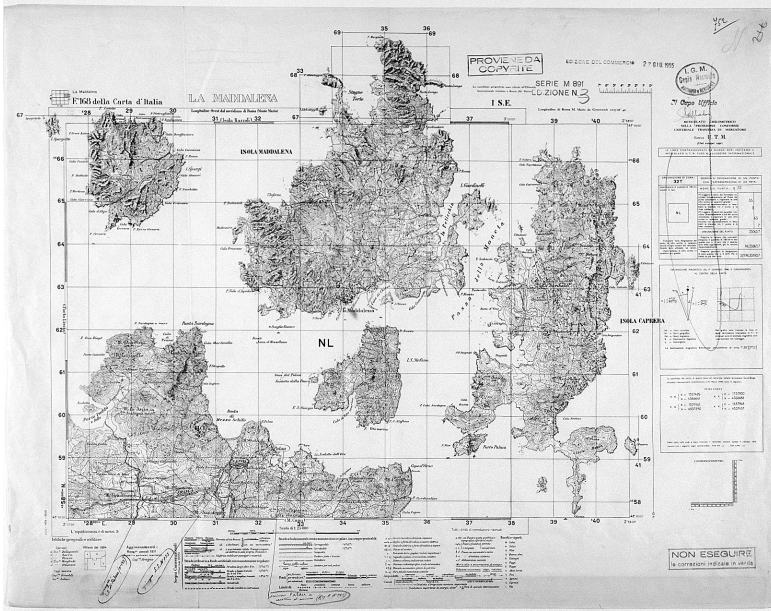
I.2. La Maddalena, Santo Stefano, and Caprera. *Source:* Istituto Geografico Militare, 168 I-SE (La Maddalena), Year 1931, Series: 25V. Authorization number: 7091.

strategic position and the local community's habituation to living in a militarized place, which seemed to guarantee a peaceful coexistence with the new "guests." However, when the agreement between the two governments was revealed, the Italian left, environmental activists, and sectors of the scientific community raised questions about the radiological safety of northern Sardinia. Accused of having made the decision to host a foreign nuclear base without any parliamentary debate, the Italian government defended its choice by reasserting the country's obligations to the North Atlantic Treaty Organization (NATO) alliance and provided risk assessment reports (with the collaboration of conniving experts) that swiftly denied the existence of hazards for the local population and the environment. The effort to demonstrate the innocuousness of the US nuclear submarines proved unsuccessful as several radioprotection experts expressed doubts about the neutrality and the scientific validity of the government's sources. Most antibase parties and environmental activists followed suit and instead of using the leitmotif of US imperialism, decided to bolster their arguments by focusing on radiological safety and the lack of transparency of the US Navy operations in the archipelago. Between 1972 and 1974 La Maddalena became one of the most controversial US Navy posts of the Cold War.

In the following years, expert and public debates revolved around the design and the implementation of an environmental monitoring system that the Comitato Nazionale per l'Energia Nucleare (CNEN, Italian Committee for Nuclear Energy) and the Istituto Superiore di Sanità (ISS, Higher Institute of Health) established with many difficulties only in 1979. The initial lack of environmental data pushed Italian experts to conduct a lengthy survey of the archipelago and later to adopt unusual research strategies to cope with organizational shortcomings, scarce human and technical resources, and classified information regarding the reactors and operations of the US nuclear submarines. Military secrecy and the haphazardness of the Italian nuclear program delayed and ultimately limited the efficacy of the monitoring system, which worked under severe technical and political constraints. In this context, rumors of malfunctions and allegations of connivance between expert agencies and military authorities fed distrust toward the radiosurveillance program among La Maddalena's residents.

Relying on the strength of popular antinuclear sentiments—culminating in the post-Chernobyl referendum that halted the operations of Italian nuclear plants—in 1988 the Region of Sardinia promoted a consultative referendum over the permanence of the US Navy base. Worried about the political implications of the initiative, the Italian government appealed to the constitutional court, which ruled that a regional constituency could not express their views about an international agreement between the Italian state and another sovereign country. Even after suspending its nuclear program, Italy denied Sardinians the possibility to vote on the permanence of a foreign base for nuclear submarines in their region.

In the 1990s the strategic objectives of the US Navy changed. Established as an antisubmarine warfare and surveillance node at the height of Cold War tensions over the control of the Mediterranean and the Middle East, the base of La Maddalena was repurposed to assist military operations in the Persian Gulf and in Africa.[3] Local opposition, usually minoritarian among long-term inhabitants, became particularly active in 2003 when the nuclear submarine USS *Hartford* ran aground in the archipelago's waters. The accident—which US and Italian military authorities kept secret for two weeks—did not have environmental consequences but provoked unprecedented and widespread concern due to the contradictory results of the first radioecological reports that state and independent researchers produced one month after the event. The mismanagement of the postaccident phase, besides discrediting military and scientific institutions, offered local antibase protesters the opportunity to discuss openly the risks involved in the operations of the US submarines and

the limits of the environmental monitoring program established in the mid-1970s. Following a major reassessment of its global basing strategy in 2005, the Bush administration—almost unexpectedly—decided to close the base, which was finally decommissioned in 2008. Like other communities strongly dependent on militarized economies, after the decommissioning of the US base and the progressive downsizing of the Italian navy presence, La Maddalena entered a painful and seemingly endless transition: loss of jobs, depopulation, and a drastic reduction of vital services make it hard to reimagine the future of the archipelago.

Several expert agencies, both military and civilian, have monitored environmental radioactivity levels in La Maddalena for over thirty years and always found that the quantity of radioactive isotopes in the area was negligible from a sanitary point of view. In sum, no single study has ever shown that the presence of nuclear submarines caused a relevant increase of radioactivity. In May 2017, five years after I completed my fieldwork in the archipelago, a group of local historians invited me to La Maddalena to present my study in public. At the end of the conference—the *municipio* was filled with people—a former mayor of La Maddalena, who was also chairing the panel, tried to wrap up my presentation: "So, we heard what Dr. Orsini found and everybody, I think, should feel reassured that the base did not have any negative effects on our community, as many of us kept repeating for decades, despite the alarms created for political and ideological reasons." I did not have the time to reply then, but many in the audience responded with a buzzing noise of disapproval and the shaking of their heads.

So, why study the case of a base for nuclear submarines that did not have negative environmental and public health consequences rather than leave it to the past, where it belongs? One obvious answer is that the risk implications imposed on the local community in the name of Italy's Atlantic position cannot be silenced or justified after the fact just because the base did not cause serious environmental and health effects. The elementary and fundamental rights of the Maddalenini to know what risks they were running and to feel safe were not always guaranteed. The story I tell in this book is, at least in part, a way to acknowledge that and to analyze aspects of Italy's Cold War history that have so far remained unexplored.

In *The Atomic Archipelago* I examine the environmental monitoring system set up by Italian expert agencies as a prism to explore the ecological, political, and social implications of the US military presence in Italy during the Cold War and beyond. I document the multiple—and sometimes conflicting—meanings of nuclear power and technology that emerged in everyday encounters with radiological risk, from the perspec-

tives of long-term residents, local administrators, US Navy personnel, and Italian experts who lived and worked in La Maddalena from the early 1970s until 2008. Using radiological risk as a historical tracer, I endeavored to reassemble the sociotechnical systems that sustained the deployment of US nuclear weapons and military outposts abroad, to explain the politics of knowledge production in Cold War Italy, and to shed light on practical aspects of the Italian nuclear program, such as the work of radioecology experts in the field, that so far have not received the attention they deserve.

The submarine base offered Italian radioecologists and radioprotectionists a unique training opportunity, as they mounted a laboratory to monitor potential radiation releases around the site. Experts worked under severe constraints of military secrecy—jointly if unevenly maintained by the US and Italian militaries—and the radiosurveillance system suffered from the inadequate organization of the Italian nuclear program, including lack of technical infrastructures and expertise in peripheral places like Sardinia. These conditions shaped which and how knowledge was produced and how it did or didn't travel. The radiosurveillance system of La Maddalena, I argue, was the result of profound compromises between public safety and military security; it was not just a technical solution to the problem of radiological safety but the material instantiation of a technopolitical compromise between military security and public safety, in the sense that it was neither the result of a strategic political design to conceal military secrets nor a strictly technical solution, but combined elements of both.[4] For one, Italian radioecologists working in La Maddalena adapted routine radiosurveillance protocols to an unusual situation in which information was limited because of external constraints. Furthermore, the design of the radiosurveillance system resulted from the institutional arrangements of the Italian nuclear program and the epistemological approaches of Italian radioecologists during the 1970s.

The case of La Maddalena was not strictly unique. During the Cold War, the US Navy installed other bases overseas through the legal sanction of bilateral agreements with allied governments.[5] There, similarly to La Maddalena, the imperatives of military security often obstructed the application of standard radiosurveillance protocols implemented around civilian nuclear sites.[6] My analysis, however, runs against the assumption that the global outreach of the US basing strategies had uniform effects everywhere.[7] Transnational and global approaches to Cold War studies have finally started to recognize the importance and active role of local communities, organizations, and environments in coproducing knowledge and systems of power, including the experiences of actors who often disappear in the flat, bipolar world of top-down diplomatic histories.

Exploring the "lumpy world" of knowledge production and movement (or lack thereof) during the Cold War—and in other periods—involves attending to the material entanglements of technoscientific practices; explaining their meanings, causes, and effects in different contexts; and including case studies outside the domain of the anglophone world (and its archives).[8]

This study moves a step in that direction by offering a close examination of expert and nonexpert understandings of risk in the making. The story I tell in the following pages reveals the obstacles that nuclear experts found in applying their methods in the archipelago's political and environmental conditions. By following the work of radioecologists and radioprotectionists in labs and in the field and comparing the situated and practical applications of technoscientific protocols with standard national and international regulations, this research reveals the contradictions, the organizational features, and the epistemic cultures that characterized the trajectory of the Italian nuclear program in distinctive ways. This allows me to take into account the mutual effects and interactions of international and national nuclear regulatory regimes and scientific practices as well as the contributions and uses of technology to embodying and enacting political goals and to shaping power relations between Italy and the United States, and (within Italy) between center and periphery.[9] Finally, I advance a novel phenomenological approach to the study of risk, aiming to overcome established assumptions about the role of essential epistemic divides in sociotechnical controversies between experts and nonexperts. The semiotic approach to risk that I propose here focuses on practical processes of signification in which both experts and nonexperts use material signs to objectify and represent risk in tangible ways.

The narrative and the organizational structure of the book reflect my effort to include local, regional, and transnational levels of analysis. The sources and the stories mobilized for this study emerge from peripheral (to the canonical institutional and diplomatic histories of the Italian nuclear program) places and archives to reveal the daily work and struggles of unknown experts, anonymous soldiers, Italian citizens, and bureaucrats whose role has been as important as that of known scientists and preeminent political figures, that appear more frequently in studies of Cold War Italy. In the rest of this introduction, I describe the central themes of the volume, its major arguments, and its organization.

NUCLEAR ITALY UNSEEN

In *The Atomic Archipelago* I bring Italy back into a global and more theory-oriented discussion of the meanings and effects of nuclear power and its applications during and after the Cold War. Existing histories of the Ital-

ian nuclear program have focused almost exclusively on the institutional life of expert agencies and on diplomatic and domestic struggles among scientific and political elites over the development of nuclear technology. There are two main historiographical interpretations of the parable of the short-lived Italian nuclear program: The first attributes its failure to conflicting political and economic interests (both domestic and international) behind Italy's energy production. The second, usually advanced by convinced nuclearists, maintains that irrational fears fomented by antinuclearist groups—especially after the Chernobyl accident—guided the majority of Italian citizens to vote against the continuation of the nuclear program in the national referendum of 1987. Behind these explanations are research traditions that, with a few exceptions, look alternatively at elite struggles and democratic protest in isolation and ignore the tensions that—even inside nuclear agencies—existed between technocratic and democratic views of nuclear power since its inception, and even more so during the 1970s.[10]

Looking at radioprotection and radioecological practices in the environment of La Maddalena allowed me to overcome the most important limitation of current Italian nuclear studies: the treatment of nuclear technology as a black box, a mere political instrument, whose technical characteristics are relegated to the rank of historical curiosity. In this study, I instead look inside nuclear technology as the embodiment of complex sociotechnical systems that allowed its development, applications, and deployment in one place, including the disputed claims about its effects on the environment and public health. Moving beyond the mere documentation of formal institutional arrangements and elite storytelling involves adopting a more localized approach that allows us to adopt different scales of analysis and to have a better grasp of the everyday experiences of communities of experts and nonexperts simultaneously.

While I agree that bottom-up approaches are not inherently superior to diplomatic histories, I am convinced that looking at the deployment of nuclear technology and the implementations of regulatory regimes on the ground offers a perspective that so far has been sorely missing in Italy. I deem it crucial for scholars of science and technology to move beyond mere discursive analyses of the history of nuclear politics and to engage more directly with the material entanglements, experiences, and affordances that contributed to shaping expert and nonexpert conceptions of nuclear technology.

LA MADDALENA AND THE POLITICS OF SCIENCE IN COLD WAR ITALY

The widespread identification of the archipelago's inhabitants with military institutions did not prevent a minority of Maddalenini from oppos-

ing the US nuclear base immediately after its installation. With the help of expert activists who denounced the inadequate safety protocols set up to monitor the archipelago's environment, they were able to open a controversy over risk assessment. The articulation of these critical positions by both expert activists and local opposition underscored immediate objectives, such as the removal of the US base from the archipelago, but also reflected widespread social concerns. Between the end of the 1960s and the beginning of the 1970s, analogous to other public interest movements in the United States, inside Italian research centers and agencies, experts started to interrogate their role in society and pushed for a democratization of technoscience.

The politics of science emerged as a central theme in Italian public debates especially during the years of contestation, although the problem was not new.[11] Normative and formal understandings of objectivity in technoscientific knowledge production underwent a scrutiny in the late 1960s as the political ferment of student revolts, the movement against the Vietnam War, and the birth of political ecology shaped more critical perceptions of the presumed neutrality of technical knowledge and of the relationship between science and progress.[12] This critical rethinking of the social and environmental responsibility of technoscience became politically influential with the formation of what Kelly Moore, in discussing the United States, has called "public interest science organizations," like the Scientists' Institute for Public Information (led by biologist and political ecologist Barry Commoner), the Union of Concerned Scientists, and Science for the People.[13]

In Italy, where the articulation of social conflicts and the life of political institutions was much more structured around parties and labor unions, groups who advocated a democratization of science were often active members of national political organizations within professional societies, public companies, and state agencies. In research laboratories, scientists, technicians, and workers created union chapters and party cells, sometimes in coexistence with autonomous and more radical collectives, who contested the hierarchical structures of research institutions and universities, and their subservience to American capitalism and its military-industrial complex. Political occupations of university buildings, laboratories, and research centers were quite common. In 1969, for example, a group of occupants started a five-month protest at Casaccia, CNEN's biggest research center, against the exploitation of workers and technicians and the subordination of the agency to the "capitalistic mode of knowledge production."[14] Also inside ISS, the instances of change promoted by the 1968 movements inspired political initiatives and vibrant debates about the future of the institute and its role within Italian society.[15]

The activity of contestation and the proposals of expert activists were more frequently—but not exclusively—associated with parties, unions, and collectives on the left of the political spectrum. Among more organized and institutionalized parties, the Partito Comunista Italiano (PCI, Italian Communist Party) discussed systematically the necessity to reform the school system and the health system, and to reorganize technoscientific research around strategic national goals.[16] The conference "La ricerca scientifica e la società in Italia" organized in Ariccia (outside of Rome) on March 20–22, 1970, was the first organic attempt by the PCI to catch up with the wave of youth protest and to establish a structural alliance between students, researchers in the public sector, and workers.[17] In presenting the objectives of the event in the pages of *L'Unità*, Giovanni Berlinguer explained that Italy's science policy needed to move past the legacy of fascist autarchy and the current subordination to American technoscientific power. Berlinguer affirmed that technoscientific research could find its fundamental raison d'être in "the human needs of the masses to imagine an alternative use of science. This is why an alliance of workers, students, and all citizens with the movement of researchers and scientists is an urgent necessity."[18] Almost two years later, another important conference titled "Uomo, Natura, Ambiente: Ecologia e Rapporti Sociali," organized at the PCI's headquarters of Frattocchie, signaled the party's shift of attention to the emerging world of environmentalism.[19] But a strategic and organic alliance between the labor movement (traditionally concerned with occupational safety) and political ecology had to wait until the second half of the 1970s, after the Seveso disaster of 1976 and the formation of Lega per l'Ambiente in 1979, of which Berlinguer was one important promoter.[20] The mid-1970s were also fundamental years for the formation of the ecological movement in Italy, which built its political platform and consensus around the antinuclear protests that local communities launched against the Piano Energetico Nazionale (PEN, National Energy Plan) of the Ministry of Industry and the government's plan to install twelve to twenty new nuclear power plants in ten years.[21]

The divisions and heated debates within Italian research institutes and agencies can be understood only by considering this general context of political mobilization around central questions concerning the role of science and technology in society. Thus, throughout the chapters that follow, the readers will find many instantiations of ideological cleavages within ISS and CNEN and other expert communities. Conflicting ideological orientations and different political affiliations did not prevent individual experts and groups from collaborating with one another, necessarily, but alternative views of the role of science in society undoubtedly

catalyzed alliances between scientists and political activists in distinctive ways. Parties, unions, collectives, and the church organized discussions, aggregations, and cultural elaborations, which defined strategies, platforms, and geographies of knowledge production tied to their worldviews. In the chapters that follow I show how the controversy around the nuclear status of La Maddalena brought to the fore these conflicts, which found expression in two alternative views of nuclear science and technology: the technocratic outlook of high cadres, who conceived of technoscience as an exclusive expert business, and the democratic approach, typically advanced by leftist researchers working in the public sector.

ITALY AND US MILITARY BASES

Scholars of the Cold War largely agree that the United States exercised its hegemonic role (with various outcomes) through a variety of tools: military, diplomatic, cultural, economic, which do not necessarily fit within formal definitions of colonial empires. For example, historians of science and technology have documented how the United States' active participation in rebuilding Europe's technoscientific capabilities after World War II was not just inspired by the universal principle of sharing knowledge for the betterment of human life, or by an idealistic appeal to universal progress, but was primarily guided by more mundane objectives like shaping Europe's development according to US interests.[22] More traditional Cold War historiography has offered representations of US hegemony in Europe mostly in terms of "Americanization," cultural colonization, and economic and military dependence.[23] These studies present only cursory descriptions of the environmental problems that local communities often experienced in relation to the deployment and operation of US military personnel and infrastructures.[24] To move beyond formalistic comparisons of the United States' global military and economic outreach after World War II with other empires, in this study I examine empirically the deployment of US military bases overseas to, first, document the localized "imperial effects" of US global military, geopolitical, and economic strategies; and, second, introduce themes and actors usually excluded from prevalently top-down diplomatic histories of the Cold War.[25]

Joining the now abundant literature on US overseas military bases, my analysis foregrounds the importance of islands as strategic nodes for the formation of the "US networked empire."[26] US overseas basing strategies during the Cold War (and earlier periods) responded to two related needs. On the one hand, islands allowed for the deployment of armaments, troops, communication networks, and surveillance systems, and provided necessary refueling spots for global intervention. On the other hand, islands were strategic because they enabled the formation of

an invisible infrastructure, a deterritorialized network of stations that appeared far removed from conventional colonial practices of territorial annexation.[27] Military islands are crucial loci for understanding the flexible modes of operation and the legal and extralegal arrangements that allowed the United States—like other empires before World War II—to build its global military outreach and protect its economic and commercial interests, while claiming for itself the status of an anticolonial power.[28]

The Italian government ceded the use of La Maddalena to the US Navy without prior parliamentary debate or approval. This was in part was because in 1954 Italy and the United States stipulated a bilateral infrastructure agreement in implementation of the North Atlantic Treaty. Based on these executive provisions, whose terms remain classified, Italy allowed—and sometimes invited—the deployment of US military personnel and the use of bases on its territory for defensive purposes within NATO's coordinated strategies. After the signature of the bilateral infrastructure agreement, several US and NATO military bases opened on the national territory.[29]

During the Cold War, pro-NATO Italian political elites perceived the deployment of American nuclear weapons on the national territory as a guarantee of defensive capabilities and used it as a diplomatic shortcut for reaching higher international status.[30] For this reason, when the Eisenhower administration proposed "nuclear sharing" to its European allies, Italy actively pursued a special partnership with the United States by offering logistic support and collaboration—such as the installation of nuclear submarine bases on Italian soil and seas. This is in marked contrast to other European countries, such as France, especially after the advent of the Fifth Republic, which were reluctant to enter such agreements.[31]

As early as 1955, Italy and the United States started an exchange of secret executive notes concerning the storage of nuclear weapons and in 1962 the two governments formalized a more detailed Atomic Stockpile Agreement.[32] The deployment of the Jupiter missiles in Gioia del Colle, Puglia, in 1961–1962 and of the Pershing II missiles in Comiso, Sicily, between 1983 and 1987 are well-known examples of the strategic importance that Italian political elites assigned to military collaboration with the United States.[33] Given their visibility and the internal and international opposition they triggered, governmental decisions to welcome the installation of US missile ramps could not bypass public scrutiny. But less visible infrastructures—many of them still operational and repurposed after the end of the Cold War for the "War on Terror"—made possible the implementation of NATO strategies in Italy. Like the small airbase of Ghedi, in Lombardy, used since 1963 as a storage facility for nuclear

warheads, a myriad of "technical facilities" were disseminated across the Italian peninsula for radar interception and communication, submarine surveillance, radio communications, and satellite tracking.[34]

The history of the US Navy presence in La Maddalena is part of this larger Cold War military infrastructure.[35] The US personnel operating at the base could pursue their assigned antisubmarine warfare and surveillance objectives thanks to their coordination with other installations. In northern Sardinia the US Air Force ultra high frequency (UHF) antennas of Mount Limbara, and the US Navy very low frequency (VLF) communication station mounted on the Island of Tavolara (just in front of the Gulf of Olbia) in 1962 (guarded by small US military contingents) guaranteed aerial and underwater communication transmission to and from the base of La Maddalena and other facilities.[36] As was the case with other US military bases during the Cold War, Italian pro-NATO elites delegated technical decision-making about the installation of the US Navy station in La Maddalena to restricted circles of military and diplomatic personnel.[37]

THE POLITICS OF KNOWLEDGE PRODUCTION

The installation of the US Navy base in 1972 did not automatically bestow on La Maddalena the status of a nuclear site. For reasons of military security, the Italian government and the US Navy initially claimed that there was no need for Italian expert agencies to conduct radiation monitoring activities normally adopted for inland nuclear plants. Establishing the nuclear status of the archipelago entailed two years of intense debates, during which only a minority of La Maddalena's residents seemed to be actively involved—namely, members of the local chapter of the PCI, sectors of the Partito Socialista Italiano (PSI, Italian Socialist Party), and a few intellectuals critical of the traditional subservience of the local community to military authorities.

Interested or distracted observers of La Maddalena have often interpreted the apparent passivity of the local community as due to its traditional acquiescence to military authorities. In the words of Massimo De Carolis, a conservative member of the Democrazia Cristiana (DC, Christian Democratic Party) in the 1970s: "The tranquility of the Maddalenini is easy to explain. Over the past two centuries the island has always been a naval base and now the presence of the submarines leaves them indifferent. The Americans spend five million dollars per year and have always been fair and polite."[38] This interpretation, like others of the same tenor, is based on the simplistic assumption that silence or lack of protest means acceptance.

Such swift explanations neglect the fact that assessing risk is a diffi-

cult and often controversial task, which has to do with probabilistic calculations of the consequences of adverse events that may or may not take place. In addition, some sources of risk are not immediately perceptible, as in the case of radiation, and their appraisal is significantly influenced by environmental variables and the socioeconomic conditions of the communities living near them. For these reasons, thinking about risk and defining it in concrete terms requires work, expertise, and infrastructures.[39] The observation that the Maddalenini seemed at ease with the presence of US nuclear submarines due to their traditional identification with the Italian navy glosses over the complex individual and public epistemologies (formal and informal as they might be) through which risk is rendered visible or remains invisible. In sum, cost-benefit explanations alone do not consider the complexities of knowledge production about risk and the "politics of (in)visibility."[40] This book digs into this complexity and documents how in La Maddalena the uncertain status of US nuclear submarines as nuclear things, military secrecy, and the epistemic traditions and the (dis)organization of the Italian nuclear agencies contributed to shape a particular "regime of perceptibility" that made certain aspects of nuclear risk visible and others invisible.[41]

Nuclear Submarines as Nuclear Objects

CNEN and ISS experts found it difficult to convey to local administrators (and nonexperts in general) the gravity of the US Navy base's safety implications in La Maddalena because nuclear submarines pose specific challenges to risk assessment. Unlike big, visible nuclear plants with their reactor domes dominating the landscape and conditioning in many concrete ways the everyday life of entire communities around them, nuclear submarines can be quickly and quietly removed from the local context: mobility and invisibility play a crucial role in making them ambiguous nuclear things. As subsequent chapters will detail, in the archipelago nuclear submarines gave local administrators the illusion that risk was controllable precisely because its sources could be removed at any time: "If they start creating problems, we can push them away," said Giuseppe Deligia, the mayor of La Maddalena, during a conference on the US base organized in February 1975. Therefore, at least initially, the ontological status of the submarines as "nuclear things" needed to be demonstrated and established through comparisons and analogies with more stereotypically nuclear artifacts like nuclear power plants or, in more alarming tones, nuclear bombs.[42] Given that until 1979 Italy did not have formal and consistent regulations of the transit and mooring of nuclear military vessels in national waters, ISS and CNEN experts treated the US base in La Maddalena as if it were a nuclear plant.

Gabrielle Hecht calls the contested technopolitical category of being nuclear *nuclearity*, to point out to the geographically contingent and historically shifting attribution of radiological risks and their potential consequences to objects and practices.[43] Nuclear submarines are not only technological artifacts for conducting war. In La Maddalena, different groups with direct or indirect knowledge about their characteristics developed different understandings of nuclear submarines' risk and safety implications.[44] For example, mayors and other members of the local elites were occasionally invited on board for short cruises underwater. As I was told during interviews, it was on those occasions that the US Navy used nuclear submarines as diplomatic tools to demonstrate the innocuousness of the most advanced war machines in the world. Additionally, the belief that all US Navy personnel working on the base were aware of their occupational risks circulated among the Maddalenini since the base was installed. This was reassuring to civilian workers and long-term residents, who repeatedly told me: "If US Navy servicemen were at ease with their job, why should we worry? They brought their families with them. Do you think they would do that if there were a real danger?" However, interviews with retired US Navy servicemen reveal a different story: only select personnel knew the technical details of submarines' equipment and were authorized to access specific sectors of the base. Only partially visible to the rest of the population, safety measures against radiation exposure defined sociotechnical and professional hierarchies through thresholds of accessibility and areas of exclusion inside the base.[45] As dosimeters, gloves, clothes, shielding procedures, and time of exposure defined the daily encounters of specialized US Navy personnel with nuclear risk, long-term residents coped with their lack of experience and information by constructing a reassuring image of the competent and self-aware American soldier.

Nuclear things acquire different meanings (dangerousness, security, development) according to who uses them.[46] In La Maddalena, like in the rest of Europe, images of Hiroshima and Nagasaki, as well as other public notions of the potentially disruptive power of nuclear technologies, were in circulation well before the installation of the US Navy base. The Maddalenini often interpreted information and evidence about the risks generated by the presence of nuclear submarines through their political lenses: Christian Democrats and other pro-NATO party members usually defended the American presence in the archipelago, while PCI and PSI members retained an inherent distrust toward America's foreign policy and intentions. Thus, political, and ideological affiliations inflected controversies about safety in La Maddalena and made technical assessments of nuclear risk hardly separable from other considerations

about the trustworthiness of expert agencies, of the Italian navy, and US intentions.

Consider again the common interpretation circulating among the Maddalenini of antibase campaigns and concerns from leftist parties as alarmist propaganda: "If the Americans were here with all their families it means that they knew they were safe, otherwise they would not expose themselves to the risk of contamination. So, this means that we were safe too!"[47] Consolidating this sense of safety and protection was the lionization of American technological prowess and competence—the idea that nuclear submarines represented the apex of US technical mastery associated with rigorous individual and collective training. As I will explain further, these narratives about American technological competence were not simply the result of false consciousness or of materialistic calculations of the costs and benefits of the US Navy presence but emerged from a wider field of interactions between actors (experts, US personnel, local residents, political authorities), things (submarines, the environment, radiosurveillance instruments), and ideologies (scientific knowledge, radiological training, local traditions) that carried and produced more or less coherent objectifications and representations of nuclear risk.

The political relevance and power of nuclearity—the quality of being nuclear—as a technopolitical category is directly tied to *nuclear exceptionalism*, the idea that nuclear things are essentially different from ordinary ones.[48] After World War II nuclear exceptionalism has been a recurrent theme in public discourses. The ability to exploit the power of fission and radioactivity became the material demarcation of a historical "rupture" with the world as it existed before the nuclear era. Utopias of limitless progress, made possible by infinite sources of energy, coexisted with dystopias of apocalyptic scenarios, nightmares of annihilation, and thermonuclear wars. Nuclear exceptionalism thus "transcended political divisions" and was filled with contradictions. It could be manipulated for opposite political purposes: either to create a sense of collective empowerment and futuristic enthusiasm or to warn the public that nuclear threats required special safety measures and more nukes to dissuade the enemy from launching an attack.[49]

The apparent contradictions of nuclear exceptionalism coexisted also in La Maddalena, where the Italian government and US Navy officers justified the maintenance of secrecy as a necessary limitation to scientific inquiry in the name of absolute security imperatives. At the same time, they had to represent nuclear technology as safe, benign to the local population, and tightly controlled by the technical mastery of the US Navy. The attempts of the Italian government and the US Navy to assuage public anxieties by naturalizing nuclear technology and making

it appear innocuous, harmless, and safe is an example of what Stephen Hilgartner and others have called "nukespeak," the set of rhetorical devices and edulcorated language that the nuclear establishment (military, industrial, and scientific) uses to make the potential negative effects of nuclear technology invisible.[50] Thus, in La Maddalena different registers of nuclearity shaped the initial controversy over the presence of the US submarine base. According to the Italian government, nuclear submarines were to protect La Maddalena from the Soviet enemy, yet the archipelago did not need radiosurveillance measures, as nuclear submarines were apparently less dangerous than nuclear plants. On the other hand, Italian radioecologists and radioprotectionists, supported by a variegated antibase front (mostly from outside La Maddalena), did see nuclear submarines as nuclear objects—and demanded acknowledgment of the risks associated to their operations. Consequently, they argued, the archipelago should have been monitored as any other nuclear site to guarantee the safety of the local population.

Secrecy, Bureaucracy, and the Production of Ignorance

Several studies have documented how radiation and its effects are often rendered invisible by hiding, challenging, and classifying information.[51] Stated otherwise, the "invisibility" of radiation is not simply a natural phenomenon related to its physical characteristics but is also produced by the very material acts of confining knowledge and data only to experts and military authorities.[52] Works on agnotology—the production of ignorance—have demonstrated how strategic acts of knowledge removal impeded access to information by the public in various fields: from tobacco industry's concealment of data about the health effects of smoking to the production of uncertainty concerning global warming data.[53]

In La Maddalena, military secrecy—imposed jointly by the US State Department and sectors of the Italian government—conditioned and limited the application of scientific protocols that Italian experts routinely implemented at civilian nuclear sites. CNEN and ISS personnel voiced these contradictions and explained how restricted data about US nuclear submarines' reactors and lack of information about environmental characteristics of the archipelago forced them to adopt alternative, more complex, and time-consuming research strategies. The radiosurveillance system of La Maddalena, I argue, was a technopolitical compromise between military security and public safety, which epitomized the constraints and contradictions of Italy's sovereignty during the Cold War. As mentioned above, Italy was not an exception or a unique case.

During the Cold War, secrecy became an integral component of the national "security state" in the United States, transforming the very na-

ture of American democracy into a "compartmentalized knowledge society."[54] The US Atomic Energy Act (1946) and the National Security Act (1947) separated national security from state security and officially "introduced a new kind of information—nuclear weapons data—that did not need to be formally classified" because it was born secret.[55] The exclusion of activities and information of strategic interest from public scrutiny created a typical Cold War phenomenon: Removing knowledge entailed the proliferation of extensive bureaucratic apparatuses exclusively devoted to maintaining and producing secrets.[56] "How did secrecy and bureaucracy become so entwined—a vast secrecy system almost wholly hidden from view?" asks Daniel Moynihan in his book devoted to this subject.[57] For Joseph Masco, the proliferation and ramifications of secret apparatuses in the social fabric of American democracy have provoked the dislocation of secrecy itself from a clearly definable center of power to a pervasive and yet fragmented and uncoordinated security system in which "knowledge is rendered suspect."[58] As Masco has ably demonstrated, secrecy not only consists of acts of knowledge removal, concealment, and sequestration but is also a ruling technique shaping "a pathological administrative form."[59] The national "security affect" as a form of social technology allowed the American state to achieve collective "perception management and control."[60] Masco's analysis foregrounds two complementary aspects. The first is the organization of secrecy as a bureaucratic infrastructure that became incorporated into democratic institutions.[61] The second is the role of secrecy as a social device that influenced individual and collective interactions, expectations, and rights.

In his book *The Worst-Kept Secret*, Avner Cohen explores Israel's nuclear policy—identified with the Hebrew term *amimut*, which means "opacity"—by showing how the state successfully maintained an ambiguous posture with regards to its nuclear status.[62] *Amimut* required special diplomatic arrangements (the US active contribution to the protection of Israel's nuclear secrets and Israel's decision not to sign the Non-Proliferation Treaty). Internally, the politics of opacity involved the creation of an invisible bureaucratic infrastructure: special constitutional provisions; direct and exclusive control of the executive and the military commands over the nuclear program; and a vast apparatus of surveillance, censorship, and classification.

These and other works have revealed that the priorities of the national security state made secrecy an essential component of the everyday life of entire nations. As I document in the case of La Maddalena, the Italian executive left the area of military nuclear applications under its control to achieve a separation between military activities and civilian radiosurveillance programs and to preserve the autonomy of the first from pub-

lic scrutiny. The result of this informal institutional arrangement was the creation of a dual system of radiosurveillance that contributed to the compartmentalization of nuclear knowledge.

Let's consider now the second aspect of secrecy as a pervasive phenomenon that shapes interpersonal relationships and the very content of citizenship—that is, the relations between individuals and groups with the state. Amimut, as Cohen argues, could not have worked out if, in addition to ad hoc institutional arrangements, the existence of the bomb had not been transformed into a taboo, a form of tacit knowledge that has been individually interiorized and collectively expunged from public discourses. This is an example of what Michael Taussig calls a "public secret," which he defines as "that which is generally known, but cannot be articulated."[63] For Taussig, secrecy also involves knowing what not to know, which he calls the "labor of the negative," the deployment of ignorance as a strategy for surviving within a context in which knowing is risky. An inherently social device, secrecy creates bonds and solidarity; conversely, it excludes those who are not given privileged access to the secret.[64] Wondering what is concealed is part of the secret's allure, which also invites its transgression.[65]

Secrecy, confidentiality, and opacity can be a reflex of technocratic approaches to public participation in technical matters when citizens are deemed unprepared, immature, not educated enough, and too emotional to be able to deal with the culture of risk in a rational way. Multiple strategies for excluding the public from decision-making processes include formalized rituals such as public audits and hearings whose goal is to neutralize critiques through the rationalizing (and patronizing) techniques of administrative practices.[66] Secrecy, as a form of social regulation, morphs into a variety of knowledge removal techniques. But what is the reception of secrecy within society? How does the public in democratic systems respond to the fact that secrecy lies at the very core of state power?[67]

Secrecy is not an exclusive tool of knowledge control in the hands of power elites. In Italy, for example, state secrecy (*segreti di stato*) has become a popular interpretative category that citizens use to make sense of opaque, unintelligible, or unexplainable actions and inactions of public institutions.[68] Italian jurist and philosopher Norberto Bobbio argued that state secrecy was a pervasive threat to the life of democracy.[69] He used two concepts to describe Italian state secrecy: *sotto governo* (subterranean government) and *criptogoverno* (cryptogovernment). The first term referred to the growing intervention of the state in the economy through which political elites exercised an inscrutable control over centers of power—such as banks and nationalized and state-subsidized industries. By *cryp-*

togovernment he meant "the totality of actions carried out by paramilitary political forces which operate behind the scenes in collaboration with secret services."[70]

In La Maddalena, military secrecy and diffused technocratic views of nuclear technology as an exclusive expert field created a substantial exclusion of the local community from important decision-making processes concerning the radiosurveillance system. This systematic divide between decision-makers and citizens contributed to establish an atmosphere of distrust and diffuse sense of resignation. Some members of the local community embraced conspiracy theories to explain otherwise unexplainable bureaucratic delays, malfunctions, and silences by expert and military authorities.

Secrecy, however, does not fully explain the limits of the radiosurveillance system installed around the US Navy base of La Maddalena. Framed within a larger national historical context, this case study offers ample evidence of the shortcomings and contradictions that characterized the Italian nuclear program since its inception. I argue that both secrecy and knowledge gaps resulting from epistemic traditions and regulatory practices produced ignorance about the environmental status of La Maddalena.

Sociologist Scott Frickel observes that scholars working on agnotology have generally explored secrecy as an active removal of existing knowledge, or "knowledge sequestration," while leaving other aspects of the production of ignorance aside.[71] Inspired by David Hess's work on "undone science," Frickel proposes to focus instead on the multilayered and cumulative selective effects of epistemological assumptions and regulatory practices that on the one hand stabilize and define objects and scope of scientific research and on the other exclude other areas of investigation and underrepresented/nonprivileged sectors of the population from expert intervention.[72] In doing so, the "new political sociology of science" aims to move beyond the individualistic paradigm of agnotology, which examines the "nonproduction of science" only as a result of state agencies, corporations, and military interests in concealing the "truth" or as the result of bad science.[73] Form this point of view, I see Frickel's proposal as an institutional variant of Michelle Murphy's "regimes of perceptibility," which openly relies on the analytical tradition of "historical ontology."[74] But Frickel's "institutional approach" does not exclude taking into account larger historical and political trends that—for example, during the Cold War—inevitably shaped institutional processes and collective trajectories of knowledge (and ignorance) production.

Instead of considering the "knowledge sequestration" and "selective attention" approaches as alternative research strategies, I adopt them si-

multaneously to grapple with the political economy of knowledge pro-
duction shaped by interested acts of knowledge removal and institutional
arrangements that created and reproduced knowledge gaps in La Madd-
alena. I show that the Italian government made specific institutional
choices concerning the radiation surveillance program (what I described
as the Cold War technopolitical compromise between public safety and
military security) and that within the limits of institutional arrange-
ments and epistemic traditions of Italian regulatory agencies some ex-
perts voiced their disagreement and proposed solutions to achieve more
inclusive—and consequently more accurate—radioprotection practices.

SEMIOTICS OF RISK

Especially during the six years following the installation of the US base
(1972–1978), incomplete data prevented expert agencies from providing a
concrete definition of the risks that long-term residents were facing. Lack
of previous experiences with radiological hazards left many Maddalenini
wondering about what could go wrong (accidental and routine discharges
of radioactive material), the likelihood of an odd event taking place, and
the possible consequences of accidental releases of radioactive substances
around the US base. Expert assessments, citizens' conjectures about the
potential consequences of radiocontamination, and practical knowledge
of radiological hazards among specialized US Navy personnel shaped dif-
ferent understandings of risk in the archipelago. In the third part of the
book, I address two questions: First, how do nonexperts make sense of
radiological risk in the absence of previous experiences with it? Second,
how do objectifications of risk change and get stabilized within the same
community over time?

As a field, science and technology studies (STS) has successfully
overcome some severe limitations of cognitive and psychometric ap-
proaches to risk perception in vogue until the end of the 1980s.[75] While
one "traditional" branch of "public understanding of science" (PUS) has
substantially maintained the public deficit model,[76] since the beginning
of the 1990s "interpretationist" approaches have shifted the STS com-
munity's attention to questions of trust in technoscientific institutions,
epistemic recognition of lay knowledge, and public participation in
technoscience.[77] Here the influence of Ulrich Beck's theses on "risk so-
ciety"—especially the proposition on "relations of definitions"—is hardly
disputable.[78]

Initially conceived of as a breakaway from traditional PUS, the an-
alytical leverage of community-based approaches has become an almost
teleological frame to study power relations in sociotechnical controver-
sies. Within STS many have assumed the existence of an essential incom-

patibility between scientific knowledge production and other forms of experiential knowledge.[79] Works on street science, citizen science, and popular epidemiology, to cite a few critical PUS approaches, tend to reify "a dichotomy between 'scientific' and 'public' forms of knowledge and understanding . . . and a level of homogeneity and coherence within both 'scientific' and 'public' understandings."[80] "The possibility of disagreements and contradiction within each form of understanding is played down [while] the use of 'knowledges' in this context can suggest a static account, rather than directing attention to the kinds of sense-making activities engaged in by public and other groups."[81] In addition, both traditional and critical PUS tend to use the concept of knowledge as a catchall category to describe a variety of cognitive, affective, and cultural processes in which local communities and communities of experts are involved when trying to define and objectify risk.[82]

Brian Wynne's point that "the most germane risks are (social) *relational*"—that is, perceptions of risk depend in large part on evaluations of the trustworthiness, competence, and independence of expert institutions—is now taken for granted but leaves the question of materiality and the role that it plays in processes of signification largely unexplored and undertheorized. This is even more problematic, I would argue, because it is through the analysis of the material entanglements of communities' experiences with unprecedented and concerning issues that we can fully grasp the ethical implications of Wynne's relational approach.

Object-oriented analyses of public involvement in technoscience have helped STS move beyond schematic analyses of lay/expert controversies.[83] For example, Noortje Marres explicitly shows how domestic devices and other objects allow different modes of participation, whether the role of material objects is consciously articulated in the enactment of participatory practices or remains unaccounted for and "under-articulated."[84] Affected publics formulate hypotheses about what is going on and what's next in moments of disorientation, surprise, ambiguity, and extraordinary attention solicited by unexpected events. If publics, as in John Dewey's conceptualization, could be defined as "communities of affected interest" and if, as Bruno Latour suggests, we need to explore how "matters of concern" catalyze assemblies of heterogenous actors, then the problem is: what happens after "issues spark a public into being"?[85] To move beyond the recognition that objects actively enable, enhance, and constrain forms of participation through their affordances, we need to attend to the material processes of signification in which publics are involved when trying to make sense of the circumstances that concern them. In sum, how do publics move from being concerned/affected (by something they do not know about) to making sense of their experiences?[86]

Phenomenological studies of risk perception and assessment suggest that to make invisible risks (such as radiation) visible, nonexperts and experts alike rely on a variety of evidentiary practices through which they can objectify and represent risk in tangible ways.[87] Without "opportunities for articulation," risk signs remain unnoticed.[88] In other words, expertise, monitoring devices, and technical infrastructures are necessary to make sense of bodily symptoms, environmental changes, and sensorial alterations that would otherwise remain in the background, unexplained.

Building on these insights, I propose that instead of assuming lay/expert epistemic divides as the basic explanation for the existence of divergent definitions of risk, we should first attend to the processes of signification through which local communities and communities of experts and practitioners pay attention to signs and interpret them as indicators of risk or lack thereof. This allows us to explore the interdependence of experts and nonexpert understandings of risk in and across specific contexts, but to do so we need to renounce the assumption—as STS scholars have done for expert knowledge—that lay or local knowledge is always already *in place*, as if it were a constitutive feature of any community by virtue of an osmotic (almost deterministic) relationship with the surrounding environment.[89] Instead, we should ask how and when objectifications and representations of risk arise from the material entanglement of experts and nonexperts with the environment, broadly defined.

To explain how residents of La Maddalena, local administrators, experts, and US Navy personnel interpreted or ignored signs of risk I advance a semiotic approach that attends to material processes of signification through which communities of experts and nonexperts establish and challenge definitions of risk over time. The semiotic approach to risk is based on the following theoretical and methodological propositions:

1) Both experts and nonexperts use material signs to make invisible risks like radiation visible.

2) Understandings of risks change over time and are highly contingent on local power dynamics. Objectifications and representations of risks change and get stabilized over time as signs of risk become available for interpretation (i.e., environmental changes, unprecedented events, health effects).

3) Experts and nonexperts are not bounded and homogeneous groups. Especially in situations of uncertainty, when knowledge about risk is not established yet, epistemic and communicative strategies of experts and nonexperts emerge out of contradictions and conflicts, and influence one another, at times through forms of active collaboration.

4) When experts and nonexperts elaborate arguments in public contro-
versies, members of both groups engage in activities that aim at reducing in-
ternal conflicts and contradictions, which can undermine their credibility.
I call this set of activities "the politics of coherence."

The word *semiotics* derives from the ancient Greek *σημειόν* (semeión;
sign, miracle) and *σημειόω* (to observe). One common use of the word
σημειωτική (semeiotiké) denoted the act of observing signs that post-Hip-
pocratic medical practitioners used to make diagnoses about their pa-
tients' illnesses.[90] This original phenomenological approach to the use
of signs as vehicles of knowledge (through the definition of their contex-
tual meanings) is retraceable in the semiotic theory of Charles Sanders
Peirce, one of the founders of the science of semiotics: "It appears, then,
that the rule for attaining the third grade of clearness of apprehension
is as follows: Consider what effects, that might conceivably have practical
bearings, we conceive the object of our conception to have. Then our
conception of these effects is the whole of our conception of the object."[91]
        In this formulation Peirce sketches out the logical implications of
the use of signs as vehicles for knowing about the world, which is an in-
ductive process. Knowledge is always partial and inductive because it
is based on our experiences of the world through signs as vehicles: we
know the causes of phenomena because we learn to pay attention to and
to interpret their effects. The interpretation of signs (from natural phe-
nomena to social habits, from technological artifacts to events) requires
that the interpreters acquire a set of strategies to delimit their potential
meanings, which may vary according to material circumstances, to the
context (historical, cultural) of interpretation, and to the communities
of interpreters, who may share different interests in and definitions of a
phenomenon. This is the role of what anthropologist Webb Keane calls
semiotic ideologies—that is, "basic assumptions about what signs are and how
they function in the world."[92]
        The concept of semiotic ideology, among other things, helps us ex-
plain just this: how we move from the realm of affectedness to that of
representation, or in Peircean terms, how we move from the level of sec-
ondness (being struck by and reacting to something/someone) to that of
thirdness (thinking about, conceiving of, and representing something,
such as radiological risk, trust, or others' intentions, for example). The
strike of thunder may be taken to signal the imminence of a storm, but it
may be interpreted as a sign of divine intervention if we believe that gods
and spirits are real agents. As Keane underlines, the word *ideology* in this
context should not be intended as false consciousness but rather as indi-
cating "a fundamental reflexive dimension of the general human capacity

to use signs" subject to history and struggle.[93] According to Keane, semiotic ideologies provide instructions for how to use abductive reasoning in processes of signification but involve much more than this, as "semiotic ideology mediates between abductive inference or interpretation, which are general cognitive processes, and the more specific material and conceptual circumstances that prompt them, the forms of judgment to which they give rise, along with hopes and anxieties that attend them."[94]

An example of the reflexive dimension of semiotic ideologies and their consequences is the possibility for different interpretations of the same signs as iconic or indexical. For example, in Wynne's classic analysis of the interactions between experts and Cumberland farmers the problem of incommunicability resulted from underlying assumptions held by the latter about the untrustworthiness of the former, given the history of secrecy and reticence surrounding the activities of Sellafield. In this light the ambiguous and contradictory behavior of experts on the ground was taken by the farmers to be iconic, a reflection of the true essence (untrustworthy) of that group, rather than an index of the difficult applicability of standard scientific protocols under the specific environmental circumstances of their region.[95]

The role of semiotic ideology is to furnish us with instructions for how to connect signs with objects through guessing practices. This is due to the very assumptions upon which Peircean semiotic theory is built: in particular, the ontological presupposition that we have only partial encounters with objects in our experiences through their sign vehicles, and this happens in different contexts and under specific material circumstances. To use a simplification, we can say that our knowledge of the external world involves inferring the cause of an event by interpreting its effects as we perceive them. So, the potential causes of a phenomenon can be numerous, and our guessing efforts could be potentially infinite if shared cultural, historical, and cognitive codes wouldn't delimit the set of possible interpretations. This is the role of semiotic ideologies.

But what happens when a sign cannot be interpreted based on our past experiences? What if we found ourselves in front of something never experienced before and for which we lack a code for interpretation? In this case we enter the terrain of the conjectural, as we would probably start formulating hypotheses about what could have caused the unprecedented phenomenon before our eyes.

As I document in the final part of this book, nonexperts generated hypotheses about the presence or absence of radiocontamination in La Maddalena. These were not just based on fears, or ideological preconceptions. Residents made inferences, like scientists do, but with different material at their disposal: They relied on common images of nuclear

things and their effects, repeated observations of the environment, and unprecedented events, like episodes of birth defects, which they interpreted as possible consequences of radiocontamination due to the proximity of the US Navy installation. Unprecedented events prompted new potential understandings and conceptions of risk that became the object of public controversies. In an effort to establish their credibility vis-à-vis Italian governmental authorities, expert agencies, and the US Navy, local antibase elites adopted a set of strategies to delimit the proliferation of hypotheses about the radiological causes of birth defects, with the help of allied experts. The semiotic regimentation of potential risk signs shows that conceptions of risk are subject to "history and struggle," and that static representations of expert and lay knowledges gloss over the complex mechanisms that shape controversial understandings of risk in moments of uncertainty.

ORGANIZATION OF THE BOOK

This book is organized both chronologically (loosely) and thematically; therefore, it can be read in various ways, not necessarily from cover to cover. The introduction provides readers with a review of key research problems and approaches within and beyond STS: expert/lay controversies, secrecy and the politics of knowledge production, and risk. My ambition for this book is getting out of disciplinary silos and internal debates to favor the cross-fertilization of insights and approaches coming from different, albeit contiguous, scholarly traditions.

My choice to keep the conceptual apparatus as it appears in the present text represents an attempt to be transparent about the intellectual trajectories that inspired the interpretation and the organization of the documentary material discussed in the chapters. I am sure that most readers will agree with me that the organization of a book, even a history book, involves much more than arranging the material chronologically. There is always a "vision" of the project that inspires writers or that emerges after collecting all the material. While the organization of this book is partially the result of practical research organization, opportunities, and constraints, it is also the outcome of roads I have not taken, either willingly or inadvertently. The display of the conceptual trajectories I undertook when trying to understand the meaning of the stories I wrote, reveals just that. I hope that this effort will be as useful to the readers as it was to me.

In chapter 1 I explain that the arrival of the US Navy in 1972 did not transform La Maddalena into a typical American fleet town. The bicentennial presence of the Italian navy incorporated the archipelago into the military-industrial projects of the Italian state while forging a wide-

spread sense of local identity around military institutions. The US Navy blended into this context without altering the fundamental traditions of the local community. The military legacy of the archipelago explains why La Maddalena was chosen for the installation of the US submarine base: the Italian government hoped that the local acquiescence to the military institutions would make the stationing of nuclear submarines just in front of the urban center of the major island less problematic. Local identity, though, explains only partially why most long-term residents and local administrators did not openly oppose the American presence.

When important sectors of the Italian scientific community, including expert radioecologists and radioprotectionists working inside regulatory agencies, protested the lack of safety measures around the base, the Italian government responded with arguments that represented nuclear submarines as nonnuclear objects or as completely safe, like inland nuclear plants. The contested nuclear status of the US base, and consequently of the archipelago, revealed the political power of nuclearity that Hecht examines in her study of uranium mining in Africa. In chapter 2, I show that the Italian government and the US Navy on one side, and anti-base activists and experts on the other side, adopted different discursive registers of nuclearity, relying on the ambivalent exceptional status of nuclear technology as both safe and risky.

Combining ethnographic methods with a close reading of previously unexplored archival material, in chapters 3, 4, and 5 I examine the complementary effects of military secrecy and the haphazard organization of the Italian nuclear bureaucracy to explore the political economy of knowledge production in Cold War Italy. The material I examine in part II of this book points to the technopolitical compromises between military security and public safety that shaped the concrete implementation of scientific protocols in La Maddalena.

In chapter 3 I offer a brief introduction to the history of radioecology during the Cold War and show in detail how the field grew in Italy during the 1960s and the 1970s in connection with the development of the Italian nuclear program and its relative regulatory regime. Then the analysis shifts to the local level, describing how radioecological campaigns were conducted in La Maddalena amid public debates over the nuclear status of the US base and the difficult adaptation of standard research protocols to the unknown environment of the archipelago.

In chapter 4 I focus on the uses of secrecy and information management of US and Italian military and civilian officials about nuclear submarines' operations in La Maddalena and document how the concealment of data and restriction to its access conditioned the work of Italian expert agencies in the archipelago. The history of the radiosurveillance

system of La Maddalena (which I argue is one instantiation of a typical Cold War compromise between public safety and military security) also brings to the surface the informal organization of what I call the dual system of radiosurveillance. The latter consisted of a de facto separation between civilian and military spheres of competence concerning the monitoring and the regulation of nuclear technology, with the objective of subtracting military applications from public scrutiny.

Finally, in chapter 5 I detail the complicated birth and the haphazard organization of La Maddalena's radiosurveillance laboratory. The causes of delays and malfunctions in the implementation of the environmental monitoring program were both political and organizational. I map out the complex distribution of radioprotection competences across a multitude of agencies and administrative levels. In La Maddalena's case, the difficult coordination between central expert agencies and peripheral labs added to the political conflicts between central authorities and regional and local administrations over the acceptability of risk and the financial responsibility for the laboratory's costs. These institutional short-circuits resulted in a precarious radiosurveillance system, which became partially operational only in 1986. In the last part of the chapter, I discuss the attempt by the Sardinian administration to organize a consultative referendum against the permanence of the US nuclear base in La Maddalena. The hostile reaction of the government, backed by the decision of the Italian Constitutional Court, denied Sardinians the right to express their opinions over the US installation, restating the strategic importance of the US military presence in Italy. The sentence made evident once more the exceptional status of military nuclear technology: while Italians voted to phase out nuclear power plants in the national referendum of 1987, Sardinian citizens could not express their views over the permanence of a foreign base with nuclear submarines and armaments.

Different understandings and representations of radiological risk coexisted in La Maddalena based on practical experiences (and lack thereof) and evidentiary practices of various groups living and working around the US nuclear submarines and (more or less) acquainted with nuclear things in general: US Navy personnel, Italian employees on the US base, and long-term residents, local administrators, radioecologists, and radioprotectionists working for Italian expert agencies. In chapter 6 I examine the role of material evidence in processes of signification to explain how experts and nonexperts fix, challenge, and negotiate the meaning(s) of radiological risk in sociotechnical controversies. To this end, I advance a set of methodological and substantive arguments that constitute what I call "semiotic approach to risk."

Personal interviews with retired US Navy personnel and official documentation shed light on the practices of risk control on board of submarines and around the submarine base. I give concrete examples of the misunderstandings generated by expert definitions of risk and the frustrations that these provoked among local administrators who expected clear answers from the scientific community. The transcripts of a conference on nuclear contamination held in La Maddalena in February 1975 provide insights on how decontextualized and abstract objectifications of nuclear risk by Italian experts did not allow local administrators to grasp the immediate problems of radioprotection in the archipelago. The illustration of radioprotection practices inside the US Navy provides examples of how training programs and the culture of risk control furnished radiological workers with opportunities to acquire material understandings of risk. Finally, I focus on nonexperts' guessing strategies and evidentiary practices for making invisible risks visible and explain how local activists regimented and sometimes silenced long-term residents' hypotheses about risk to construct scientized and credible arguments against the US Navy base.

In chapter 7 I explore the complex relationship between accidents and understandings of risk. A US nuclear submarine accident near La Maddalena in 2003 generated a heuristic for studying how the intervention of independent experts challenged the established radiosurveillance protocols of Italian state agencies. In this chapter I detail why national experts faced a crisis of credibility, and how the intervention of independent experts and local activists reshaped debates about the risks of the US nuclear base. My analysis moves beyond deterministic and all-encompassing explanations of public opposition to certain technologies and industrial activities as reactions to accidental "events." Instead, I show that different data interpretations that animated expert controversies after the accident derived from divergent scientific protocols and agendas shaped in the context of the Cold War and in the aftermath of the Chernobyl disaster. Italian radioecologists, most of whom worked for the state, formed their expertise during the Cold War, and adopted established methods of analysis that led them to interpret the presence of radionuclides in the archipelago as long-term consequences of atmospheric fallout from previous nuclear experiments. Other experts adopted a different method that revealed phenomena of isotopes' bioaccumulation unnoticed until then (previously undocumented). Finally, independent marine geologist Fabrizio Aumento introduced a fast alpha-particle tracing technique that produced evidence about the presence of traces of plutonium in the archipelago. Expert debates after the 2003 accident generated uncertainty in the local population, but also created a unique opportunity for local

activists to openly question the efficacy of La Maddalena's radiosurveillance system. Rather than embracing a particular scientific argument, local activists demanded transparency, and organized public forums in which they invited experts with competing views to debate their positions.

SOURCES AND METHODOLOGY

This study is based on several years of multisited ethnographic and archival research in Italy. In La Maddalena, I conducted dozens of interviews with local residents, including former mayors and city councilors, Italian workers, and employees of the US Navy base, antibase activists, religious authorities, and retired US Navy personnel. Many antibase activists, local historians, and journalists shared their stories and personal archives, including films produced by local directors, photographic material, newspapers, pamphlets, and fliers used for political propaganda by parties and protest groups in the 1970s and 1980s.

I approached archival research in Sardinia, and in other parts of Italy, from an ethnographic perspective. The combination of oral and archival sources gave me the opportunity to make sense of the material and to compare the views of key actors as they appear in official documents with other perspectives emerging during interviews. This process opened new possibilities to evaluate, interpret, and reflect on the sources at my disposal. With the assistance of Italian nuclear experts, I reconstructed the history of La Maddalena's radiosurveillance system within the institutional ecology of the Italian nuclear program. When I was conducting the most intense part of my fieldwork, the main archives of the Ente Nazionale Energia e Ambiente (ENEA, Italian National Agency on Alternative Energies; previously CNEN) were dispersed or not systematically organized. Several retired radioecologists and health physicists shared personal copies of their work with me.

Thanks to the generous support of director Roberta Delfanti and radioecologist Carlo Papucci, I accessed the archive of the Center for the Study of Marine Environments of ENEA (near La Spezia, in the region of Liguria), whose personnel have five decades of collective experience in radioecological campaigns throughout the world, from the Mediterranean Sea, including La Maddalena, to Cienfuegos, Cuba, and the Arctic Pole. Beginning in the winter of 2012, Delfanti and Papucci shepherded me through the rich archival material of the center, from collections of biosamples to logbooks of data entry and notes taken during radioecological campaigns in La Maddalena, internal correspondence and preparatory research designs, the illustration of laboratory practices, and final reports. During multiple visits to the center and in extended interviews with Arrigo Cigna, one of the founders of Italian radioecology and for-

mer president of the International Union of Radioecology, I acquired detailed knowledge of the theoretical and practical steps taken by nuclear experts to assemble their knowledge of La Maddalena and of other sites across Italy. These collaborations enhanced my ethnographic work in La Maddalena and allowed me to develop a more nuanced analysis of the connections between environmental, cultural, and political dynamics that shaped both expert and nonexpert understandings of nuclear risk around the US base.

I also retrieved and assembled archival and other documentary material scattered across Italy. In Rome I consulted the libraries of ENEA and ISS. At the Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA, National Institute for Environmental Protection) and at the ENEA research center of Casaccia I located the former archive of the Comitato Nazionale per l'Energia Nucleare, Direzione Sicurezza e Protezione (CNEN-DISP, Italian Committee for Nuclear Energy, Division of Safety and Protection). Until the 1980s, the division was responsible for the elaboration of the emergency plans for nuclear installations, including nuclear ports like La Maddalena (from 1979). Followup interviews and examination of archival sources enabled me to further detail how military secrecy forced Italian expert institutions in charge of monitoring radioactivity levels in the Archipelago to operate with incomplete data.

In La Maddalena I accessed municipal archives, which included detailed transcripts of city council debates, official administrative documentation about the US Navy base, and the correspondence between US military authorities and the local administration. At the library of the Italian Navy Command, I could access national and local newspapers articles that the Italian Navy Intelligence Office had collected over the course of thirty-five years. The collection covers every reported event directly or indirectly related to the US Navy in La Maddalena, including local and national debates from 1976 to 2008. To cover the years 1972–1976, I conducted archival research at the Public Library of Sassari, the capital of northern Sardinia. I also collected national newspapers and accessed transcripts of parliamentary debates concerning the base at the Library of the Senate in Rome. During the final months of fieldwork in La Maddalena, I found rare documentary evidence about the organization and monthly operations of the local laboratory for the measurement of environmental radioactivity. From the archives of the Province of Sassari I also retrieved allegedly lost radiometric reports and internal correspondence about the technical characteristics and bureaucratic deficiencies of the radiosurveillance system.