Cables, frontiers, bunkers, and ruins

relating anew to the internet's material infrastructure through non-linear speculative assemblies

Master Thesis

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Abstract

This thesis centers on a critical interdisciplinary research on the Atlantis-2 submarine cable and its landing site in Conil, a small coastal town in the south of Spain, seeking to understand the material environments, geopolitical contexts, and social relations in which the internet's material infrastructure is embedded. Weaving together archival material, interviews, observations, autoethnographic considerations, and speculative storytelling, this thesis reflects on the internet's contentious mediation of reality, proposing a mode of research on media technologies that operates from a relational networked proximity. Starting with a theoretical discussion on the materiality of media technologies, the first chapter exposes the need for interdisciplinary, creative, and interpretive methodologies in order to approach the complexity of the internet as a technosocial infrastructure. Having established the theoretical and methodological backbone of this thesis, the second chapter traces the intricate relations between submarine cables, frontiers, bunkers, watchtowers, and maritime routes in the south of Spain, emphasizing the colonial and modern paradigm of connectivity through securitization in which the internet's undersea cable system is deeply rooted. Bearing these connections in mind, the third chapter discusses the tensions between institutional narratives and local stories in Conil about submarine cables, exploring the role of speculative storytelling in the contested production of meaning around the internet's materiality. This thesis argues that interdisciplinary research on submarine cables and their landing sites, bridging archival, ethnographic, and creative methodologies, brings to the forefront the concealed material and social entanglements embedded in the internet's infrastructure and opens up new possibilities to relate to contemporary networking technologies.

Declaration of authorship

I, Juan Pablo Pacheco Bejarano, born the 30th of June 1991, in Bogotá, Colombia, hereby declare,

- 1. that I have written my Master Thesis myself, have not used other sources than the ones stated and moreover have not used any illegal tools or unfair means,
- 2. that I have not publicized my Master Thesis in my domestic or any foreign country in any form to this date and/or have not used it as an exam paper.
- 3. that, in case my Master Thesis concerns my employer or any other external cooperation partner, I have fully informed them about title, form and content of the Master Thesis and have his/her permission to include the data and information in my written work.

Madrid, Spain, 8 of August, 2021

Place, date

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Signature

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Foreword

I first became interested in the materiality of the internet during several visits to the Internet Archive in San Francisco, California in 2015, while I was supporting the archival initiatives of the Ohlone Profiles Project, a group composed of indigenous communities from the San Francisco Bay Area and their allies. Despite being a mostly digital platform, I was immediately struck by the Internet Archive's investment in the social relations that unfold in its vicinity. As the Archive strives to provide continued free access to its online collections, its staff are also working on local issues such as housing rights for communities affected by the economic speculation caused by the tech boom. Drawing from this experience, I decided to steer my research-based artistic practice towards the relations between digital technologies and the social, cultural, and material relations that they are part of. Through texts, videos, and web projects I have delved into the material, poetic, and territorial connections between the internet and water, seeking to deepen my understanding of the complex entanglements between technology, culture, and nature.¹

As I decided to conduct research for this thesis on the Atlantis-2 submarine cable—the first fiber optic cable to establish a direct connection between Europe and Latin America—the COVID-19 pandemic accelerated our ongoing retreat into digital spaces. Under these conditions, the internet solidified its position as the most fundamental technology for the continuation of business as usual, both increasing the omnipresence of digital devices as well as increasing the power of tech companies whose profit is made from trading users' data. At the same time that the pandemic renewed a general sense of techno-optimism, it also evidenced Earth's deep socioenvironmental crisis as a privileged minority retreated into the digital world while the rest—mostly in the Global South—faced the continuation of extractive practices and increasing inequality. Driven to despair by the intensification of the climate crisis, inequality, corruption, and violence amidst the pandemic, thousands of Colombians took to the streets in what has been the largest social uprising in decades. While being in the south of Spain I kept wondering if the information from the protests was travelling to my phone through the very same undersea cable I was researching, which connects South America and Europe. These complex and multilayered

¹ To find out more about my artistic work and other research, see: https://www.juanpablopacheco.com

fields of relation to the internet permeated my three months of ethnographic research at Conil, a coastal town in the Atlantic coast of Spain where the Atlantis-2 submarine cable lands. Informed by the political context under which I conducted this research, this thesis seeks to reflect upon the deep relations between the internet and the social and material environments in which its infrastructure is embedded.

This thesis would not be possible without the support of many people with whom I have discussed my research and ideas over the last two years. Even though it is impossible to mention everyone who has participated in this process, I want to name a few. First, I want to thank the people who I met in Conil, who kindly opened their homes to me and shared their knowledge about and experiences with the submarine cable infrastructure, the Ocean, and Conil's history: Patricia Peces, José Ligero, Juan Ramón Holguín, Diego Tirado, Isabel Tomé, Inma Martínez, Joshua Rodríguez, Alba Lorca, Rocely Uzcategui, Jan, Ana, and Vicente. I also want to thank Anahí Rebatta, senior analyst at TeleGeography, and Juan Luis Suárez de Vivero, Professor of Marine Biology at the University of Seville, who both generously shared their knowledge about submarine cables and the seafloor with me. This thesis would not be possible without the support of my supervisor Morten Søndergaard, whose persistent feedback enriched the theoretical and methodological foundations of my research. The support of my friends and tarot accomplices Julia Bande and Jyoti Arvey was crucial whenever I thought I was reaching dead ends. In particular, thanks to Jyoti Arvey for her poignant and caring feedback as well as for copy editing the final drafts. Special thanks to Andrés Suárez for his unwavering and loving support, especially during my last month at Conil, as well as for transcribing most of the interviews that I recorded as part of this research. For providing information and feedback at different points of my research process: Laura Beloff, Anna Nacher, Wendy Coones, Christian Ulrik Andersen, Søren Bro Pold, Geoff Cox, Magdalena Tyzlik-Carver, Gabriel Pereira, Sudipto Basu, Ozgun Eylul Iscen, Mariana Murcia, Santiago Pinyol, and Enar de Dios Rodríguez. For their friendship and support throughout these two years moving across Europe: Riad Salameh, Czarina Calinawagan, Suhun Lee, Amanda Parra, Natacha Lamounier, Meraj Sharifi, and my other colleagues at the Media AC program. Last but not least, thanks to my mother, my grandmother, my siblings, and my father, who have always been a source of inspiration and motivation. Finally, I want to thank the internet, the Ocean, and the tarot cards for allowing me to sense the deep relations between my research and my own experience in complex and inspiring ways.

Introduction

Installed in the year 2000, Atlantis-2 was the first submarine fiber optic cable to create a direct internet connection between Europe and South America. One of its seven landing points is located in an anti-nuclear bunker at Conil de la Frontera, a coastal town in the south of Spain. Built in 1970, the bunker was intended to protect one of the nodes of the TAT-5/MAT-1 telephone cable that connected Italy, Spain, Portugal, and the United States during the height of the Cold War. Before descending the stairs that lead into the underground bunker, there is a bronze plaque hanging on the wall that features a relief of the Italian, Portuguese, Spanish, and US flags connected by a meandering cable, commemorating the laying of TAT-5/MAT-1. In the background, there is yet another relief that depicts three caravels with crosses on their sails navigating through the Ocean, most likely referring to the three caravels used by Christopher Columbus when he first sailed to America: La Pinta, La Niña, and La Santa María (see fig. 1).² The image inserts submarine cables into a historical genealogy that originates from the European colonization of America,³ establishing a visual relation between colonial and modern transatlantic infrastructures. Taking this image and Conil's cable bunker as a starting point, this thesis' main objective is to propose a different way of relating to the internet through establishing the historical relations between its material infrastructure and other colonial and modern infrastructures. Through interdisciplinary research on the Atlantis-2 submarine cable and its landing station in Conil, this thesis reveals the historical roots of the internet's infrastructure and highlights how communities at its landing sites relate to this history in order to disrupt the monolithic narratives of connectivity that characterize the internet.

Through the COVID-19 pandemic, the internet has solidified its status as a fundamental technology for the continuation and expansion of social, economic, and political relations. At surface level, the internet appears to be a neutral tool that effortlessly sustains education, health, work, amongst other social activities that have been affected by the restrictions imposed in response to the pandemic. However, Naomi Klein (2020) quickly brought to the public's

 $^{^{2}}$ The same plaque is also in a small DIY museum inside the bunker, and I tried to buy a reproduction of the plaque that I found on e-bay, but was probably the victim of a digital scam. I wonder if an algorithm detected my online searches, and informed online scammers that this would be a good bait for me.

³ Even though the English-speaking world has monopolized the name of an entire continent to refer to the United States, when most people in the Spanish-speaking world refer to America, they mean the entire continent. In this thesis, when I refer to America I mean the entire continent, not the United States.



Figure 1. TAT-5/ MAT-1 cable commemorative bronze plaque. Source: Burns, B. *History of the Atlantic Cable & Undersea Communications* (https://www.atlantic-cable.com).

attention the perils of handing democratic and public services to the private tech companies that control most of the internet, highlighting concerns about mass surveillance and data collection. Klein is not the only one who has recently rang the alarm on the unethical practices of private internet and online service providers. Shoshana Zuboff (2019) proposes that the economic system at the core of tech companies such as Google, Facebook, and Amazon are based on the surveillance and commercialization of data provided by the hundreds of clicks and scrolls that users perform on a daily basis. This form of surveillance capitalism is based on the extraction and trading of private digital information in order to fill the vaults of the multinational

companies that own both the internet's software and hardware. Therefore, the increased digitization of the world under the pandemic could come at a cost if the internet, as a global infrastructure, is not critically examined and thought of anew.

While other research has focused on the study of software such as data algorithms and protocols as the crucial infrastructure of the internet, this thesis works from the premise that studying the internet's hardware—its material infrastructure—is key in order to explore new ways of relating to the global movement of information. Despite the intangibility conveyed by most digital metaphors such as clouds and wi-fi, the internet relies on a material infrastructure composed of hard drives, data centers, and cables. Since the laying of the first transatlantic telegraph cable in 1858, which connected Valentia in Ireland with Trinity Bay in Newfoundland, the circulation of information across the world has mostly relied on submarine cable infrastructure. Despite the generalized perception that the internet travels via satellite or using invisible airwayes, approximately 95% of digital information today moves through nearly 440 transoceanic cables.⁴ The data transfer rate of submarine cables is approximately eight times faster than satellites, partly due to the vast distance that signals have to travel from the Earth's surface to outer space in contrast to the shorter distances across Oceans.⁵ As the COVID-19 pandemic increases the internet's pervasiveness in the production of social relations, the demand for more and better internet infrastructure has become a pressing issue for governments and multinationals alike. According to TeleGeography,⁶ even though international bandwidth used by global networks had already more than doubled between 2018 and 2020, digital data networks are expected to continue growing at an ever-expanding rate due to the pandemic (Brodsky, 2021). In a way, submarine cables are the most essential infrastructure for modern global telecommunications.

With this in mind, this thesis is particularly interested in the entangled social history of the telecommunications infrastructure that support the internet. This research focuses in particular on submarine cables and their landing stations, which enable the movement of information through a transoceanic network that connects data centers around the world. The

⁴ Interview with Anahí Rebatta, senior analyst at TeleGeography, 21 April 2021.

⁵ Interview with an anonymous telecommunications engineer, 7 April 2021.

⁶ TeleGeography is a telecommunications market research and consulting firm based in the United States. They are widely recognized beyond the telecommunications industry due to their Submarine Cable Map, an open and free tool that maps all the active fiber optic cables around the world and their respective landing stations.

hypothesis at the core of this thesis is that if submarine cables and their landing sites through are critically analyzed through interdisciplinary approaches, as spaces where the deep spatial and temporal implications of the internet's infrastructure are condensed, the concealed material and social relations at the core of contemporary networking technologies can be uncovered. This thesis discusses my research on the Atlantis-2 fiber optic cable, the first to connect Europe and South America, and its landing site in the south of Spain, in order to perform a critical examination of the historical and technosocial relations embedded in undersea cables. Through this analysis, I aim to demonstrate that the interdisciplinary study of submarine cables and their landing sites unveils the tangled relation between the internet, geopolitics, and history, opening up possibilities of relating anew to the internet as a connecting technology.

This thesis also seeks to enrich the theoretical and methodological framework in which to conduct critical studies of technological infrastructures. Influenced by critical discourses within the field of Science and Technology Studies (STS), the study of technological infrastructures such as the internet has been characterized by a constellation of material, technical, and social considerations weaved through interdisciplinary research methodologies. Christian Sandvig argues that this study of infrastructure as social phenomena emerges from two fundamental paradigms that bridge the gap between social and technical approaches in the study of technology (2013). On the one hand, some researchers emphasize a relational paradigm that characterizes infrastructure as a historical process of entangled social and technical relations (Star and Bowker, 2006). And on the other hand, the interdisciplinary field of infrastructure studies has also been marked by a materialist drive that focuses on artifacts and their relation to the natural and social surroundings where they are embedded (Parks and Starosielski, 2015). Far from being mutually exclusive, both approaches embrace multiple methodologies to study technological infrastructures, emphasizing the role of social relations and of material environments in the construction and meaning of technology. Drawing from this perspective on infrastructure, this thesis brings together archival and ethnographic methodologies in order to assemble the connections between historical, social, and technical relations at the Atlantis-2 cable and its landing site at the south of Spain, seeking to plot the colonial and modern roots of the internet and to speculate on new ways of relating to the internet as a networking technology.

In order to weave the various elements of this research together, I approach technology from a relational perspective. Bruno Latour (1993) and Donna Haraway (1997) have proposed

that technology is more than just a simple mediator between humans and the world, which is a notion that emerges from the separation between culture and nature that characterizes modernity. In contrast, technology participates in the configuration of the world as an active agent. In the particular case of modernity, technoscientific practices and discourses have produced, and continue to reproduce, specific configurations in which humans remains masters of their nonhuman surroundings. In this sense, modernity is much more than a historical period; it is an anthropocentric epistemological framework enabled by particular kinds of technological developments. Haraway (2003) mobilizes the concept of *naturecultures* as a tool to identify how modern technoscience participates in the construction of worldviews and practices that recreate a world in which humans remain at the center of the universe. Drawing from Haraway's concept of naturecultures, Jussi Parikka (2015) goes even further to propose the notion of *medianatures* in order to emphasize the co-constitutive relation between technology and nature "where the ties are intensively connected in material nonhuman realities as much as in relations of power, economy, and work" (p. 14). Contemporary media technologies are thus inserted into a set of social relations that places humans at the presumed center of things, playing a crucial role in the symbolic and material construction of reality. As a technoscientific construct, the internet is crucial in the production of contemporary modernity, especially when considering the military, academic, and capitalist figurations it promotes (Haraway, 1997). Based on these critical approaches towards technology as relational, this thesis investigates transatlantic submarine cables as a technological infrastructure that plays a crucial role in the construction of social relations in the twenty first century.

The deep connection between modernity and technology discussed by Latour, Haraway, and Parikka are also embedded in the colonial history that prefigured the emergence of the contemporary world. Latin American decolonial thinkers such as Walter Mignolo (2011), Aníbal Quijano (2010), and Arturo Escobar (2010) have identified that the narratives of anthropocentric dominance that characterize modernity were a key driving force of colonialism, as European empires solidified a world order in which they were both masters of their colonial subjects and of the ecologies at the offshore territories they controlled. These decolonial thinkers have worked together through collaborative interdisciplinary programs, producing a set of texts that enunciate the deep relations between modernity and coloniality. Their main thesis is that these two historical configurations constitute mutually defining material and semiotic projects, which

monopolize space and time through technologies that favor a linear notion of progress. Drawing from an understanding of technology as a social phenomenon, as well as from the decolonial notion of technology as co-constitutive with modernity and coloniality, the first objective of this thesis is to explore the complex entanglement between the Atlantis-2 cable, its landing station at Conil, and other colonial and modern infrastructures in the south of Spain. This research project is not interested in clearly demarcating the starting and ending moments of modernity, but rather in plotting the deep historical layers at the root of contemporary networking technologies.

Studying the internet's submarine cables and its landing stations from the perspective of the social, geopolitical, and historical relations that they are part of is not entirely new. Discussing the undersea telecommunication networks of the British empire and in the Pacific Ocean, Nicole Starosielski (2015) suggests that research on the complex histories of submarine cables "reveals how our undersea network, as well as the connections it enables, has been made possible only by the deliberate manipulation of technology, cultures, politics, and environments, all of which remain invisibly enfolded in the lines between nodes" (p. xiv). The internet's infrastructure is embedded within the material and social relations at the multiple places it occupies, and it is an active agent in the production of geopolitical, ecological, and technosocial relations across the sites where its cables land. However, despite her in-depth research into submarine cables, there has not yet been a comprehensive study on the material history of the transatlantic cables that connect the different regions of the Spanish-speaking world, namely the Iberian Peninsula and Latin America, and the ways in which this infrastructure is part of the colonial and geopolitical history that links both regions. Therefore, this thesis aims to examine the internet's transatlantic infrastructure through a critical analysis of the Atlantis-2 fiber optic cable-the first to establish a direct internet connection between Europe and South Americaand its landing point at Conil de la Frontera in the south of Spain.

The interdisciplinary and networked narrative that this thesis constructs around the internet's infrastructure is, nevertheless, not very common. Susan Leigh Star and Geoffrey Bowker (2006) suggest that infrastructures such as submarine cables are typically sunk into other social structures, technologies, and geographic spaces, making them invisible to the naked eye and subsequently absent from discussions on technology. Cables under the Ocean have also remained on the periphery of public discourse partly because of the limits of institutional cable narratives, which overemphasize the instances when two or more places are newly connected by

a cable instead of focusing on the complex material and social relations in which cables are embedded before, during, and after they are laid down (Starosielski, 2015). In order to challenge these limited narratives, Starosielski (2015) invites her readers to create nodal narratives that highlight cable landing sites "as places where global cable systems encounter friction and experience tension with human and nonhuman inhabitants of aquatic and coastal space. Landing points are an interface between technological networks and the local cultural practices they seem to bypass, a bridge linking previous and future circulations" (p. 169). In other words, cable landing sites and cable stations provide a fertile ground to understand the material environments and geopolitical contexts upon which particular segments of the internet are embedded, bringing to the forefront the concealed material and social entanglements of digital technology and connecting the internet's infrastructure to other phenomena across time and space. Drawing from Starosielski's invitation to focus on the material and social dynamics at a cable's landing space, this thesis constructs a nodal narrative that aims to connect the multiple layers of historical, geopolitical, and social relations embedded in the Atlantis-2 cable and its landing station in Conil.

Atlantis-2 has seven landing sites: from Spain and Portugal the cable travels to the Canary Islands and Cape Verde, where it connects to Senegal before crossing the South Atlantic to land in Brazil and Argentina. Besides the difficulty of conducting research on all of the seven landing sites of Atlantis-2 due to their wide geographical locations, I decided to focus on the cable's landing site in Spain because it is sunk in a historical context deeply entangled with other colonial and modern infrastructures. Conil is located in Andalucía, the southernmost region of Spain and of continental Europe, a geopolitically contested zone filled with watchtowers and bunkers from the war between the Islamic caliphate and the Catholic monarchy, the colonial conquest of America, the Spanish Civil War, World War II, and the Cold War. The cable station at Conil is located in a tense geopolitical region, where the frontiers of modern Europe have been continuously contested. Furthermore, the Iberian Peninsula is quickly becoming a strategic interconnection hotspot,⁷ which places even more importance in the critical study of the historical layers in which telecommunications infrastructure are embedded in this region. The material and historical entanglements of the Atlantis-2 cable and Conil's cable station constitute

⁷ Mingas, M. (2021) *DE-CIX, EllaLink, Interxion and TeleGeography put connectivity on the map.* Available at: https://www.capacitymedia.com/articles/3829045/de-cix-ellalink-interxion-and-TeleGeography-put-connectivityon-the-map (Accessed: 4 August 2021).

a vital space of interdisciplinary research on the relations between digital, modern, and colonial infrastructures in the Spanish-speaking world, and add new perspectives to the social history of the internet's infrastructure. It is important to note that my aim is not to establish clear historical lines between the internet's infrastructure and its colonial and modern genealogies, but rather to interpret a network of discursive and material connections that emerge from the landing site of Atlantis-2 in Conil.

To review, I first aim to trace the intricate relations between the internet's infrastructure, coloniality, and modernity through an interdisciplinary study of the Atlantis-2 cable and the cable station in Conil where it lands. Through plotting the links between submarine cables, frontiers, bunkers, and watchtowers, this thesis seeks to reveal the submerged relations between the internet's infrastructure and the production and securitization of colonial and modern frontiers. Having established this relation, this thesis' second objective is to diversify the possibilities of relating to the internet based on the fieldwork I conducted in the south of Spain. In other words, establishing the colonial and modern roots of the internet is not my main goal, but rather a stepping stone for the question at the center of this thesis, which could be stated as: What new relations to the internet are possible when critically examining how its submarine cable infrastructure is embedded in the social, material, and historical relations at its landing sites? In order to address this question, this thesis discusses the tensions between institutional and local narratives about submarine cables that emerged from my research in Conil, in order to explore the role of storytelling as a tool to relate differently to technological infrastructure and reassess the status of the internet as a connecting technology. In order to present this research, this thesis is divided into three main chapters.

In the first chapter, *How to situate technosocial infrastructures: notes on methodology*, I discuss my interdisciplinary approach to the study of submarine cables as technosocial infrastructures, which draws from archival and ethnographic methodologies. Referring to discussions within the study of infrastructures and to feminist approaches to technology, I first highlight the importance of interdisciplinary research in order to uncover the relational dimensions of technology (Star, 1999) and to situate the co-constitutive relationship between technology, coloniality, and modernity (Haraway, 1988; Mignolo, 2011). This chapter then discusses the interdisciplinary methodological approach I use to situate the internet's infrastructure, which draws from archival research and creative ethnographic mediation on the

Atlantis-2 submarine cable and its landing station at Conil. Furthermore, this section argues that speculative non-linear assemblies (Latour, 2006; Haraway, 2015; Ferreira da Silva, 2016) are essential tools to weave more ethical stories about technological infrastructures and the material, historical, social, and geopolitical relations in which they are immersed.

The second chapter, *Cables, frontiers, and bunkers: deep relations between colonial and modern infrastructures,* weaves a series of speculative non-linear assemblies between Atlantis-2 and its landing station in Conil with other colonial and modern infrastructures in the south of Spain, aiming to trace the co-constitutive relation between interconnection and securitization that defines these technosocial infrastructures as geopolitical agents. My first set of assemblies traces the deep relations between Conil's cable station and the layers of military infrastructure still present in the town such as watchtowers and bunkers, which have defined the contested construction of the modern European frontier and its subsequent securitization in this region of Southern Spain. My second set of assemblies follows the topographical layout of Atlantis-2 through the South Atlantic in order to trace the spatial and temporal relations between the transatlantic routes followed by submarine cables and other transatlantic colonial and modern routes. In sum, this chapter problematizes the internet as a connecting technology through establishing a link between its material infrastructure, the creation and securitization of frontiers, and the relationship between submarine cables with colonial and modern geopolitical configurations.

Then, in the third chapter titled *Secrets under the sea: cables and fiction*, I focus on the use of speculative storytelling as a relational tool to resignify the internet's material infrastructure as a boundary object where multiple meaning-making practices collide (Star and Griesemer, 1989). In the first part of this section, I discuss how people in Conil relate to submarine cable infrastructure through speculative storytelling, a tool that enables them to challenge the frontier securitization practices embedded in telecommunication companies and the monolithic geopolitical narratives on the internet as a connecting technology. In the second part of this chapter, I weave a concluding story around Atlantis-2 that speculates on the deep relations between the internet and submarine ruins in order to imagine other possible relational futures for the internet as a material infrastructure.

Finally, in *Conclusions* I come back to the problem set out at the beginning of this thesis in order to evaluate the shortcoming and advantages of the interdisciplinary methodologies I used to investigate Atlantis-2 and its landing site in Conil. Reflecting on the material, social, and historical relations around the internet's infrastructure that surfaced from the assemblies proposed throughout the thesis, I asses the emergence of new possible ways of relating to contemporary networking technologies. After assessing the interdisciplinary methodology and the multilayered relations embedded in submarine cable infrastructure in the south of Spain, I consider some perspectives for future research on the internet's materiality.

1. How to situate technosocial infrastructures: notes on methodology

The term infrastructure is traditionally understood as a stable material background upon which social relations unfold. However, critical approaches to the study of technology have highlighted that infrastructures are not stable, but rather emerge from the constant dialogue between technical and social relations. Susan Leigh Star (1999) has emphasized infrastructure as a relational concept that, in addition to highlighting configurations that are typically taken for granted, refers to the multilayered network of symbolic and material systems that create multiple social meanings. Although modern technological infrastructures tend to aspire towards the homogenization of procedures and standards, Star has identified that the same physical system can perform different roles depending on the spatial, temporal, and social relations that it participates in. In other words, every infrastructure is part of the material and symbolic relations of the specific place and time that it occupies. As a technological infrastructure, the internet means different things depending on the specific spaces occupied by submarine cables and their landing stations. Submarine cables are part of disputed and situated social relations, which can sometimes share some characteristics across geographic distances but are typically informed by the histories at each site. Drawing from this understanding of infrastructures as contingent on their material surroundings, this thesis dives into the historical, geopolitical, and social relations entangled with the Atlantis-2 submarine fiber optic cable at its landing site in Conil de la Frontera in the south of Spain. In order to discuss how I go about achieving this objective, this chapter lays out the theoretical and methodological backbone of my research process.

Situating an infrastructure such as Atlantis-2 and one of its seven landing stations means not only to consider the ways in which they are immersed in a particular social and material space, but also to understand the cable and its landing station as actors that participate in the configuration of these relations. While academic fields such as media archaeology mobilize methodologies that engage with the deep histories of technological material culture (Zielinski, 2006), networked infrastructures such as undersea cables are more than just material culture, a concept that remains too static to describe the complex ways in which they relate to the social and environmental dynamics at the places they become part of. Referring to these limitations, Bruno Latour (2005) suggests,

[t]alking of 'material culture' would not help very much since objects, in this case, would

be simply connected to one another so as to form a homogeneous layer, a configuration which is even less likely than one which imagines humans linked to one another by nothing else than social ties. Objects are never assembled together to form some other realm anyhow, and even if it were the case they would be neither strong nor weak—simply 'reflecting' social values or being there as mere decorum. Their action is no doubt much more varied, their influence more ubiquitous, their effect much more ambiguous, their presence much more distributed than these narrow repertoires (p. 84-85).

Latour proposes that objects play an active role in the construction of social relations, and highlights their role as intermediaries capable of modifying a given state of affairs. This thesis embraces a critical approach to the social study of technology that emphasizes the role of technological objects as social agents, challenging the divide between passive objects and active subjects. Latour argues that objects are precisely what allows researchers to better explain "the overarching powers of society, the huge asymmetries, the crushing exercise of power" (p. 72). Latour's reconceptualization of objects, and subsequent decentering of humanity as the singular vantage point in the production of the world, is heavily influenced by Deleuze and Guattari's (1989) description of reality as the making and unmaking of multiple relational rhizomes. Latour draws from Deleuze and Guattari's description of reality as a constantly shifting network of relations in order to suggest that any subject or object can potentially be connected to anything else at a given time, thus creating the multiple assemblages that constitute the social as a relational space. Drawing from Latour's relational approach towards objects, the field of infrastructure studies has brought typically hidden material and symbolic systems to the forefront of sociological discussions. When I speak about infrastructures as being technosocial, I mean that technology and its material systems cannot be understood as separate from the specific social relations in which they are created, used, and mobilized. Bearing this in mind, this thesis investigates how submarine cables are inserted in the material and social relations at their landing stations.

In addition to considering submarine cables and their landing stations as agents, the process of situating the internet's infrastructure also requires that I position myself as a researcher who is also an agent. Donna Haraway's feminist perspective on the study of technoscience and the construction of reality further challenges the separation between subjects and objects as discrete entities. Haraway (1989) criticizes the modern pretension of objectivity that solidifies an artificial distance between objects of knowledge and the knowing subject, a

predisposition that she identifies as complicit with dominant perspectives that favor western and modern militarism, capitalism, colonialism, and male supremacy. In contrast, she suggests that feminist objectivity perceives the object of knowledge as an agent located within particular sets of relations, moving research away from the paradigm of discovery and explanation towards the paradigm of conversation. In other words, the things and topics studied by researchers across multiple disciplines are not passive nor neutral; in fact, objects modify, frame, and enable particular kinds of relations and meaning-making practices in dialogue with the particular perspective of each researcher and the specific moments in which they are embedded. Drawing from this feminist research approach, this thesis discusses the role of submarine cables in the production of reality as more than just simple conduits of anthropogenic signals, but as agents of the material surroundings at the places they occupy.

Seeking to challenge the subject/object and nature/culture divides, Latour (1993) and Haraway (2003) identify that this segmented perception of reality is an essential characteristic of modernity, as system of knowledge that places humans at the center of things. Even though both of them occasionally mention the role of colonialism in the production of these relations, Latin American decolonial thinkers have pointed out more clearly that the division of nature from human culture and of subjects from objects is also the epistemological cornerstone that has driven the global imposition of colonial paradigms since the European conquest of America. Through a joint research program called Modernity/Coloniality/Decoloniality, thinkers such as Walter Mignolo (2011), Arturo Escobar (2010), and Aníbal Quijano (2010) have argued that modernity and its main tenets cannot be divorced from the colonial expansion of European paradigms since the sixteenth century. From a decolonial perspective, though speaking of European empires and of more recent nation-states implies multiple differences, modernity and coloniality are inseparable. Mignolo (2011) suggests that the co-constitutive relationship between modernity and coloniality is enabled by a set of technological infrastructures, which promote monolithic visions of the socioeconomic, political, and epistemological arrangements that constitute contemporary capitalism. Regardless of the shifting geopolitical locus of power, which is today fought by multinationals and governments beyond Europe and the Anglo-American world, the epistemological projects of modernity and coloniality continue to be defined by the dominance of western(ized) human subjects over the natural non-western(ized) world (Mignolo, 2011) and by the production of discrete subjectivities separated from their material surroundings

(Quijano, 2010). In order to challenge this construction of reality, decoloniality invites researchers to situate the production of knowledge within particular contexts, focusing on how practices and paradigms of progress are translated as a contested set of social relations (Escobar, 2010). Bearing these discussions in mind, this thesis embraces a decolonial approach towards media infrastructures as a way to enunciate the co-constitutive relationship between technology, coloniality, and modernity, and to explore the relational networks that break away from monolithic and hegemonic narratives around technological infrastructures. Drawing from the decolonial theories, I seek to discuss the deep relations between Atlantis-2 and its landing station in Conil with the geopolitical history of the southernmost tip of continental Europe, and to highlight the counter-hegemonic narratives created by the local community.

So far, I have discussed the importance of thinking about infrastructures as relational agents that take part in the material and social dynamics at the places they occupy. This perspective leads me to approach submarine cables as technosocial actors embedded in the particular dynamics of their locations. Seeking to challenge modern and colonial configurations that tend to isolate technology from its material surroundings, this thesis embraces the most ubiquitous space occupied by the internet's infrastructure: the Ocean. Phillip Steinberg and Kimberly Peters (2015) propose the concept of "wet ontology" as an analytical tool that seeks to move technological materialism away from fixed categories and towards notions of volume and depth. For them, thinking with the Ocean as a theoretical tool places further attention on the particular materiality of seawater not just as a neutral background for human technosocial configurations, but as a key element in the configuration of such systems. Steinberg and Peters emphasize the need to think through and with material and ecological systems as essential parts of contemporary human infrastructures. Similarly, Starosielski (2015) complicates the notions of flow that characterize early studies of modern networks, since the latter are increasingly characterized by centralization rather than by distribution (2015). In order to move away from flow as an analytical category, this thesis embraces the notion of depth to push my understanding of the internet's marine infrastructure into multilayered configurations. Thinking about submarine cables through depth allows me to see the abstruse and ambiguous relational aspects that define the internet at its landing sites.

Finally, in addition to situating submarine cables within particular spatial and historical contexts, a critical and interdisciplinary study of infrastructures also considers the relation

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between different technosocial systems across time. One of the salient features of infrastructure discussed by Susan Leigh Star and Geoffrey C. Bowker is that it is typically based on an installed base: "infrastructure does not grow de novo; it wrestles with the inertia of the installed base and inherits strengths and limitations from that base. Optical fibers run along old railroad lines [...] and failing to account for these constraints may be fatal or distorting to new development processes" (2006, p. 231). Drawing from Star and Bowker's discussion on the temporal genealogies of infrastructure, Shannon Mattern (2015) proposes that every media infrastructure is part of a deep network of past systems that can be historically traced. In addition to the spatial considerations discussed in the previous paragraphs, this research explores the deep relations between submarine cables and other layers of infrastructure across time. The study of the spatiotemporal roots of submarine cables at their landing sites enables me to situate the internet as a technosocial infrastructure in the south of Spain. Through an interdisciplinary methodology that bridges archival and ethnographic research, this thesis asks how the Atlantis-2 cable and the cable station at Conil intersect with other infrastructures of border securitization and geographical connectivity located in the same site, such as bunkers and watchtowers, and how the local community relates to these multilayered connections. Having outlined the core theoretical tenets that constitute my outlook on the internet's materiality, I will now transition to discussing the archival and ethnographic methodologies I employed to research the Atlantis-2 cable infrastructure at Conil.

1.1. Archival and creative ethnographic mediation

In the previous section, I presented a set of theoretical considerations that understand media infrastructures as multilayered agents, which act as intermediaries and participants in the construction of social relations at the spaces they occupy. Both critical studies of science and technology and decolonial research suggest that in order to challenge the epistemological divisions between nature/culture and subject/object, which are fundamental to the colonial and modern world order, technology must be approached as a technosocial system. Through an interdisciplinary research methodology, this research seeks to reveal the often hidden relational and material dimensions of digital technology (Sandvig, 2013) and, most specifically, it aims to visibilize the operational intersections between the internet's material network and the social and historical contexts in which it is embedded (Parks and Starosielski, 2015). In other words, the

critical perspective on infrastructure mobilized by this thesis challenges the status of submarine cables as a passive background upon which digital relations unfold. Instead, submarine cables are changed by and, in turn, change the relationship between space, humans, and other non-human agents in their geographic contexts. In this section, I will discuss how I investigate the Atlantis-2 cable and the bunker cable station in Conil, drawing connections between the archival and ethnographic research methodologies that I employ.

Before describing my particular use of these two research methodologies, I will briefly refer to the relevance of approaching media infrastructures such as submarine cables from an interdisciplinary lens. As I have discussed above, the study of infrastructures often focuses on revealing the relational and material qualities of systems that are hidden from view, problematizing the division between background and foreground. However, bringing infrastructure to the foreground is not enough because as I put forth in the previous section, infrastructures are not just material phenomena. The constant interaction between the material and the social within infrastructures leads Star and Bowker (2006) to suggest that "a historical, archaeological approach to the development of an infrastructure like the Internet needs complementary sociological, regulatory and technical studies" (p. 231). Thus, in order to understand the complex role played by infrastructures as agents, research has to consider how they operate at multiple levels, from their technical materiality to their historical and social genealogies. Lisa Parks and Nicole Starosielski (2015) suggest that the tangled set of relations folded into infrastructures provides a platform for innovative transdisciplinary methodologies "by activating and combining approaches such as archaeology, political economy, phenomenology, ethnography, and discourse analysis" (p. 7). Drawing from these interdisciplinary perspectives in the study of infrastructure, this thesis engages with archival and ethnographic methodologies in order to address the intricate connections between the historical, geopolitical, and social aspects of the Atlantis-2 cable and its landing station at Conil de la Frontera.

The first set of considerations for this research emerges from an archival approach towards the history of transatlantic submarine cables, particularly focused on the laying of the Atlantis-2 cable and the construction of the cable station bunker in Conil. Throughout this thesis, I refer to documents related to the construction and management of these two internet infrastructures as well as to historical narratives on their implications for the local community

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and the dynamics of global telecommunications. Additionally, I selected examples of multimedia content produced by Telefónica—the Spanish telecommunications company that partly owns both Atlantis-2 and the bunker in Conil—, which reveal the institutional stories around submarine cables. Besides referring to these documents in order to establish a series of historical moments, this thesis performs a discourse analysis of their contents, aiming to understand the paradigm of connectivity that characterizes the official narratives on the internet coming from governments and multinationals. Through a historical and discourse analysis of these documents, this thesis establishes a set of spatial and temporal parallels between submarine cables, trading routes, and other military infrastructure in Conil.

This archival approach, however, does not sufficiently trace the relational and material aspects of Atlantis-2 and the cable station at Conil, since institutional discourse typically seeks to homogenize the meaning of technological infrastructure regardless of the particular relations in which it is embedded (Star and Bowker, 2006). Considering that this thesis focuses on the relational aspects of the Atlantis-2 cable and its landing station in the south of Spain, I also engage with an ethnographic approach towards this particular infrastructural node of the internet's global network. Archival research meets a series of shortcoming when seeking to situate media infrastructure in particular social and material relations, since it privileges official narratives over the experience of the people who coexist with these systems. Seeking to situate the complex relational dimensions of infrastructure, Star (1999) suggests that traditional ethnographic tools such as interviews and observations can add valuable insights to the historical and literary analysis of technology. Through observing and asking about the ways in which people interact with the material structures around them, ethnographic methodologies are better equipped to understand the role played by submarine cables as social and material agents at particular sites. Observations and interviews reveal how people create meaning about the infrastructures that occupy their material surroundings, challenging what Star (1999) calls the "master narratives" that speak from the presumed center of things. In other words, the relational narratives revealed by ethnographic research challenge and diversify hegemonic institutional discourses around infrastructures such as submarine cables.

In order to conduct an ethnographic research of Atlantis-2 and its landing station in the south of Spain, I spent three months living in Conil. During the first month, I slowly created an affective network with the help of my landlady and my yoga teacher. Since my native tongue is

Spanish and I also understand several local social conventions that tend to coalesce around work, food, and drinks, I was able to quickly develop close connections to the people I met. Most people I spoke with were initially surprised when I mentioned that I travelled to Conil to conduct research on the internet station that houses the cable that connects Europe and America, since most foreigners come to Conil for its beaches. Conil has roughly 20,000 permanent inhabitants, but in the summer the population can reach 120,000 between local and international tourism. After a brief moment of incredulity about my status as an artist and researcher instead of a surfing tourist, most locals had a story to share about the cable and the cable station, which is popularly referred to as the Telefónica bunker. Through this network of people, which grew during the three months I spent in Conil, I was eventually able to contact engineers directly connected to the town's cable station owned by Telxius, an infrastructure subsidiary of Telefónica, the largest telecommunications company in Spain and one of the most important in Latin America. My presence as a male researcher with the backing of a Danish university definitely played out in my favor, as the people I talked with took me more seriously once I provided some context. In the following chapters I will discuss the intersecting layers of accessibility that define the internet's infrastructure in Conil.

Through this affective network that I built during my three months of research, I had several informal conversations and conducted some formal interviews, all in relation to the historical layers of Conil and their particular relationship with the internet's infrastructure. In total, I recorded seven formal interviews: five in Conil, one in Seville, and another one over videoconference. In Conil, I interviewed: José Ligero, fisherman and filmmaker; Diego Tirado, president of the Fishermen neighborhood's association; Isabel Tomé, a local teacher of languages and history; and two telecommunication engineers. Both engineers will remain anonymous because, even though they did not see any harm in my research, Telxius is very protective of the information they share.⁸ In Seville, I interviewed Juan Luis Suárez de Vivero, Emeritus Professor of Marine Geography at the University of Seville, and through a videoconference I interviewed Anahí Rebatta, senior analyst at TeleGeography. Through these interviews I was able to identify both academic and popular narratives about submarine cables, the history of the south of Spain, and their relationship with the Ocean, which are weaved throughout this thesis. Moreover, during

⁸ I will further discuss this strict control over access to information in the later section *Secrets under the sea: cables and fiction.*

my three months there, I visited an internet cable station and Network Operations Center (NOC) as well as a submarine cable manhole on the beach for the first time in my life. Most of the concepts and stories I discuss in this thesis arise directly from the firsthand interviews and observations that I conducted during this research, which add a crucial relational dimension to my understanding of the lived experience around cable infrastructure, diversifying and sometimes challenging the institutional narratives around Atlantis-2 and Conil's cable station.

Ethnography opens up the possibility of listening to the experiences of those who interact with particular infrastructures on a daily basis. The kind of experiential immersion required to conduct this type of research must be, nevertheless, guided by an acute awareness of the complex layers of meaning that are produced at each site. After conducting research on marine submersibles, Stefan Helmreich (2007) argues that the concept of transduction, which refers to the shift of signals from one medium to another, can help to rethink the work of ethnographers. He claims that when submerged in a particular set of social relations, it is vital to remain open to the dialogue between spaces, environments, and agents, which are continuously coding and decoding messages across varied experiences. Helmreich also suggests that "[t]he metaphor of transduction can tune one in to textures of disjuncture, to the corporeal character of transferring signals, particularly in cyborgian settings" (p. 631). Therefore, when conducting ethnographic research, especially on the multilayered relations of a technological infrastructure, it is crucial to stay attentive to one's own perspective, from which information is being constantly transformed.

Bearing this in mind, in addition to traditional ethnographic methodologies such as interviews and observations, my research process also engaged with autoethnography as part of the methodological approach during my time in Conil. Autoethnography is a method of recognizing one's own situation in relation to the subject being studied as a way to trace the intersection of multiple narratives at particular sites (Méndez, 2013). It situates the experience of the researcher in relation to the particular place of enunciation, further challenging the modern separation between knowing subject and studied object highlighted by Haraway (1998), Latour (2005), and Quijano (2010). During the three months I spent at Conil, autoethnography invited me to ask questions around the elements that constitute my voice as a researcher, the temporal and spatial particularities of my research, and the clash between my own preconceived notions with the narratives of the people I interviewed. These considerations opened up very relevant reflections about the multiple voices and agencies involved in my research, from submarine

cables and cable stations to the people who live around them and myself as researcher. Throughout this thesis, I weave together archival material, interviews, observations, and autoethnographic considerations in order to reflect on my status as a researcher deeply implicated in the contentious mediation of reality, shifting research on technology from its usual objectivist and universalist distance towards a relational networked proximity.

As a research methodology, autoethnography lends itself to more creative approaches to the study of media infrastructures, inviting researchers to experience themselves as mediators between objects, histories, and social relations in the spaces they occupy. Moved by a similar drive to expand the possibilities of ethnographic research of media, Kember and Zylinska (2012) propose "creative mediation" as an interdisciplinary methodology to study media, "in which critique is always already explicitly accompanied by the work of participation and invention" (p. xvii). For them, media is better explained from an expanded view of mediation as an entangled relational process of emergence, "with media being seen as (ongoing) stabilizations of the media flow" (p. 21). In other words, mediation is an act of constant translation between different states, a process enabled by objects as intermediaries. Inspired by their invitation, both Lisa Parks (2016) and Nicole Starosielski (2015) have conducted work on technological infrastructure such as broadcasting infrastructure in the United States and submarine cables in the Pacific Ocean respectively, through an interdisciplinary approach that combines archival and ethnographic methodologies through creative photographic mediations. In this thesis, I will refer to the combination of the ethnographic, autoethnographic, and creative methodologies I have discussed so far as creative ethnographic mediation, which constituted my main methodological framework for studying the Atlantis-2 cable and its landing site at Conil in the south of Spain.

In addition to the archival and ethnographic methodologies I have mentioned so far, my background as a visual artist deeply informed my methodological approach in Conil. Throughout the years I have worked as a visual artist, professor, and producer of collaborative laboratories at the intersection of art, science, and technology, I have used creative and collaborative methodologies in order to investigate the relations between the tecnosphere and the biosphere. For example, through the video essay *The Blue Dot* (2020), I investigate the ecological and epistemological networks woven around the internet's materiality, creating a network of historical and theoretical associations between the Internet Archive, the Library of Alexandria, Google, and submarine cables, amongst other elements. The video-essay uses appropriated

material and original recordings at the Internet Archive and San Francisco's Ocean Beach in order to connect multiple techno-ecological networks on a planetary level, inquiring about the poetic and material relationship between water, knowledge, and the digital revolution. Drawing from the creative approaches towards the study of media infrastructure that I have discussed so far, and from my own experience as a research-based artist, my three months of research in Conil were accompanied by my camera, tripod, and sound recorder, which I used to photograph and record both the interviews I conducted and several of my observations. Even though this thesis will not discuss the production of a creative artwork, I want to emphasize my experience as a visual artist in order to highlight my artistic approach towards the study of media infrastructures, which has allowed me to establish more embodied, creative, and imaginative relations with the internet's materiality.

This section presented the methodological approach of my research, which draws from archival and creative ethnographic methodologies in order to investigate how the Atlantis-2 fiber optic cable and its landing station in Conil are embedded in the historical, geopolitical, and social relations of the south of Spain. First, a discourse analysis of documents and institutional archives on Atlantis-2 and Conil's cable station enables me to reveal the relations between the internet's infrastructure and the particular geopolitical history in Southern Spain. Second, in order to address the shortcoming of a solely archival approach, this thesis is also based on a creative ethnographic mediation as a methodology to situate the material and social relations around the Atlantis-2 undersea cable and its landing site in Conil, tracing the tensions between official and popular narratives around submarine cables. In the next section, I will discuss how speculative and non-linear storytelling enable me to assemble the information I gathered during my three months of archival research and creative ethnographic mediation in Conil.

1.2. Weaving speculative non-linear assemblies

In the previous section, I presented the interdisciplinary methodology that framed my research of the Atlantis-2 cable and its landing site in Conil. I first discussed the archival research of documents related to the construction and maintenance of both the cable and the station in the south of Spain, which enables me to identify the narrative of connectivity embedded in the

internet's infrastructure and to discuss the multilayered historical and geopolitical relations embedded in transatlantic submarine cables. Then, in order to surmount the limitations of archival research when approaching cables as relational infrastructure, I engage with what I defined as a creative ethnographic mediation at the Atlantis-2 cable landing site in Conil. After gathering the archival and ethnographic information obtained throughout my three months of research at Conil, the connections I could plot in my mind were overwhelming. These were my main questions: How do the material and discursive aspects of the internet's submarine cables relate to the social and historical networks at the places they land? What kind of relations are constructed, reinforced, or challenged by these temporal and spatial networks? And even more pressing, how could I tell the story of such complex relations between the internet's infrastructure, institutional narratives, the stories shared with me by people in Conil, and the geopolitical history of the south of Spain through a single narrative?

While this thesis embraces creative ethnographic mediation as a methodology that complements the relational limitations of archival research, there are also crucial limitations inherent to ethnography, autoethnography, and creative mediation as methodological approaches to the study of media infrastructures. Ethnographic methodologies can place too much emphasis on the self, limiting the description of the relations between technological infrastructures and their historical and material surroundings to individual perceptions. These subjective accounts of technosocial phenomena run the risk of producing self-engulfed discourses that further isolate the researcher and the object of study. In particular, autoethnography and creative ethnography often rely too heavily on interpretation and subjective descriptions. However, as opposed to more traditional hermeneutic methodologies that also rely on interpretation, creative ethnographic mediation does not attempt to remain unbiased nor to fully explain a social phenomenon. In contrast, the creative ethnographic mediation that I propose embraces interpretation as a speculative act of translation, an unexpected methodological relation that I will further discuss in the following paragraphs. Bearing these limitations and particularities in mind, this section discusses the value of interpretation, speculation, and non-linear thinking as analytic methodologies for tracing the deep spatial and temporal relations embedded in the internet's material infrastructure.

As I discuss in the introduction, this thesis constructs a nodal narrative of the internet that highlights cable landing sites as places where the internet's material network collides with the

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histories, practices, and narratives of the local communities (Starosielski, 2015). These nodal narratives seek to trace the deep relations between social and technological elements as coconstitutive forces that shape reality. This thesis aligns with Latour (2005) when he claims that the social is not a passive context in which non-social activities take place, but that it is constituted as an assembly of associations between actors, elements, and agencies. Human and nonhuman actors are not merely embedded in particular social contexts, rather the social is constituted by a network of relations at any given space and time. Latour (2005) proposes to reassemble the social as the tracing of associations between actors, elements, and agencies, a shift from sociology towards associology. Latour's proposal of sociology as the reassembly of relations is deeply related to Haraway's suggestion that anthropology is precisely the "knowledge practice that studies relations with relations, that puts relations at risk with other relations" (2016, p. 12).⁹ Latour and Haraway emphasize that the social is better understood through tracing relations between multiple agents, and through moving from one association to the next, as networks that interact at different levels. This relational approach towards media infrastructures embraces technology as a key agent in the relational production of the world, where the social is a constantly changing category that emerges from the situated relations between technological infrastructure and the material surroundings with which it interacts.

However, the question remains: how to trace and construct these associations? I want to suggest that the interpretative tools provided by creative ethnographic mediation, despite their limitations tied to an overly subjective perspective, provide useful ways to weave the assemblies necessary to situate technosocial infrastructures. In particular, I argue that speculation and non-linear thinking enable research to embrace the relational complexity of infrastructures across time and space. Speculation can refer to many different things that range from foretelling the future to economic investments or active contemplation. However, in this thesis I refer to speculation as the creative act of making conjectures based on the interpretative connection between seemingly disparate elements. In this sense, speculation has permeated several disciplines in the last decade, providing an analytical tool that renovates the value of imagination and interpretation. In philosophy, speculation has reintroduced poetics into the discussion of knowledge by highlighting the ways in which imaginative thinking generates correspondences between apparently unrelated things (Shaviro, 2014; Avanessian, 2014). In design, speculation

⁹ Haraway draws from anthropologist Marilyn Strathern in order to put forth this notion of anthropology.

has encouraged experimental interactions with the present through imagining possible futures as a medium to think with (Dunne and Raby, 2013). Even though speculation is typically associated with the act of guessing and with its capitalist dimension when it comes to future investments, the methods I refer to reinforce the role of networked interpretations in the production of knowledge. Even though speculation and interpretation are hardly the same analytical act, I am bringing them together as speculative interpretation, a creative tool that enables me to weave connections between elements that appear to be distant at first sight. My understanding of interpretation differs from the hermeneutic approach that seeks unbiased explanation, which attempts to objectively explain a social phenomenon, speculative interpretation enables me to trace associations and relay connections, a key exercise in the construction of the assemblies proposed by Latour (2005). What might seem unorthodox to traditional scholars in clearly demarcated disciplinary fields is precisely what is needed most when approaching media infrastructures: it is crucial to imagine new ways of connecting humans, technology, and their material surroundings, as opposed to reproducing the division between subjects, objects, and their material surroundings that characterize modernity and coloniality.

The imaginative quality of speculative interpretation is also deeply tied to the creative act of storytelling and fabulation. Latour (2005) suggests that "the resource of fiction can bringthrough the use of counterfactual history, thought experiments, and 'scientifiction'-the solid objects of today into the fluid states where their connections with humans may make sense" (p. 82). The imaginative quality of fiction can destabilize rigid and monolithic notions on technology and social structures, enabling researchers to create new connections and see different patterns from those that have been already established. Referring to the relation between storytelling and feminist objectivity, Haraway (1989) proposes that the coming together of science and science fiction can generate narratives that, instead of explaining their objects of knowledge, enter into open and multifarious conversations. Later on, Haraway (2016) emphasizes the role of speculative fabulation as a method for tracing connections between different temporal and spatial scales that are not linearly causal, creating patterns across seemingly disparate elements that can shed light on the complex constitution of the contemporary world. Bearing this in mind, this thesis weaves a series of speculative stories around the internet's infrastructure in the south of Spain that is based on my findings, aiming at addressing the complexity implicit in the layered history of technological infrastructures.

The imaginative interpretation favored by speculative methodologies also embraces the non-linearity of social phenomena, privileging the creation of assemblies that connect elements across time and space. Denise Ferreira da Silva (2016) claims that conducting research and writing from the depth, width, length, and time of occurrences, enables researchers to grasp the relation between multiple compositions, exposing similarities and enabling "a kind of material thinking capable of reading symmetries, or correspondences. Images of poetical thought are not linear (transparent, abstract, glassy, and determinate), but fractal (immanent, scalar, plenteous, and undetermined), like most of what exists in the world". The spatial and temporal depth referred to by Ferreira da Silva is reminiscent of Steinberg and Peter's (2015) call for embracing the Ocean's depth as an analytical tool. Both seem to suggest that reality is always layered and multiple, a network that goes back in time and tends to be obscured by distance. In order to shed light on these complexities, non-linear thinking is better equipped to perceive symmetries and correspondences, which can also be thought of as assemblies of seemingly different technosocial configurations. In other words, speculative non-linear assemblies enable me to plot the colonial and modern roots of the internet's infrastructure, as well as to explore the multiple ways in which people at the internet's material nodes relate to cables and landing stations. Drawing from speculation and non-linearity, this thesis builds a series of assemblies that trace the spatiotemporal relations at the internet's infrastructure in the south of Spain. In so doing, I seek to build a story that creates and interprets the connections that emerged from my archival research and creative ethnographic mediation into Atlantis-2 and its landing station in Conil.

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This section has proposed that the internet is, to a large extent, a technosocial material infrastructure that means different things depending on the specific sites that its cables and landing stations occupy. Considering the relational limitations of archival research and the interpretative limitations of creative ethnographic mediation discussed in the previous section, this thesis assumes that speculative and non-linear interpretation is a better equipped tool than linear causal explanations to mediate the complex network of relations embedded within media infrastructures. Through weaving speculative non-linear assemblies with the information gathered through my archival research and creative ethnographic mediation of the Atlantis-2 cable and Conil's landing station, this thesis seeks to trace the colonial and modern roots of the internet and to diversify the master narrative of the internet as a connecting technology. Instead

of telling a chronological history of the development of submarine cables, the following chapters propose a series of associations that seek to understand the material environments, geopolitical contexts, and technosocial relations embedded in the internet's infrastructure at the south of Spain.

2. Cables, frontiers, and bunkers: deep relations between colonial and modern infrastructures

On May 2021, as I was conducting my research in Conil, 8,000 refugees reached the border between Morocco and Ceuta, a Spanish territory in northern Morocco. The Spanish government sent troops to the border and intensified the deportation of people who, in pre-pandemic conditions, would have a legal right to apply for refugee status. Most news outlets agreed that the Moroccan government enabled the refugees to reach the Spanish border in retaliation for the medical assistance given by the Spanish government to the leader of Western Sahara's independence movement, a region that used to be a Spanish colonial enclave and is now under Moroccan occupation. In light of the tense situation, the President of the European Council claimed that "Spain's borders are the European Union's borders",¹⁰ revealing that territorial frontiers are still vital in multinational imagination and rhetoric (Paansi, 2003) and pointing at the deep historical roots of the contested border in the south of Spain. Bearing in mind the geographical proximity of the Gibraltar Strait—the narrow maritime passage that separates Europe from Africa—to the Atlantis-2 landing point at Conil, this chapter revolves around the question: what does the historical and geopolitical relation of the Atlantis-2 landing site with this contested frontier reveal about the status of the internet as a networking technology?

This chapter begins by weaving a speculative non-linear assembly between the internet's infrastructure and the contested frontier-making practices at the south of Spain, the southernmost region of continental Europe. Through bringing together documents, observations, and interviews gathered throughout my research in Conil, I seek to trace how the internet is linked to other colonial and modern infrastructures in the region that promote interconnectivity through securitization. In particular, the first section will discuss the deep relations between Atlantis-2 and its landing station in Conil and the construction of frontiers, bunkers, watchtowers in the south of Spain, revealing the concealed geopolitical and historical roots in which the internet is planted. Then, the second section of this chapter creates a second assembly of documents, interviews, and observations around the Atlantis-2 fiber optic cable, focused on the origins and implications of the transatlantic route it follows between the Iberian Peninsula and South

¹⁰ BBC News (2021) 'Ceuta: Spain sends troops as 8,000 migrants enter enclave', 18 May. Available at: <u>https://www.bbc.com/news/world-europe-57156320</u> (Accessed: 9 July 2021).

America. In sum, this chapter speculates on the origins of the internet's infrastructure through plotting non-linear assemblies around the historical, geopolitical, material, and semiotic entanglements between technology, modernity, and coloniality.

2.1. Frontiers, watchtowers, and bunkers: interconnectivity and securitization

When I first arrived in Conil, I assumed that the cable station where the Atlantis-2 cable lands would be located on the coast line, as close as it could be to the Ocean. Since I knew from my online research that the cable station was a bunker, I did a quick google search of bunkers at Conil that led me to the bunker of Fuente del Gallo on my first weekend. After walking there with my camera and sound recorder, I found the bunker carved into the stone, overlooking the Ocean, and in complete ruins. Could this be the internet bunker? Was the landing station hidden somewhere inside the rock? A man passing by saw me recording the bunker, and after hearing my hypothesis about the cable station, he laughed at me and said: "what you're seeing is an old bunker from the Spanish Civil War that was never used...Do you see that tall telecommunications tower?", he said pointing towards downtown Conil. "That's what you're looking for." Attempting to hide my shame for sounding like a conspiracy theorist looking for cable bunkers inside rock hills, I thanked him for pointing me in the right direction and told him about my research project. After listening to my intentions surrounding internet infrastructure, he told me that if I walked down to the Spanish Civil War bunker and followed a little stream inland, I would find a manhole that belonged to Telefónica where he thought that the cable that goes to America passes through. Overall, our short conversation would be the first of many with people in Conil about bunkers and watchtowers, which play an important role in the region's history and are part of the town's infrastructure. The entire coast of Conil-and as I would eventually find out, the whole province of Cádiz-is filled with watchtowers from the Islamic and Catholic wars, bunkers from the Spanish Civil War, and telecommunications infrastructure, creating a network of infrastructures designed both to connect across frontiers and to secure the very same borders (see fig. 2). This section creates a non-linear assembly between the contested geopolitical history at the south of Spain, defined by the construction of frontiers, watchtowers, and bunkers, and submarine cable system, seeking to shed light on the concealed material and semiotic genealogy of the internet's material infrastructure.



Figure 2. Map of bunkers, watchtowers, and internet infrastructure at Conil's coastline, Spain.

To begin this assembly, I would like to emphasize the proximity of Conil to Morocco, and the relevance of this frontier in the constitution of modern Europe. Every time I walked on the beach during my first week in Conil I could see a range of mountains on the horizon to the Southeast, which I thought belonged to the Spanish side of the Gibraltar Strait. The first weekend that I went out to record video and sounds of the coast of Conil, I asked the same man that I mention at the beginning of this chapter about this mountain range. After telling him I thought these were still in Spain, he laughed at me and said: "that's Africa, boy!" I knew that this region of Spain was very close to Morocco, but I was amazed to learn that the northern shores of the African continent could be seen from Conil. In fact, the African and European continents are only separated by 13km of water at the Gibraltar Strait, which can be crossed in approximately 30mins by ferry. This geographic proximity is at the root of ancient, colonial, and modern conflicts that situate this frontier in a set of complex geopolitical relations that have historically defined Andalucía, the southern region of Spain.¹¹ Cádiz, one of the eight provinces in the region

¹¹ Even though in English the name of this region is Andalusia, I have decided to maintain its Spanish name because of the associations I will further make and to be consistent with my conversations and interviews at Conil.
of Andalucía and where the Atlantis-2 landing point is located, has been a contested historical frontier between modern Europe and Africa, between the Catholic and Islamic worlds, between the Roman Empire and Ancient Carthage, and between Europe itself and the Atlantic Ocean.

This contested geopolitical history is embedded in the very name of Conil de la Frontera, which originates in the catholic Reconquista (Reconquest) of the south of Spain. Throughout the 800 years that the Islamic caliphates and kingdoms ruled Al-Andalus—the Arabic name of the region that was eventually transformed into Spanish as Andalucía—they were in a constant war with the Catholic kingdoms that remained in northern Spain. After the fall of the Umayyad Caliphate—a vast and wealthy reign that had reached the contemporary border between Spain and France-at the beginning of the twelfth century, the Catholic kingdoms regrouped under the Castilian crown and began a war of nearly 250 years with the remaining Nasrid kingdom of Granada, which controlled most of contemporary Andalucía. As the Catholic armies reconquered cities and towns from the Islamic kingdom, the Spanish renamed several towns adding de la frontera (of the frontier, in English) to their names, referring to the oscillating frontier of Catholic Spain. These names refer to the instability of this particular frontier in the province of Cádiz, which shifted between Catholic and Islamic control for more than two hundred years until the ultimate defeat of the Nasrid dynasty in 1492. In an interview with José Ligero, a fisherman and filmmaker from Conil, he highlighted that seven towns in Cádiz, including Conil, still bear this historical reference to the formation of the Christian border of modern Europe.¹²

During the wars between the Islamic caliphates and kingdoms and the Christian Spanish crown, both factions built a series of watchtowers to secure the protection of the contested frontier. Diego Tirado, president of the association of the Barrio de los Pescadores (the Fishermen's neighborhood), told me that the entire coast of Cádiz, from Gibraltar to the city of Cádiz, was filled with these towers.¹³ During my time in Conil I counted five watchtowers in total, some in complete ruins and others restored or reused. José Ligero tells me that most of the standing towers could have been originally built by the Arabs, but then were reused and fortified by the Spanish as they reconquered the area. When Conil was taken by the Spanish crown in the thirteenth century, the town was known as the Tower of Guzmán, because of the watchtower built by Alonso Pérez de Guzmán—popularly known as Guzmán el Bueno (Guzmán the

¹² Interview with José Ligero, fisherman and filmmaker from Conil, 5 May 2021.

¹³ Interview with Diego Tirado, president of the association of the Barrio de los Pescadores, 8 May 2021.

Good)—a Spanish military leader who defeated the Islamic armies at Gibraltar and was gifted the entire coastal region of Cádiz as reward.¹⁴ According to both Diego and José, these watchtowers worked as *almenaras*, a communication system that consisted of lighting fires on top of towers that could be seen from a distance, enabling the Spanish to quickly spread the news of an attack by the Islamic armies and, later on, by Berber pirates coming from Morocco. In other words, the system of watchtowers was an early-modern telecommunications infrastructure that enabled the flow of information along the coast in order to secure the contested border.

Of the five towers I saw, only the Tower of Guzmán in downtown Conil is fully renovated. Others, such as the Tower of Castilnovo, are a main touristic attraction of the region because of their historical value. Some of them have also been repurposed by humans and nonhumans alike. For example, the lighthouse of the port of Conil is constructed on top of an old Arab almenara from the fourteenth century, and the Tower of Castilnovo houses the nest of several families of Ibis Eremita, a species of Mediterranean bird that was thought to be extinct for many years. As infrastructures, these watchtowers serve as a base for other infrastructures, both materially and symbolically (Star and Bowker, 2006), creating a network of territorial associations in which Conil's submarine cable station is embedded. For example, making use of its considerable altitude in relation to the coast line, there are three telecommunication towers that are fully operational next to the lighthouse (see fig. 3). Actually, when looking at Conil from the beach, I could see many antennas installed across the entire town, of which the one located inside the submarine cable station is the tallest. Conil's cable station, where Atlantis-2 lands, is embedded in this social landscape of colonial watchtowers and modern telecommunication towers, which create a material and semiotic continuity based on the historical connection between frontiers, communication, and securitization.

In addition to ancient frontiers and colonial watchtowers, the coast of Cádiz is also the site for a series of bunkers constructed during the Spanish Civil War and World War II, which were created to secure the fascist control of the western edges of Europe. In July of 1936, several factions of the army staged a coup against the Spanish Republican government, unleashing a three-year civil war that resulted in the installation of the fascist dictatorship of Francisco Franco for the next four decades. When the coup began, Franco was actually in Morocco, which at the time was under a colonial protectorate administered by Spain and France. Organizing the

¹⁴ Interview with José Ligero, fisherman and filmmaker from Conil, 5 May 2021.



Figure 3. Telecommunication towers, lighthouse, and almenara in Conil. Photo: Juan Pablo Pacheco Bejarano, 2021.

military forces in northern Morocco, Franco launched several attacks across the Gibraltar Strait in order to secure control of the southern regions of the Iberian Peninsula. During the three years of war, Nazi Germany provided multiple forms of assistance to the fascist armies in Spain until in 1939 they took over the entire country, right before the start of World War II. As the multinational war advanced, fearing an attack by the allies through the Atlantic coast of Spain, Hitler financed the construction and fortification of a set of bunkers along the coast of Cádiz, some of which had been built during the civil war. Diego Tirado told me that each town along the coast has approximately eight bunkers, and José Ligero claimed that some were constructed immediately by the coastline while other were designed to provide support three to four kilometers inland.¹⁵ Both of them agreed that Conil in particular was a very strategic site not only because of its proximity to Gibraltar, but also because it is located on top of a hill right by the Ocean. In fact, one of the bunkers from World War II that I visited is right across from the submarine cable station, on the highest point of Conil's hill.

¹⁵ Interviews with Diego Tirado, president of the association of the Barrio de los Pescadores, 8 May 2021; Interview with José Ligero, fisherman and filmmaker from Conil, 5 May 2021.

This strategic geopolitical location is probably the reason why the telecommunications bunker where Atlantis-2 lands was built in Conil, initially designed to serve the TAT-5/MAT-1 telephone cable that connected Italy, Spain, Portugal, and the United States. At the time when this cable station was built, Spain was still under Franco's dictatorship, who since the end of World War II became a crucial ally of the United States due to their shared opposition to communism. As part of this alliance throughout the Cold War, the United States built a military base in Rota, 64km north of Conil in the province of Cádiz, and in 1970 the Spanish government collaborated with the United States in order to build the telecommunications anti-nuclear bunker in Conil. Both the military base and the bunker, which are still operating today, are surrounded by the remains of the colonial watchtowers and modern bunkers from the early twentieth century. These historical layers of surveillance and military infrastructure constitute what Shannon Mattern (2015) defines as the deep time of media infrastructures. She argues that "when we look at our media histories through our cities, we observe a layering, or resounding, of media epochs" (p. 96). Therefore, the Atlantis-2 cable and Conil's cable station are deeply related to the historical layers of other military infrastructures designed to securitize the frontiers of the western world. This chapter speculates on the material and semiotic connections between these multiple infrastructural layers, in order to complicate the characterization of the internet as a connecting technology.

The construction of the submarine cable bunker in Conil is, therefore, not a coincidence but a reflection of the contested geopolitical history of this region as a multilayered frontier. According to Juan Luis Suárez de Vivero, Emeritus Professor of Marine Geography at the University of Seville, Conil was a strategic site for the construction of the TAT-5/MAT-1 cable station because of its proximity to the Gibraltar Strait—the entrance to the Mediterranean Sea and because of its uncommonly shallow sea platform, which made it relatively easy to install and maintain submarine cables.¹⁶ The Gibraltar Strait is still a contested frontier zone between Europe and Africa, and at the same time a connecting site through which many container ships and fiber optic cables enter and exit the Mediterranean Sea (see fig. 4). Juan Luis also tells me that the two main seaports at the Gibraltar Strait—Algeciras on the Spanish side, and Tanger-Med on the Moroccan—are currently competing to become the largest regional nodes of

¹⁶ Interview with Juan Luis Suárez de Vivero, Emeritus Professor of Marine Geography at the University of Seville, 9 June 2021.

commercial distribution between Northern Europe and the Mediterranean.¹⁷ In addition to Spain and Morocco as geopolitical actors in this region, the Rock of Gibraltar on the Spanish side still belongs to the United Kingdom as a result of the British army's victory over Napoleon's occupied Spain in the battle of Trafalgar, only 13km away from Conil. The geopolitical and commercial importance of controlling the contact point between the Atlantic and Mediterranean was the main reason why in 1970 the TAT-5/MAT-1 was built here, with the intention of solidifying the alliance between the United States and the Mediterranean world under the geopolitical arrangements of the Cold War. Since then and up until today, Conil is a hotspot for European-American telecommunications. Both engineers that I interviewed, as well as José Ligero and Diego Tirado, observed that the cable station in Conil is deeply embedded in the contested geopolitical history over the control of the Gibraltar Strait as a frontier zone.



Figure 4. Fiber optic cables at the Gibraltar Strait. Adapted from the Submarine Cable Map by TeleGeography (https://www.submarinecablemap.com).

¹⁷ *Ibid*.

This layering of the submarine cable infrastructure in the south of Spain with other colonial and modern infrastructures designed to surveil and monitor geopolitical frontiers reveals how the internet is embedded both in a history of connectivity, but also in a deep infrastructural history of securitization. During the Cold War, when the cable station was built in Conil, the securitization of internet stations was generally defined by the architecture of the bunker. Starosielski (2015) discusses the militarization of cable stations during World War II and the Cold War as a process of hardened architectures, which consisted in "physically fortifying the cable station and often entailed locating it underground in a nuclear fallout shelter. This corresponded to a broader shift in the perception of how power would be intercepted and diffused: the focus was on a potential attack from above" (pp. 111-112). Just as submarine cables were always protected by their strategic location in the depths of the Ocean, cable stations had to be moved underground in order to create an extra layer of protection in an era of aerial surveillance and war. Therefore, as they became increasingly critical infrastructures during the geopolitical tensions of the Cold War, cable stations located at contested sites were fortified and secured through the construction of underground anti-nuclear bunkers. As opposed to watchtowers, which places more importance on the capacity to see across a large distance, the bunkers of the twentieth century privileged the capacity to hide, since the need to see was replaced by other technologies such as airplanes, radars, cameras, and eventually satellites. According to the ABC Spain news outlet, the coordinator of Telefónica's cable station in Conil claimed that the bunker was built to protect the communications between the United States and the Mediterranean, turning it into the most important telecommunications bunker in Europe until today.18

Though the Cold War ended thirty years ago, certain aspects of the militarization of cable stations during that era persist at Conil's cable station, even if they seem oddly dated. After two months in Conil, I finally managed to make an appointment to visit the cable station. From the outside, the bunker resembles a prison, surrounded by a four-meter-high wall, with barbed wire all over (see fig. 5). The building is located in front of hotels and residential complexes, surrounded by the tourist economy that characterizes Conil. Above the main door there are two stickers gnawed by time. One says "Security System: Permanent Image Recording", and the

¹⁸ ABC Spain news (2015), "El lugar más estratégico para las telecomunicaciones europeas está en Conil". Available at: http://www.abc.es/videos-espana/20150725/lugar-estrategico-para-telecomunicaciones-4374352096001.html (Accessed: 13 July 2021).

other says "It is mandatory to use your identification card to enter the building, always wearing it in a visible place during your stay". Both are signed by the Directorate of Security and Protection of Telefónica. While I waited at the entrance, the security guard spoke to me through an intercom asking to see my passport, which I had sent the day before as a PDF. After a while a door opened automatically, letting me in. I was not allowed to enter with cameras or a sound recorder. When I asked why there is still so much security, I was told that although the fear that Russians will drop an atomic bomb in Conil is not real anymore, a place like this can still be a target for terrorist attacks. I am reminded that there are cameras watching us in every corner of the compound. Even if the building looks deteriorated, the military language of securitization is still embedded in Conil's undersea cable infrastructure in 2021.



Figure 5. Cable station in Conil, Spain. Photo: Juan Pablo Pacheco Bejarano, 2021.

Inside the compound, the bunker is located under a house that resembles a typical suburban 1960s construction, with a front porch and what appears to be a garage from the outside. However, the garage hides a set of staircases that lead down into the bunker's entrance. After activating a sensor using both my host's card and mine, two thick steel doors open automatically, leaving an empty space in between. As a remnant of the Cold War era, this heavily

protected double entrance conveys a sense of impenetrability that still defines the language around the cable station in Conil. Inside, there is a big central room with machines for the three cables that land at that station: PENCAN-6, PENCAN-8, and Columbus-III. The latter was deactivated in December of 2020. There are two types of machines per cable: those that receive the signals carried by the pairs of optic fiber and those that power the electrical system that enables submersible repeaters to amplify the signal when moving across the sea. All fiber optic cables travel under the Ocean in pairs so that the light signals that encode data can move in both directions. Referring to the information highway metaphor, one of the engineers told me that it is like having two equal traffic lanes, each one going in an opposite direction, enabling the same cable to send and receive data at the same time¹⁹. However, light signals tend to fade out while traveling, so each cable has an auxiliary electrical system that power a set of submersible repeaters placed approximately every 80km on the Ocean floor, and whose function is to amplify the fiber pair's signal.

While my host explained this to me, I could not help but wonder if I had come all the way to this bunker guided by misinformation about the location of the Atlantis-2 landing station in Spain. He had not mentioned this particular cable so far. I nervously asked, "So where is Atlantis-2 in this bunker?" He laughed and explained that technically speaking, the fiber pairs of Atlantis-2 that come from Argentina and Brazil do not arrive at Conil. In fact, the PENCAN-6 cable connects Conil to the fibers brought from South America at a branching unit in the Canary Islands, a submarine junction between the two fibers of Atlantis-2 and those of PENCAN-6. The reason why Conil appears as a landing site for Atlantis-2 in most of the networking maps I found online is because the machines that power PENCAN-6 share the same sub-electrical system as Atlantis-2.²⁰ The electrical machines of PENCAN-6 located in the bunker actually have a placard that says "Atlantis-2" on their doors. In other words, Atlantis-2 is both the name of two fiber pairs and of the repeaters' electrical system that enable the light signals to travel back and forth between South America and Europe. Here I began to understand the layered technical and material complexity of submarine cables. As my host moved forward from the central room, I remained looking at the Atlantis-2 sign just a little longer, imagining the other end of the electrical system I was just looking at all the way in Las Toninas, Argentina. Could my

 ¹⁹ Interview with an anonymous telecommunications engineer, 10 April 2021.
²⁰ *Ibid.*

imagination travel faster than the internet's light signals?

Bringing my attention back to the bunker, next to the central room my host showed me two smaller rooms with electric generators and transformers, as well as batteries that are continuously charging and distributing electrical power across the multiple machines. The station owns two power plants in order to keep the flow of data functioning in case there is a power outage from Conil's main grid. The sound of all of these machines running at the same time is both overwhelming and hypnotizing, a permanent hum that completely floods the space. This is how the internet sounds. After walking around these rooms in a sort of infrastructural trance, I asked why there is still so much security protecting this station if there are only two old cables still functioning. Instead of answering right away, my host took me into another room with around fifteen screens arranged in a half-moon shape. The room is full of maps, both on the screen and also physically hung from the walls, showing the specific geographic locations of several cables. Here I find out that besides being the landing site for two old cables, Conil's bunker is a Network Operations Center (NOC) of Telxius, a subsidiary company of Telefónica that operates all of the company's telecommunications infrastructure. At this NOC, engineers monitor and oversee the entire submarine network owned by Telxius, the largest fiber network in Europe and Latin America with more than 90,000km of submarine cables.²¹ Each computer monitors one cable, allowing engineers to detect damages through a set of color-coded warnings that range from yellow to red. This room reveals that monitoring and maintaining submarine cable infrastructure requires a deep knowledge of geographical and geopolitical considerations, which leads engineers to fill the NOC with maps that mark specific maritime coordinates and geopolitical frontiers.

When a failure in a cable is detected, the NOC notifies the vessels of a subcontractor that operates under an international agreement for fixing cables. Atlantis-2, for example, falls under the Atlantic Cable Maintenance & Repair Agreement (ACMA), a non-profit cooperative cable maintenance agreement founded in 1965.²² ACMA is not only responsible for the maintenance of undersea telecommunications and power cables, but it also oversees the operations of oil and gas platforms in multiple regions of the Ocean. Submarine cable, oil, and gas infrastructure in each region of the Ocean operates under its own agreement. Even though the Ocean is a deep and

²¹ Telxius corporate presentation, sent to my email by Telxius Communications Office, 23 April 2021.

²² To learn more about ACMA, see: https://www.acma2017.com/

fluid biosphere, the division of maritime space evidenced by cable repair systems is mirrored by recent turns in the International Law of the Sea. Juan Luis tells me that the most recent trend he has identified in relation to marine geography reflects an extension of the nationalist logics of territorial organization onto the sea. Several countries around the world are seeking to extend their sovereignty into the seabed through new international legislation, extending already existing geopolitical frontiers into what used to be international waters under the laws drafted in the 1970s. With this new legislation, several European countries such as Spain, Portugal, France, and the United Kingdom, which still control several offshore territories, would extend their sovereignty into several places in the Ocean and become some of the largest countries in the world.²³ This renewed form of colonial expansion transforms the idea of the Ocean as the limit of Western Europe, and creates new frontiers within maritime space itself. This transition opens up a new seascape in which undersea cables play a crucial role. Under this scenario, the role of maintenance and repair agreements as well as of NOCs, which traverse and define new borders at sea, becomes even more important.



Figure 6. Telefónica's manhole in Conil, Spain. Photo: Juan Pablo Pacheco Bejarano, 2021.

 ²³ Interview with Juan Luis Suárez de Vivero, Emeritus Professor of Marine Geography at the University of Seville,
9 June 2021.

The cable station at Conil is heavily guarded probably because it is a NOC, not necessarily because of the two outdated cables that land there. In fact, landing points per se do not represent much security concerns for companies. Most often than not, submarine cables land through ditches dug up under beaches and coasts, reaching very discrete locations such as shacks or small huts (Starosielski, 2015). For example, nearby to the Spanish Civil War bunker of Fuente del Gallo in Conil, the manhole where the underwater portion of cables meet the underground sections has no security at all. Eroded by the Ocean tides and the passing of time, the manhole's cement tunnel and its lid are overexposed most of the time to people passing by in one of the most touristic beaches in the province of Cádiz (see fig. 6). During my many visits to the manhole, I often thought that if I wanted to and had the right tools, I could probably open it. The lack of security at the landing site contrasts with the heavy architectural and infrastructural securitization of the cable station, revealing the geopolitical importance of the NOC as a pressure point of the internet's global network.

As a surveillance center, the NOC inside Conil's bunker functions like a watchtower that oversees the network of submarine cables. Despite not being built on top of an old watchtower from the frontier wars between the Catholic Spanish crown and the Islamic kingdoms that I discussed previously, the cable station bears a deep material and semiotic relation with the exercise of surveillance performed by watchtowers along the coast of Cádiz. The function of this bunker is to securitize the contested borders of the internet's material infrastructure, which are immersed in a set of historical relations marked by geopolitical tensions. In this sense, the NOC exemplifies the logic of interconnectivity through securitization that characterizes the internet and its infrastructural ancestors in the south of Spain. After the NOC room inside the bunker, there is what people at the station call "the library", a space filled with user manuals and a small recreational corner with a kettle, coffee, and a bottle of Peruvian Pisco. After asking my host about this bottle, which I found odd in this Spanish cable station, he told me that it was sent by their colleagues at the other Telxius NOC, which is located in Lima, Peru. When one station sleeps, the other is working, in order to maintain a 24/7 watch over the company's submarine network. This deep collaboration between the south of Spain and Peru reminded me of the ways in which the Spanish Viceroys worked during colonial times, as envoys from the crown that administered off-shore territories and reported back to the European capital. The monitoring of the internet's network is embedded in the exercise of administering global flows between Europe and South America, which dates back to the colonial configurations of the sixteenth century, which I will discuss even further in the following section of this chapter.

So far, this chapter has demonstrated that the internet is immersed in a deep history of colonial and modern infrastructures that seek to interconnect across geopolitical borders while simultaneously securitizing these frontiers. Observing these dynamics at certain nodes of the internet's undersea network, Starosielski (2015) identifies a tension between interconnectivity and insulation. On the one hand, strategies of interconnection refer to "the development of fixed architectures and spatial practices through which transfers between the cable system and its surrounding environments can occur" (p. 19). On the other hand, "strategies of insulation separate one part of an environment from the rest to stabilize the distribution of media and communication" (2015, p. 18), which range from technical development of cable insulation to geographic, social, and architectural arrangements that provide securitization to the internet's infrastructure. The constant dialogue between both interconnectivity and insulation enables the manipulation of space that is key in the geographic construction of the internet's physical network. The construction of the cable station in Conil precisely responds to this dual dynamic, as the possibility to connect multiple regions through modern telecommunications infrastructure is deeply related to the historical securitization of the contested frontiers at the south of Spain.

Even though the internet is typically thought of as a borderless territory that connects the entire world, the global flow of information is deeply related to the formation of contemporary frontiers, which rely on a sophisticated organization of interconnectivity that is dependent on the ability to secure and control these connections. Craig Martin (2012) argues that contemporary borders are defined by a logistical organization that sanctions the flow of commodities, people, and information across them, designed to privilege the mobility of whatever serves the accumulation of contemporary capitalist markets. Martin argues that,

[t]he roots of this market-driven control resides in my reading of geopower as the means to structure, manage and control the technologies and practices of interconnection in order to promote specific mobilities: those of sanctioned commodities, peoples, knowledge, etc. (p. 360).

In other words, geopolitical power relies heavily on the ability to connect across territorial boundaries while simultaneously securing and sanctioning what can and cannot cross them. Even though submarine cables surpass contemporary geopolitical borders in order to connect the world, this section has demonstrated that the internet's infrastructure cannot be disentangled

from the colonial and modern paradigm of interconnectivity through securitization.

The internet's infrastructure in the south of Spain is embedded in the contested production of the modern border of Western Europe, which is deeply related to the previously discussed wars between the Spanish Catholic crown and the Islamic kingdoms. In light of the refugee crisis discussed at the beginning of this section, Isabel Tomé, teacher of languages and history in Conil, explained to me that the rest of Spain does not understand the complex historical relations of Andalucía with the Arab world. She pointed out that the very name Gibraltar derives from Tariq ibn Ziyad, the Umayyad general who crossed the Strait in 711 and began the Islamic conquest of the Iberian Peninsula. The Arab influence in the south of Spain was officially neglected and obscured during most of Spanish modern history (García-Sanjuán, 2016), and only recently has the public discourse shifted from shame towards pride (Rubiera Mata and de Epalza, 2007). In fact, more recent historical research has demonstrated that during the Islamic caliphates and kingdoms of Al-Andalus, cities such as Córdoba were the largest centers of knowledge and open exchange in the Mediterranean for decades. Several Ancient Greek and Roman texts were translated and studied in these Islamic universities, many of them actually renewing ancient theories of the world as a globe and the possibility of crossing the Atlantic Ocean (Melo Cascorro and Vidal Castro, 2012). These technological advances, which were appropriated by the Catholic regimes that came after 1492, continue to be a contested site of historical narratives as contemporary Europe faces a wave of Islamophobic rhetoric. In Tomé's own words, Europe sees the refugee crisis and decides to turn a blind eye to the contested history of the region, revealing that international frontiers are more porous to capital and information than to displaced migrants (Hyndman, 2003; Martin, 2012). The deep relations between the submarine cable infrastructure and the history of frontiers in the southernmost tip of continental Europe places the internet in a complex historical genealogy of interconnectivity through securitization.

Thus far, this chapter weaves a speculative non-linear assembly that situates Conil's cable station in a historical relation with the contested geopolitical frontier at the south of Spain. The internet's infrastructure in the Atlantic coast of Andalucía is part of the history of frontier building on the coast of Cádiz, where one of the seven landing sites of Atlantis-2 is located. The internet's infrastructure at this site is immersed in the colonial and modern formation of one of the most geopolitically tense frontiers of modern Western Europe, which has been historically defined by a co-constitutive relationship between connectivity and securitization. In other words, this region has historically been a place where the flow of people, commodities, and information in and out of the Mediterranean is administered from. Connectivity is based on the simultaneous construction of borders, which enable empires, national governments, and multinational companies to sanction the kinds of connectivity that are permitted across those boundaries. The watchtowers and bunkers in Conil, which enabled the surveillance and protection of the southernmost frontier of continental Europe, are embedded in the historical genealogy of the cable station bunker in Conil, signaling that though the internet is a connecting technology, it is also entangled with the practice of territorial control. As a mostly privatized asset that produces vast accumulations of wealth based on the extraction and trading of data (Zuboff, 2019), the material frontiers of the internet's infrastructure are heavily surveilled. In a similar way to other maritime technologies such as colonial ships, submarine cables make possible the exercise of control through the very same act of networking. In the next section I will discuss the relationship between the maritime routes followed by submarine cables and the colonial and modern development of transoceanic routes, which lie at the core of the global capitalist system.

2.2. Maritime genealogies of submarine cable routes

The intersection between the internet's infrastructure and the production and securitization of borders is not only evident in the internet's land infrastructures, but it is also present in the maritime routes followed by undersea cables. This section explores the deep spatial and temporal connections between undersea cable routes and maritime routes of commerce, in order to emphasize the internet's material and semiotic relationship with other modern and colonial configurations focused on the consolidation of capitalist relations. In order to begin this next assembly, I want to return to the image depicted in the commemorative bronze plaque at the entrance of Conil's cable station, which I discuss in the introduction of this thesis (see fig. 1). The image places submarine cables and colonial ships on top of each other, visualizing a historical continuum between cables and ships as connecting technologies. Even though the plaque does not suggest an exact geographical overlap between cables and shipping routes, the history of Atlantis-2, the first fiber optic cable to connect Europe and South America, reveals that undersea cables are based on previous colonial and modern transatlantic infrastructures.

Atlantis-2 follows one of the main maritime routes created by the Spanish and Portuguese empires during the sixteenth century, which was designed to secure the transportation of resources and create a global market for European goods (Wallerstein, 1980). The European triangular commerce, as this transoceanic system has been mostly referred to, started with the extraction of enslaved human labor from the African west coast. Ships would transport enslaved people from West Africa to mines and plantations in America, then collect the raw materials to take back to Europe to be manufactured into consumer goods, which were finally sold back to Africa and America on return trips. Most of the seven landing points of Atlantis-2 either overlap with or are very close to some of the most important seaports of the Spanish and Portuguese triangular commerce: Carcavelos (Portugal), Conil (Spain), El Médano (Canary Islands), Praia (Cape Verde), Dakar (Senegal), Fortaleza (Brazil), and Las Toninas (Argentina) (see fig. 7). Discussing the relationship between submarine cable landing sites and colonial seaports, Starosielski (2015) argues that,

[t]he geography of telegraph routes in the late nineteenth century followed transportation and trade routes, many of which had been pioneered by British colonial investment and served to support existing networks of global business. Cables often landed at the same sites as ships [...] It is no coincidence that Australian cables were brought ashore ten kilometers south of Sydney at Botany Bay, where Captain James Cook claimed the continent for England in 1770 and where the French explorer Jean François de Galaup, comte de Lapérouse, landed in 1788. Even at the network's more remote landing points, from Bolinao in the Philippines to Banjoewangi in Indonesia, there was almost always an existing set of colonial infrastructures, however limited, that could support the new stations (p. 31).

As networking infrastructures, the routes and landing stations of submarine cables bear a deep historical relationship with other colonial networking infrastructures such as ship lines. In fact, Ferdinand Magellan's voyage in 1519 sponsored by the Spanish crown—the first one to circumnavigate the world—stopped in almost the same places where Atlantis-2 lands. Magellan crossed the South Atlantic from Spain to the Canary Islands and Cape Verde, and then sailed to Brazil and Argentina before heading towards Tierra de Fuego in order to chart the first route that connected the Atlantic and Pacific Oceans. These voyages that characterized what is referred to as the "age of discovery" created the trading routes that, since then and until today, sustain the global capitalist market (Wallerstein, 1980). The spatial and temporal connection between Magellan's voyage and Atlantis-2 reveals that the logic of interconnectivity at the core of the internet is rooted in the colonial motivation of connecting the world for the creation of economic markets, a system of sanctioned movements of profitable commodities and information.



Figure 7. Atlantis-2 cable map. Source: TeleGeography (https://www.telegeography.com)

Walter Mignolo (2010) argues that the consolidation of the European world order heavily depended on the colonial interconnection of the world through maritime infrastructures that mobilized both commercial goods and ideological paradigms of civilization and development, while also providing the possibility of extraterritorial control. Ships and their routes have been a fundamental technosocial infrastructure of colonial and modern capitalism, which have enabled empires and multinationals to secure the movement of commodities such as enslaved humans, precious metals, and raw materials (Mustakeem, 2016). These transatlantic routes ensured that the connection of the world was managed by Europe as center, through which all commerce passed through. For example, despite their geographical proximity, the lack of infrastructure directly connecting Africa and South America reflects the geopolitical configuration of early modernity with Europe at its center. This dynamic is reflected nowadays in air flights and

shipping routes between South America and Africa, which usually go first through the United States or Europe, making the North an inevitable center for the connection between regions of the Global South. The gateways that define the circulation of information and commodities across the world are still today defined by the colonial world order inaugurated by European empires.

Seaports have been crucial nodes of the transoceanic connectivity that characterized the colonial period. Once the Spanish crown annexed the entire region of Andalucía after the wars against the Nasrid Islamic kingdom were over, these frontier territories in Cádiz became crucial for the construction of the naval force that secured the Spanish colonization of America, turning Spain into the strongest European empire between the sixteenth and seventeenth centuries. In fact, the very same year in which the Nasrid kingdom was defeated by the Spanish Catholic kings, Columbus reached America and claimed it as the property of the Spanish monarchy. In other words, the construction and securitization of the reconquered European frontier happened at the same time as the colonial encounter between Europe and America, which began the offshore expansion of Europe. Quijano (2010) observes that the conquest of Latin America inaugurated the constitution of a colonial, modern, and capitalist world order that, despite its various changes over the last five hundred years, still defines global dynamics. Cádiz became one of the most important cities during the colonization processes of the Spanish kingdom, which was seeking to expand its capacity for extraction across the world. Considering the historical tensions at the province of Cádiz in the south of Spain that I have already discussed, I argue that, since colonial times, the process of interconnectivity was already co-constitutive with the practice of building and securing frontiers. Atlantis-2 and its landing station in Conil are embedded in these historical relations, as infrastructures that inherit both the practice of connectivity with America and the simultaneous creation and securitization of the modern European border.

The historical genealogy of Cádiz as a border goes even further back into the history of the ancient Mediterranean. Cádiz is one of the oldest cities in Europe that has been continuously inhabited since its foundation by the Phoenicians and further occupation by the Roman Empire. Today, Cádiz still bears a close relationship with this distant past, as the Spanish demonym for people and things coming from Cádiz is *gaditano*, which refers to Gadit or Gadeira, its ancient Phoenician and Roman name. At that time, the Gibraltar Strait was already a contested geopolitical site. During the Second Punic War in 218 BC, Hannibal and Hasdrubal attempted to defeat the emerging Roman hegemony of the Mediterranean through crossing the Strait and conquering the south of the Iberian Peninsula. Besides these geopolitical conflicts, Cádiz was understood as the edge of the western world at the time, since the Atlantic Ocean constituted a vast unsurmountable frontier. The two mountains that frame the Gibraltar Strait, which connects the Atlantic Ocean and the Mediterranean Sea, were commonly referred to as the Pillars of Heracles: a passageway and a frontier at the same time. According to Ancient Greek and Roman legend, Heracles inscribed the motto "non plus ultra" in the rocks of Gibraltar, which in Latin means "there is nothing beyond".²⁴ Today, this legend is inscribed in the coat of arms of Cádiz and Andalucía, depicting Hercules with two lions and the two pillars behind him (see figs. 8 and 9). In a similar way to the internet's infrastructure in Conil, the Gibraltar Strait was a connecting site between two bodies of water and at the same time it epitomized the edges of the European world.



Figure 8. Cádiz' coat of arms. Source: SanchoPanzaXXI, CC BY-SA 4.0, https://commons.wikimedia.org/wiki/File:Escudo_de_C%C3%A1diz.svg

²⁴ Curatorial text at the archeological museum of the Roman theater of Cádiz, visited on 1 May 2021.



Figure 9. Andalucía's coat of arms. Source: https://commons.wikimedia.org/wiki/File:Escudo de Andaluc%C3%ADa (oficial2).svg

The notion of the Atlantic Ocean as the frontier of the western world was precisely what the Spanish colonial voyages during the late fifteenth and early sixteenth centuries shifted, and many of these voyages departed to America from the coast of Cádiz. The emperor Charles V, grandson of the Catholic kings that had defeated the Nasrid kingdom and who commissioned Magellan's voyage around the world, transformed the "non plus ultra" legend into "plus ultra"— Latin for "there is more beyond"—, which became his personal motto and eventually the motto of the Spanish crown until today (see fig. 10). During my time in Andalucía, I saw the two pillars of Heracles surrounded by the "plus ultra" motto in every church and historical monument that I visited, a discursive reminder of the relevance of surmounting this maritime frontier for the construction of the Spanish modern identity. The Ocean as frontier of the pre-modern western world was transformed into the portal that enabled the creation of first the Spanish colonial empire, and then the configuration of the modern world order. The sea is both a frontier and a connecting axis of empire building. This tension between colonial connectivity and frontiermaking is precisely the genealogy that is embedded in Conil de la Frontera, where the Atlantis-2 landing site is located. Since the Atlantis-2 is the first cable that crossed the South Atlantic from Europe to South America, it bears deep historical relations to the development of transatlantic commercial routes in this region of the Ocean. Even though the South Atlantic was a very active region of the world during the early colonial routes of Spanish and Portuguese commerce in the sixteenth and seventeenth centuries, the geopolitical shift towards British and Dutch dominance over transoceanic commerce in the seventeenth century solidified much stronger transatlantic routes in the North Atlantic. As submarine cables were built during the height of British colonial dominance in the mid-nineteenth century, the South Atlantic saw very few developments in the early construction of undersea networks. As I write this thesis, only four of the nearly 450 submarine fiber optic cables in the world cross the South Atlantic: Atlantis-2 (2000), SACS (2018), SAIL (2018), EllaLink (2021).



Figure 10. Spain's coat of arms. Source: Heralder, CC BY-SA 3.0, https://commons.wikimedia.org/wiki/File:Coat_of_Arms_of_Spain_(corrections_of_heraldist_requests).svg

The absence of cables in the South Atlantic has been noted by companies with interests in South America. For example, in 2010 Telcordia presented a report to the Institute of Electrical and Electronics Engineers in the United States about the role of Brazil's undersea cable

infrastructure in the upcoming 2014 World Cup and Rio 2016 Olympic Games.²⁵ One of their conclusions was that there was a lack of major routes connecting South America with the rest of the world, since it is a region outside of the dense connectivity corridor in the northern hemisphere. The vast amount of cables that cross the northern hemisphere reflects and reinforces the geopolitical arrangement of the world when submarine cables were first laid. One of the most well-known examples of the entanglement between submarine cables and geopolitical power is the case of the British All-Red Line, a global telegraphic network that connected the British empire at the turn of the twentieth century. By the time the British empire was securing its political and economic interests with the support of the telegraphic network (Starosielski, 2015), most South American nations had gained independence from the Spanish crown and were negotiating their political and economic interests directly with the English-speaking world, mainly with the United States. In fact, the US Central and South American Telegraphy Company completed the construction of a series of cables between 1881 and 1882, which duplicated the communication between the United States, England, Brazil, Uruguay, Buenos Aires, Chile, Peru, and Ecuador.²⁶ In 1898, when the British empire was laying the Anglo-Irish telephone cable,²⁷ Spain lost Cuba and the Philippines—its last colonial enclaves in America and Asia—to local independence movements supported by the United States. The historical connections that had linked Spain to its colonies in South America was severed by the independence movements of the nineteenth century, and this disconnection was reinforced by the newfound cabled connectivity between South America and the emerging capitalist order dominated by Britain and the United States. Since then, the vast majority of telecommunications between South America and Europe first pass through the United States.²⁸ The undersea cable network has been mostly dominated by the English-speaking world, reinforcing and mirroring the geopolitical order of late modernity.

During both World Wars in the twentieth century, British telegraphic cables composed most of the world's communications infrastructure. However, the realignments of geopolitical

²⁵ Telcordia (2010) 'Potential Role of Brazil's Undersea Cable Infrastructure for the FIFA 2014 World Cup & the Rio 2016 Olympic Games: Background, Observations, and Considerations', 9 June. Available at: https://cqr2010.ieee-cqr.org/Day%202/Session%207/3_Spilios_Makris%20FIFAMAKRIS%20-%202014 2016 Olympics presentation version.pdf.

 ²⁶ Burns, B. History of the Atlantic Cable & Undersea Communications: from the first submarine cable of 1850 to the worldwide fiber optic network. Available at: https://atlantic-cable.com (Accessed: 21 May 2021).
²⁷ Ibid

²⁸ Interview with Anahí Rebatta, senior analyst at TeleGeography, 21 April 2021.

powers after the Second World War expanded the construction of submarine cables towards the United States and the Soviet Union, the two technological powers of the Cold War era. The 1950s development of submersible signal repeaters, which enabled the transmission of speech through amplifying the signal that traveled through telephone cables, inaugurated a new era in the development of submarine cable systems. In relation to the construction of cable stations during this time, Starosielski (2015) observes that "the new geographies of the coaxial network, especially in the United States, reflected the logics of the Cold War and accorded with a dominant strategy of infrastructural decentralization that located stations in remote sites so that they would not be as vulnerable to either nuclear attack or marine traffic" (p. 39). It was during this time that the anti-nuclear bunker in Conil was built as a landing point for the TAT-5/MAT-1 cable, which solidified a Cold War alliance between the United States and Western Europe. During this time, national companies moved by geopolitical interests created international agreements in order to strengthen global alliances through telecommunication infrastructure. In the case of the cable station at Conil, Telefónica-which at the time was called Compañía Telefónica Nacional de España (Spanish National Telephone Company, in English)—built a bunker capable of protecting the cable from potential attacks from the Soviet Union and controlling the passing of the cable through the Gibraltar Strait. Even though the geopolitical arrangement of the world shifted during the Cold War due to the independence of the last European colonies across the globe, submarine cables remained as key actors in the production and maintenance of cross-Atlantic geopolitical relations dominated the United States.

The end of the Cold War in the 1980s brought the rise of fiber optic cables, which quickly proliferated due to the neoliberal policies of this period that promoted deregulation, privatization, and speculation. During the dot-com boom of the 1990s, telecommunication multinationals created conglomerates in order to construct cables that were owned by multiple companies, displacing governments as the main geopolitical actors. Telefónica, the largest telecommunications company in Spain, was completely privatized during this time, and at the end of the 1990s and the beginning of the 2000s it bought several national companies in South American countries.²⁹ Atlantis-2 was built during this time as a consortium cable that aimed at strengthening multilateral relations between Europe and South America. The cable costed

²⁹ To read more about the history of Telefónica, see: https://www.telefonica.com/es/web/about_Telefónica/historia

between 230 and 370 million USD,³⁰ and was mostly financed by Embratel (Brazil), Deutsche Telekom (Germany), Telecom Italia Sparkle (Italy), Telecom Argentina, and Telefónica (Spain) (Information Gatekeepers Inc., 2020). With 8,500km of undersea cable, two pairs of fiber, and an initial capacity of 40 gigabytes per second (Gbps), Atlantis-2 was the first fiber optic cable to create a direct connection between Europe and South America, connecting Portugal and Spain to Brazil and Argentina via the Canary Islands, Cape Verde, and Senegal. In this way, two former colonial empires were linked to their former colonies through updated technological hardware, strengthening the social, political, and economic ties between the different regions of the Spanish and Portuguese-speaking world.

Atlantis-2 was built in order to provide alternatives to the geopolitical configuration of submarine cables at the beginning of the twentieth century, when the connection between Spain and South America had been severed by the Latin American wars of independence and the consolidation of Britain and the United States as the main nodes of the western world. The South Atlantic, which had once been the main stage for colonial and modern transatlantic infrastructures between South America with Europe, was no longer a prioritized geopolitical space. As a result, South America is mainly connected to the United States. Between 2017 and 2018, three new cables began operating between Brazil and Miami, reflecting a long history of already established trading routes.³¹ In their website TeleGeography says, "Undersea cables are built between locations that have something "important to communicate"", referring to how cables are part of the complex geopolitical relations that define the world.³² Nevertheless, the dynamic in the South Atlantic is currently changing as Spain is quickly emerging as an telecommunications hotspot for the entire Atlantic world. Towards the beginning of 2021, three telecommunications companies commissioned TeleGeography to develop a study on the Iberian Peninsula as a strategic interconnection region, as it provides a convergence site for data traffic between Europe, Africa, America, and Asia.³³ It seems as though Spain is recovering its

³⁰ TeleGeography reports that the cable costed 230 million USD, while the Submarine Fiber Optic Communications Systems (SFOCS) Newsletter state that Atlantis-2 costed 370 million USD. See: TeleGeography (2020) *Global Bandwidth Research Service: Atlantis-2*. PriMetrica, Inc.; and, Information Gatekeepers Inc. (2000) 'Embratel Launches International High-Capacity Fiber Optic Network', *SFOCS*, 8(5).

³¹ Interview with Anahí Rebatta, senior analyst at TeleGeography, 21 April 2021.

³² See: https://www2.telegeography.com/submarine-cable-faqs-frequently-asked-questions

³³ Mingas, M. (2021) *DE-CIX, EllaLink, Interxion and TeleGeography put connectivity on the map.* Available at: https://www.capacitymedia.com/articles/3829045/de-cix-ellalink-interxion-and-TeleGeography-put-connectivityon-the-map (Accessed: 4 August 2021).

importance as a strategic geopolitical site for global telecommunications, which had been lost due to the colonial and imperial wars with the British empire and with the United States.

Altering the undersea routes that defined telecommunications in the twentieth century is not necessarily easy, mostly because it relies on challenging preconceived notions about the geopolitical order of the world. Starosielski argues that creating new routes during the early fiber optic boom was perceived as risky: "the first fiber-optic cables continued to follow the contours of telegraph and coaxial networks, giving the imagined sources of friction and security of those periods—from the debates over territorial security in the colonial era to the spatial decentralization and institutional interconnections of the Cold War era—a residual life in digital communications systems" (2015, p. 45). However, companies in South America such as Embratel from Brazil, the largest investor in the construction of Atlantis-2, quickly began to diversify the cable routes in order to increase the redundancy and latency of the internet's signals reaching and departing from the region.

Redundancy and latency are two of the most important features considered by telecommunication companies when constructing new cable routes. Redundancy refers to the different routes that a package of data can follow in order to travel from one place to another.³⁴ So, for example, if I send an email from Spain to Colombia and the routes that go through the United States fail or are overloaded, Atlantis-2 offers my signals another path to reach their destination. The more varied cable routes are between two or more places, the more redundancy this particular system has. In this sense, Atlantis-2 diversified the route of information traveling from Brazil and Argentina to Portugal and Spain, passing through the African west coast instead of through the United States. The topology of cables, which has evolved since the telegraph era, is always seeking to maximize this redundancy. The most common point-to-point topology, which connects two places directly, does not offer much variety for data to travel through other cables. Therefore, in the fiber optic era cable companies use either branching units, which add an extra pair of fiber to a cable and subsequently create another landing site, or build cables in a ring system where three or more places are connected by a cable circle.³⁵ Bearing this in mind, the Canary Islands branching unit enables the Atlantis-2 fiber pair coming from South America to connect to continental Spain, adding redundancy to the signals between both continents.

 $^{^{34}}$ Interview with an anonymous telecommunications engineer, 10 April 2021.

³⁵ Ibid.

Latency refers to the speed at which data travels between two places. Latency is usually measured in milliseconds, and a difference between one route or another is not really important for regular users. However, for banks or for gamers an advantage of 1 millisecond might make the difference in who gets to buy a share in the stock market or gets shot in a videogame.³⁶ So, for example, if you want to connect from Africa to South America, the route with most traffic is Africa to Europe, Europe to the United States, and finally United States to South America.³⁷ Seeking to increase latency and redundancy of data, the SACS and SAIL cables were built between the Africa west coast and Brazil in 2018 and 2020, adding a new and faster route for data to travel from Africa to America. Therefore, the Atlantis-2, EllaLink, SACS, and SAIL cables—the only ones to cross the South America with Africa and Europe, skipping the United States in the cycle of communication. Latency, redundancy, and independence are all factors that companies consider when creating new cable routes, in addition to the specific demand of the new route being proposed.

These factors are key in the geopolitical tensions embedded in submarine cables, as the speed and diversity of data routes increases the possibilities for solidifying social, economic, and political relations across continents. In the case of Latin America, Telxius claims to own the largest fiber network in the region as well as in Europe,³⁸ providing its users in South America the best redundancy and latency with the United States and Europe. This is why Telefónica, the main shareholder of Telxius, is one of the most competitive companies in the South American telecommunications market. Their submarine cable network connects all Latin America with the United States and Western Europe, even though since the Atlantis-2 was built, they have not engaged in the construction of any new cables directly connecting Europe and South America (see fig. 11). Telxius operates the towers, cables, and cable stations such as the Atlantis-2 bunker in Conil. One of the telecommunication engineers I spoke to said that Telxius does not only provide infrastructure for Telefónica, they sell towers and cables to other larger companies, treating the internet's infrastructure as active assets.³⁹ Anahi Rebatta tells me that at TeleGeography, they have actually observed that in the last 10 to 20 years, small companies are

³⁶ Interview with Anahí Rebatta, senior analyst at TeleGeography, 21 April 2021.

³⁷ *Ibid*.

³⁸ Telxius corporate presentation, sent to me by Telxius Communications Office, 23 April 2021.

³⁹ Interview with an anonymous telecommunications engineer, 7 April 2021.

being acquired and bought by larger internet carriers.⁴⁰ Despite the active economic speculation of which Telxius is part of, the company describes itself as a neutral infrastructure operator in a corporate presentation shared with me by their communications office. I am not sure exactly what they mean by this, but the contested geopolitical and economic relations in which submarine cables are embedded are anything but neutral. As I have discussed so far, the social construction of territoriality is intimately entangled with the technological infrastructures deployed in particular geopolitical regions. Submarine cables are part of the contested formation of frontiers, which are simultaneously technological, geopolitical, and economic.



Figure 11. Telxius network map. Source: Telxius (telxius.com/network/interactive-map)

So far, I have discussed how the transoceanic routes that connect submarine cable stations and seaports are deeply related to each other. This interconnection is also present in the

⁴⁰ Interview with Anahí Rebatta, senior analyst at TeleGeography, 21 April 2021.

development of contemporary trading routes, which are mostly defined by the movement of material commodities through large container ships. As the coaxial cable was becoming an international norm in telecommunications after World War II, the containerization of maritime trade was also becoming the standard of global commerce (Sekula, 1995). The transatlantic routes charted during the European colonization of the world are not only at the core of the internet's submarine cables, but also define to a large extent the routes followed by the container shipping industry that moves 90% of the world's material economy (George, 2013). Similarly, submarine cables and their maritime routes are a critical technosocial infrastructure for contemporary information capitalism, as they enable the extraction of users' data (Zuboff, 2019). Submarine cables and container ships developed as the most fundamental infrastructural technologies of late capitalism, increasing the speed at which information and materials are extracted and commercialized. In other words, the flow of consumer goods and of digital data that sustains contemporary capitalism converge at the infrastructures that cross the world's Oceans. Ships and cables are both central to the processes of calculated interconnection that sanctions the movement of information and commodities across the world.

Due to their status as critical infrastructures, geopolitical conflicts extend to the construction of submarine networks. In an article titled "Tech giants fight submarine wars", the BBC mentions that Facebook dropped the construction of a cable between California and Hong Kong probably due to pressures from the US government, emphasizing the entanglement of multinationals and governments as they negotiate between increasing submarine cable infrastructure and national security.⁴¹ Similarly, one of the key elements of China's political and economic plan for the next few years is based on what they refer to as the Digital Silk Road, a vast network of submarine cables that seeks to position China as a lead competitor in emerging digital economies.⁴² The very name of the project bears a striking historical relation to the largest pre-modern web of commercial trade between Europe and China, The Silk Road. This network was expanded and consolidated during the journeys of Venetian merchant Marco Polo during the thirteenth century, sparking the imagination of medieval European kingdoms and the emerging

⁴¹ Winrow, M. (2021) 'Tech giants fight "cloud wars" deep in the Ocean', BBC News, 24 May. Available at: https://www.bbc.com/news/business-57070318 (Accessed: 26 May 2021).

⁴² Devonshire-Ellis, C. (2021) 'China's Submarine Digital Fiber Optic Belt and Road', Silk Road Briefing, 17 March. Available at: https://www.silkroadbriefing.com/news/2021/03/17/chinas-submarine-digital-fiber-optic-beltand-road/ (Accessed: 21 May 2021).

bourgeoisie, who were looking to expand their wealth. The narratives that emerged about the Silk Road solidified the chimera of the Indies that drove Europeans to colonize America, searching for the lands in Marco Polo's tales. When Christopher Columbus sailed for the first time in 1492, he was searching for a route to East and Southeast Asia in order to secure the commercial dominance of the Spanish crown over the trade of spices and precious metals. What kind of chimeras and deliriums emerge from the Digital Silk Road, as data becomes the most valuable asset?

Regardless of the shifting geopolitical locus of power, the epistemological project of modernity and coloniality continue to be defined by the dominance of western(ized) human subjects over the natural non-western(ized) world (Mignolo, 2011). As the world's emerging powers, such as China, dispute the supremacy of the already established geopolitical order, securing control over the expansion of submarine cables becomes a key aspect of these contested geopolitical arrangements. In light of the tight relationship between information and economic regimes, Christian Fuchs (2008) argues that "[t]he knowledge society is not an immaterial society but a new phase in the material reality of capitalism. It requires a large material infrastructure made up by computers, periphery, servers, routers, switches, network cables, and so on" (p. 145). Generally speaking, transatlantic infrastructures, from shipping routes to fiber optic cables, have enabled empires, states, and multinationals to extract and sanction the flow of materials and information at an accelerated rate. As material infrastructures, submarine cables are critical systems embedded in the mutually constitutive relationship between transoceanic connectivity and frontier securitization. Due to their geopolitical location, Atlantis-2 and the cable station in Conil are especially implicated in the construction and preservation of the networks that sustain contemporary capitalism.

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This chapter suggests that the internet is entangled with the historical construction of frontiers and their securitization, which enable geopolitical powers to sanction the flow of people, commodities, and information across the very same borders. The development of submarine cables is historically linked to the expansion of empire and capital, both as a form of colonial administration and control (Starosielski, 2015) but also through the extraction of data and materials that sustain contemporary network capitalism (Fuchs, 2008). Atlantis-2 reinforces the transatlantic connection between South America and Europe inaugurated during the Spanish colonial era, reviving the South Atlantic as an active geopolitical space in the digital era. Furthermore, as a layered media infrastructure, Atlantis-2 and its landing station in Conil inherit the strengths and limitations of this historical base upon which they are built (Star and Bowker, 2006), which produces a particular kind of interconnectivity that is based on simultaneous securitization. Analyzing the dynamic of modern interconnection, Martin (2012) observes that the "entwined logics of interconnection are determined by a precarious balance between the apparent openness of mobility flows and the potential stasis of securitisation" (p. 359). The apparently frictionless flow of digital information is in fact deeply implicated with the administration and regulation of material flows, which become evident in the deep layers of history at the internet's landing stations. Atlantis-2 and its landing station in Conil are embedded in a non-linear network of geopolitical relations that reveal the co-constitutive relations between technology, coloniality, and modernity.

Having established the colonial and modern genealogies of the internet's material infrastructure, I will turn my attention now to how, besides being conduits for the exercise of power and control, cables and their landing stations remain as contested meaning-making spaces. Just as transatlantic ships meant different things depending on who used them and where they were taken, the meaning attached to submarine cables is constantly negotiated by the different actors that relate to them at their landing sites. Even though Starosielski (2015) identifies the tension between insulation and interconnection that characterize the internet, and the turbulent ecologies that complicate the narrative of the internet as a frictionless technology, she disregards the role of storytelling as a relational tool for the communities at the internet's landing sites. The next chapter will focus on the tensions between institutional and popular narratives about the internet's submarine infrastructure in Conil, aiming to establish the powerful role of speculative storytelling as a relational tool capable of diversifying and expanding the monolithic narratives that characterize the internet solely as a geopolitical technology at the service of contemporary neoliberal configurations.

3. Secrets under the sea: cables and storytelling

In his 1995 publication and exhibition Fish Story, photographer Alan Sekula discusses the relationships between the Ocean and capitalism through a visual, historical, and ethnographic analysis of seaports and maritime commerce. Sekula challenges the invisibilization of sea trade and describes the modern dynamics of container ships in the construction of the capitalist global order. Referring to the relationship between his analysis and the emerging digital revolution at the time, Sekula says that his argument "runs against the commonly held view that the computer and telecommunications are the sole engines of the third industrial revolution. In effect, I am arguing for the continued importance of maritime space in order to counter the exaggerated importance attached to that largely metaphysical construct, "cyberspace", and the corollary myth of "instantaneous" contact between distant spaces" (p. 50). The opposition Sekula draws between digital telecommunications and capitalism's Oceanic materiality does not take into consideration the very dependence of the internet on the sea, as its material infrastructure crosses Oceans just like the ships he describes do. Only in 1995, when his book was published, approximately thirteen fiber optic cables were laid on the Ocean floor according to TeleGeography's submarine cable map. Even though Sekula challenges the myth of dematerialized digital connectivity, he fails to recognize how this myth is precisely dependent on a hidden set of subaquatic infrastructures.

Sekula's lack of awareness of the digital revolution's maritime infrastructure reflects the general perception of the internet from the end of the twentieth century until today: a largely immaterial phenomenon devoid of any physical infrastructure. As I discuss in the previous chapter, the architectural design of coaxial cable stations during the Cold War was defined by the construction of militarized structures such as anti-nuclear bunkers, which protected telecommunication infrastructure from potential attacks. However, after the end of the Cold War and the rise of the internet in the 1990s, companies began to control the amount of information they shared about submarine cables as a way to securitize the internet's infrastructure. In other words, the threat was not a nuclear bomb anymore, but an uncontrolled flow of information about how the internet's infrastructure operates. As a result, Starosielski (2015) argues, submarine cables are still largely absent from our technological imagination, a strategy that seeks to maintain the security of global communication through a restriction of information.

Acknowledging these contemporary dynamics, an engineer from Telefónica GlobalSolutions in Argentina gave a public talk about submarine cables in 2015 titled "Big Data: Secrets under the sea", emphasizing the secrecy that surrounds the infrastructures of the digital revolution. His response focuses on a strictly technical explanation of submarine cables that ignores the tensions that create such a concealment, a common strategy used by telecommunication companies. In order to critically address the tension between secrecy and technicist explanations, which define the narratives on submarine cables to a large extent, this chapter first discusses the tension between the administered flow of information through which companies such as Telefónica seek to securitize the internet's infrastructure and the speculative storytelling through which the community in Conil relates to submarine cable systems. Then, I will weave a concluding story around Atlantis-2 that speculates about the mythological origins of the internet and its relationship to submarine ruins, seeking to imagine alternative narratives that create new ways of relating to the internet as a technosocial infrastructure.

3.1. Science fiction and porous frontiers

As discussed in the previous chapter, the Atlantis-2 submarine cable and the cable station where it arrives in Conil are rooted in a deep historical network of military architecture designed to maintain control over contested frontiers. Infrastructures not only inherit the strengths and weaknesses of the bases in which they are built (Star and Bowker, 2006), but they also inherit particular historical dynamics. In the case of Atlantis-2, the cable's infrastructure inherits the exercise of connectivity between Spain and South America that enabled the creation of the Spanish colonial empire, as well as the securitization practices and architectures designed to maintain control over geopolitically contested frontiers. As a connecting technology, the internet is embedded in a material and semiotic dynamic of frontier securitization. The cable station bunker in Conil is part of a network along with other watchtowers and bunkers, constituting a militarized architecture that has historically defined the geopolitical dynamics of the coast of Cádiz and its geopolitical importance as the frontier between Western Europe with the Islamic world, America, and the Atlantic Ocean. In this section, I will explore how the administered secrecy that characterizes contemporary internet infrastructure is also embedded in this tension between connectivity and securitization, and how the local community in Conil challenges these practices through speculative stories based on their own experiences of submarine cable systems.

When I first walked to Conil's cable station, I brought my camera and sound recorder. After shooting some images from far away, I walked to the front gate with my camera on a tripod and began filming the house that hides the entrance to the bunker. Quickly a faceless and disembodied voice on an intercom said, "Hey! What do you think you're doing?". After I explained that I was an artist and researcher interested in the internet's infrastructure, the voice said, "It's forbidden, call our main office in Seville". The anxious reaction caused by my camera looking into theirs—a sort of counter-surveillance exercise—emphasizes the narrative control around the cable station. Only the central office and the institutional narrative they hold could provide me the information I needed. In an age when virtually everyone in Europe has a camera and a microphone in their pockets, anyone could take pictures of the bunker. Actually, I recorded several other videos of the cable station from various distant points. Nevertheless, the guard felt the need to remind me that I need authorization to portray the cable station. Even though the rundown architecture of the cable station does not convey a sense of heightened security, it is clear that at a certain point between 1970 and today, Telefónica assumed other securitization tactics beyond maintaining the physical walls in shape. During the fiber optic era, when Atlantis-2 was installed, the practice of securitization through hardened architectures was largely replaced by strategies of secrecy, which as Starosielski (2015) suggests, were mostly designed to obscure the public's knowledge about the internet's submarine infrastructure.

This invisibilization of telecommunications infrastructure is very evident in Conil, not just because of the impossibility of seeing the submerged cable, but also because of the inaccessibility of most of the above ground structures. Even though telecommunications infrastructures like antennas, cables, and towers are deeply immersed in the urban design of Conil, the stories I heard from the people I talked with emphasized the mystery surrounding the cable station. "Here we all know the Telefónica", Diego Tirado told me, referring to the cable station, "The Telefónica has always been a mystery, being able to go inside has always been a mystery. Only a few people from the town have gone in, mostly workers".⁴³ His account reveals that even though the bunker is part of the social relations in Conil, the bunker's walls and the company's withholding of information creates a physical and narrative divide between the internet's infrastructure and the local community that lives around it. The people of Conil are aware of the presence of the internet's infrastructure in their community, but also of the deep

⁴³ Interview with Diego Tirado, president of the association of the Barrio de los Pescadores, 8 May 2021.

physical and semiotic frontiers between them and what goes on inside the bunker.

The physical and discursive impenetrability of the cable station does not manifest equally for those of us who do not work inside the cable station. Considering that I had never been to Conil before, I was initially surprised by how I was able to enter the bunker after only two months of being there. The speed at which I was able to penetrate the station's walls reminded me of my privilege as a white Latin American male researcher affiliated with a Danish university, which most likely played a role in the immediate trust that the two male engineers I talked with placed in me. Seeing that my intentions were merely intellectual, and with an official letter from the university stating that I was conducting my thesis research, I was allowed to enter the bunker. Even though I was not allowed to bring my camera or sound recorder, the visit was thorough and I immediately created several personal voice notes upon leaving so that I would not forget any detail. Despite my host's welcoming attitude, he told me that in order to conduct a formal interview and record inside I had to make an official request to the communications office in Telxius, attaching all the questions and the university's sponsoring letter. The Telxius Communications Office replied to my email with a corporate presentation, and I never got any other response from them nor was I allowed to go back. Even though I had more access to the bunker than most of Conil's permanent inhabitants, I was also eventually limited by Telxius securitization practices. Their response to my questions about the station's history was answered with a monolithic institutional narrative, which is probably also used for commercial purposes. The securitization around the flow of information about the bunker is a multi-layered practice that is constantly negotiated between the actors surrounding a particular infrastructure.

In spite of the architectural and discursive practices of impenetrability at the cable station, the communities in Conil have created their own ways to relate to the internet's infrastructure in their hometown. During my three months of research in Conil, most people I talked with knew something about the Telefónica bunker or about "the cable that goes to America", the way in which most people referred to Atlantis-2. When I was interviewing Diego Tirado, he pointed to the Ocean horizon and said, "There goes the cable to America". I could not help but wonder if during the dominion of Spain over its American colonies, whenever people in the coast of Cádiz saw ships on the Ocean's horizon, they would point just like Diego Tirado did and say, "There goes the ship to America". This speculation led me to think that the people from the Atlantic coast of the south of Spain have probably always related to the colonial and modern

infrastructures I described in the previous chapter through imagining how they function in relation to their own contexts. The following paragraphs aim at pointing out the role of speculative storytelling in Conil as a powerful relational tool that shatters the institutional monolithic narratives about the internet's material infrastructure.

During the three months I spent talking to people in Conil about the submarine cables, I heard several stories around the bunker that have become popular local narratives about Telefónica. For example, José Ligero and Diego Tirado both told me that there have always been speculations about what is hidden inside the bunker and why it is located in Conil. During the last years of the Cold War and during the Gulf War in the 1990s, people thought that the cable station would be a main target of nuclear attacks because of its strategic geopolitical location.⁴⁴ José Ligero told me, "We all thought that the Russians, or whoever, would come at any point, and that the bunker was designed to protect someone important". After a pause he laughs and says, "I don't know who that would be though". Similarly, when the Atlantis-2 cable was built, several people thought that Conil had acquired even more geopolitical importance, since the communications gateway between Europe and South America passed through the town. Even though there were several other telecommunications infrastructures that created redundancy between Europe and America, the narrative of the town is that they are right at the center of geopolitical tensions between the western world and its others, whether these are the Soviets during the Cold War or the Islamic states since the rise of the wars in the Middle East. Some people still think that if war reaches European soil again, Conil will be one of the first places to be blown up because of the cable station. These narratives enable the citizens of Conil to insert the cable infrastructure in their particular historical contexts, and make sense of an infrastructure that is most commonly hidden away from them.

Beyond the veracity of these stories, the narratives they promote are immersed in the particular geopolitical context that has characterized the coast of Cádiz as a tense frontier space. Starosielski (2015) argues that the emphasis placed on narratives of connectivity or of potential cable disruption reveal how Cold War geopolitics skew the public's perception on submarine cables, functioning as discursive frontiers that obscure the operations of submarine cable infrastructure. She argues that "[a]lthough the cable landing point is the place where network infrastructure surfaces and becomes intelligible in social space, not everyone has the ability to

⁴⁴ Interview with José Ligero, fisherman and filmmaker from Conil, 5 May 2021.

affect the composition of these spaces" (p. 168). Even though the people I talked with in Conil do not have a clear direct channel to alter what goes on inside the cable station, I argue that these stories do much more than simply obscuring the technical operations of cable systems. While Starosielski does not bring the power of local narratives into her analysis, I observed that people in Conil create meaning around the internet's infrastructure through speculative fabulations, which in turn enable them to challenge the emphasis placed by companies on the mirage of frictionless connectivity. In this sense, even though the fictions around submarine cable infrastructure in Conil are deeply related to Cold War geopolitics as Starosielski identified, they also allow the inhabitants of Conil to challenge the securitization and invisibilization of technological infrastructures and place them in relation to the political, social, and historical relations that they are part of. Storytelling thus becomes a powerful tool to collectively express their own fears and perspectives about the internet's infrastructure and create meaning as a community.

Storytelling provides radically different ways to relate to technology, especially for people typically disempowered due to their lack of access to certain kinds of specialized knowledge. As I discussed in the first chapter of this thesis, Haraway (2016) proposes that speculative fabulation is a method of tracing patterns between seemingly disparate events, creating possibilities for relating anew to structures that appear to be set in place. Furthermore, Haraway (1989) has also argued that the convergence between science and science fiction enables researchers to revision the possibility for new bodies and meanings based on situated knowledges of the world. Latour (2005) has also identified the relevance of storytelling when he argues that science fiction can challenge the narratives solidified by modernity, opening up the possibility to make sense of the connections between humans and objects in new and different ways. Bearing these considerations in mind about the social role of fiction, I suggest that the community in Conil create and appropriate stories about Atlantis-2 and the cable station in order to break away from imposed narratives and find situated ways of relating to the technosocial infrastructures they cohabit with.

Some of these stories go beyond the more evidently geopolitical narratives, revealing that science fiction is also a crucial way for people in Conil to resignify the internet's infrastructure. For example, José Ligero, Diego Tirado, and Joshua Rodríguez, a surf instructor in Conil, told me that in the 1989 some people thought that aliens were visiting the town. During four or five nights, large footprints with strange oval shapes appeared on the beach without much explanation, causing such uproar that a newspaper in Cádiz picked up the news.⁴⁵ Eventually, the most plausible theory that locals could surmise was that scuba divers who were fixing the submarine cables were doing some kind of work in the middle of the night. Apparently, some people had seen the cable ship nearing the shore before midnight. What could have been a standardized procedure to respect the fishing sites of local fishermen during the day detonated a series of speculations about why Telefónica was secretly fixing or modifying the cables at night. Even though this was apparently never proven, these kinds of stories reveal that the internet's infrastructure becomes a crucial character in the community's narratives. In particular, science fiction narratives about submarine cables enable the community to disrupt the technicist monolithic narratives typically put forth by telecommunications companies, and actively speculate about the role of technology in their daily lives.

Science fiction is a narrative tool that allows the people of Conil to plot the interconnection between technology, history, and themselves. In their book on speculative design, Anthony Dunne and Fiona Raby (2013) argue that science fiction allows the imagination to suspend disbelief, dislocating the present into a possible future that reveals core ideas and values of the context of enunciation. In other words, science fiction serves to revise the present through a more critical lens. In the case of the people I interviewed in Conil, the science fiction narratives they shared with me were always accompanied by an acute sense of their embodied experience with Telefónica. For example, when telling me about the mystery surrounding the cable, Diego Tirado also told me that he along with five other neighbors were hired by Telefónica in 2000 to install the cast iron ballasting shells that protect the Atlantis-2 cable section located in shallow waters and buried under the beach. Similarly, José Ligero told me that his father, who was a fisherman, was hired in the 1970s by Telefónica in order to guide cable ships to the exact locations of the submerged cable for repairs. The deep knowledge of the sea held by several of Conil's inhabitants permeates the narratives of the cable, allowing them to extrapolate the company's fictions in relation to their own experience. The stories around the internet's infrastructure in Conil question the social structures and technosocial arrangements around the submarine cable, breaking through the monolithic hegemony of technoscientific discourse and

⁴⁵ To read more about the news of aliens in Conil, see: Serrano Cueto, J. M. (2019), 30 años del "Caso Conil", Diario de Cádiz. Available at: https://www.diariodecadiz.es/noticias-provincia-cadiz/anos-Caso-Conil_0_1370263466.html (Accessed: 30 May 2021).
diversifying technological narratives through lived experience and interpersonal connections throughout time and space.

The tensions between local storytelling and Telefónica's official narratives have also engendered increased opposition to technological infrastructures by the people of Conil, leading some of Telefónica's workers to attempt a shift in strategy. There have been several protests against the construction of more antennas in Conil—which most people link to Telefónica's bunker—because of their alleged relation to the increase in cases of cancer in the town.⁴⁶ In order to debunk the popular myths around the cable station, one of the engineers I talked to organized a series of visits to the bunker from 2012 to 2016, sponsored by Telefónica and by the local government's tourism office. After a visit to the bunker, the newspaper El País reports a series of facts about the cable station that either confirm, add, or challenge the gossip about the station in town.⁴⁷ Besides narrating many of the facts that I discuss in this thesis, such as the cable's route, its geopolitical relevance, and the history of the anti-nuclear bunker, the report emphasizes the role of this station as a Networking Operations Center (NOC), claiming it is the most important cable station of all of Spain and a neuralgic site of European telecommunications. The video that accompanies the report oscillates between an overemphasis of the Cold War dynamics that define the militarized language of the station's architecture, and the technical facts stoically communicated by the station's engineers. This tension reveals Telefónica's discursive securitization, which functions through intensifying the mystery around the cable while simultaneously demonstrating that they hold the truth behind local myths.

Telefónica is very much aware of the science fiction narratives built around the internet's infrastructure, which they directly address through opposing it with a message of technology as fact. A promotional ad made by Telefónica Brazil tells the viewer, "Brazil's beaches are, without a doubt, some of the most visited on the planet. And from now, thanks to BRUSA [a fiber optic cable between Brazil and the US], the visitors to these beaches can be more connected to the future. It's not science fiction, it's simply, technology".⁴⁸ The narrative in this video creates a

⁴⁷ Cañas, J. A. (2016) El búnker antinuclear que 'visitas' diariamente, El País. Available at:

⁴⁶ Interviews with Diego Tirado, president of the association of the Barrio de los Pescadores, 8 May 2021; Interview with José Ligero, fisherman and filmmaker from Conil, 5 May 2021.

https://elpais.com/elpais/2016/06/16/ciencia/1466071888_693692.html?utm_content=bufferdf70e&utm_medium=so cial&utm_source=facebook.com&utm_campaign=buffer&fbclid=IwAR1Zi9Otqgxj8wK1qUwFnaoMhameGtPFEx mvIvJdYxvbQ7K_kXM-wBpxucM (Accessed: 21 May 2021).

⁴⁸ Telefónica (2019) Viaje al interior de un cable submarino. Available at:

https://www.youtube.com/watch?v=qjjjyP65o_s (Accessed: 21 May 2021).

tension between science fiction and technology, demeaning fiction and storytelling as a meaningmaking tool around the internet's infrastructure and, instead, solidifying the myth of technology as a singular objective truth. The emphasis on the difference between science fiction and technology is not meant to debunk the popular narratives around submarine cables, but mainly it reasserts the company's role as the bearer of true, factual technological knowledge. However, the video still places cables in a discursive relation with the future, mobilizing a fictional narrative that characterize submarine cables as temporal connectors in the beaches of Brazil. In sum, Telefónica places itself as the source of factual technological knowledge on submarine cables while simultaneously inscribing them in another temporal fiction, mobilizing a particular notion of technosocial progress that supports the internet's myth as a frictionless transcontinental connector.

The narrative tensions between telecommunication companies and local communities that I have discussed so far reveal that submarine cable systems are sites of contested meaningmaking practices. Discussing the role played by objects that mean multiple things in the fields of technoscientific research, Susan Leigh Star and James R. Griesemer (1989) propose that these can be thought of as boundary objects, which are

"plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites. They are weakly structured in common use, and become strongly structured in individual site use. These objects may be abstract or concrete. They have different meanings in different social worlds but their structure is common enough to more than one world to make them recognizable, a means of translation. The creation and management of boundary objects is a key process in developing and maintaining coherence across intersecting social worlds" (p. 393).

Drawing from this description, I argue that submarine cables and their landing stations constitute boundary objects. Despite having a uniform function as data carriers between distant geographical regions, undersea cables and cable stations are embedded in different narratives at the specific sites where they are located, typically oscillating between institutional discourse and the stories of the local communities. The Atlantis-2 cable and telecommunications bunker in Conil are a boundary site of multiple meaning-making practices, where the local non-specialized community uses storytelling as a way of situating the monolithic technicist discourse into their immediate contexts and lived experiences.

In a similar way to Star and Griesemer's discussion of the semiotic fluidity of boundary objects, the geopolitical frontiers that characterize the Atlantic coast of the south of Spain, which I discuss in the previous chapter, are equally porous. Even though Andalucía has been the southernmost frontier of modern continental Europe since the sixteenth century, the cultural and social ties between this region and the Arab world remain lively and present. Isabel Tomé highlights that the relations between Morocco and the south of Spain are not only at the root of the geopolitical problem with refugees escaping wars in Africa and the Middle East, but that the connections run deeply through the architecture of the cities, weather pattern and climate, as well as language, food, and music. In my interview with her, she mentioned that despite the creation of the modern border that separates both regions, the unsanctioned movement of social and cultural practices is still very much present.⁴⁹ Walking through the streets of the main cities in Andalucía, such as Cádiz, Granada, Seville, and Málaga, the porous frontier becomes evident. From the tea houses to the markets, and the Arabic that can be heard on the streets, Andalucía and the Islamic world are inextricably tied up still today. Just as the monolithic narratives of Telefónica are challenged by storytelling, the solid frontiers enforced by militarized infrastructures are challenged by the unofficial material and semiotic movement across the Gibraltar Strait.

The connection between the coast of Cádiz and South America are equally profound, since most of the ships that sailed to America during the Spanish colonial rule came out of this region. When I mentioned my research to several people, they pointed me towards a set of variations in Flamenco music that originate from this transatlantic connection. Even though Flamenco originated in the south of Spain as a cultural expression of the nomadic Roma people, its rhythms were eventually influenced by the migrants and traders who travelled between Spain and America. Some Flamenco styles that emerged in Cádiz, which was the most important seaport in the Spanish empire and is still a site of connection between America and Spain today, are known today as Cantes de Ida y Vuelta (Songs of Coming and Going in English). The names of these styles, some of which were created during the twentieth century, are rooted in the names of places in the Caribbean and South America. One of them is called "La Colombiana" (The Colombian), to which I developed a deep relation during my time doing research in Conil. As a researcher of the Atlantis-2 fiber optic cable system, the first one to directly connect Europe and

⁴⁹ Interview with Isabel Tomé, teacher of languages and history at the Academia Andaluza of Conil, 27 May 2021.

South America, I am reminded of my own roots as a Colombian with mixed Spanish and South American heritage, a product of the colonial relations that I have described in this thesis so far. Notably, while I was in Andalucía, some people told me that my last name, Pacheco, is a typical last name for Roma people in the region. What is my personal relation to this historical network connecting the Iberian Peninsula and South America? In order to explore this assembly in a more creative way, I collaborated with Patricia Peces to create an audiovisual piece that depicts her dressed in a surfing wetsuit with the traditional hairdo and heels used in Flamenco, dancing to a Colombiana on top of the Telefónica manhole where Atlantis-2 passes through (see fig. 12).⁵⁰ This short detour through the unsanctioned relations across the geopolitical border of Southern Spain seeks to highlight the awareness of people in Conil about the deep connections that tie them to the communities across the frontier securitized by colonial and modern bunkers and watchtowers. These practices and narratives reveal that the material and the symbolic borders designed to separate are usually more porous than stable.



Figure 12. Still from the audiovisual collaboration with Patricia Peces at Telefónica's manhole in Conil. Photo: Juan Pablo Pacheco Bejarano, 2021.

⁵⁰ The song Patricia and I used for the video is a Colombiana sung by Carmen de la Jara. Available at: https://www.youtube.com/watch?v=NjGH3k-Zhnk (Accessed: 15 May 2021).

The ongoing movement of cultural and social relations across the geopolitical frontiers in the south of Spain can sometimes challenge the strict control of geopolitical borders exerted by governments and multinationals. In his analysis of geopolitical frontiers, Martin (2012) argues that the logistics deployed to sanction interconnectivity across contemporary borders are appropriated by stowaways and smugglers. In other words, the very same infrastructures designed to assert control over the movement of bodies, commodities, and information across borders are reused by other agents to secure unsanctioned flows. Martin calls this kind of strategy an extra-logistical knowledge, which reveals that "instability will always challenge the construction of supposedly stable relations" (p. 357). In this way, infrastructures of connectivity and securitization such as bunkers, watchtowers, ships, and the internet, are all boundary objects that can be used by local communities outside of the logics of governments and multinationals. In her analysis of transatlantic slavery, Sowande' Mustakeem (2016) argues that slave ships were the technology that enabled the making of transported slaves as well as the sites where rebellious ties for the unmaking of slavery were formed. Transoceanic ships thus served both to make and unmake the institution of slavery. The internet's infrastructure is similarly embedded in the history of simultaneously sanctioned and unsanctioned connectivity. Even though multinationals and governments securitize the material and symbolic boundaries of telecommunication infrastructure, the internet is not a stable space. To begin with, I would not have been able to travel to Conil if it was not for the information and people I was able to reach through the internet. Furthermore, events such as the recent social uprisings in South America have demonstrated that the internet also serves to create transnational communities of solidarity through the unsanctioned flows of information.

So far, I have argued that despite being immersed in geopolitical tensions, the internet's infrastructure is part of a deep history of unsanctioned movements of social and cultural relations across borders in the south of Spain. Based on my previous discussion on the power of storytelling earlier in this section, I want to suggest that fiction is an extra-logistical tool in itself, capable of challenging the securitization of the physical and semiotic frontiers of technosocial objects. The speculative storytelling mobilized by people in Conil shatters the monolithic narratives about the internet's infrastructure, inserting it into the immediate histories of the people who live around Atlantis-2 and its landing station. Through the creative ethnographic mediation of this technosocial infrastructure, this research was able to identify how people create

meaning on the internet's materiality and unexpectedly challenge institutional master narratives. In other words, speculative storytelling pokes holes in hegemonic discourse, allowing nonspecialized people to produce situated knowledge about the internet's material infrastructure.

This chapter has so far suggested that administered secrecy is one of the main practices of securitization mobilized by submarine cable companies in the twenty-first century, which aims at highlighting narratives of connectivity while simultaneously reinforcing the frontier between the public and the company. Telecommunication companies such as Telefónica administer the flow of information about their operations depending on who inquires, intensifying the sense of securitization of their material and symbolic infrastructural frontier. However, the meaning of the internet's infrastructure at a landing site like Conil is constantly negotiated between the company, its engineers, and the popular narratives created and mobilized by people's collective experience. These contested narratives, which complicate the frontier between fact and fiction, are always situated in the geopolitical relations embedded at each particular landing site. In Conil, these stories provide new ways of relating to an infrastructure that is over 50 years old and nearing its end. One of the three cables that operated at Conil's cable station was dismantled last year, and Atlantis-2 is expected to be taken down in the coming months.⁵¹ As Conil's anti-nuclear bunker and the internet infrastructure it supports slowly turn into technological ruins, speculative fabulation seems the most appropriate way of engaging with such a strange runoff modernity. Bearing in mind that Atlantis-2 will most likely soon be deactivated, the next section of this chapter weaves a speculative story to think about the mythological origins of the internet as a submarine ruin.

3.2. Atlantis: technology and submarine ruins

Based on a discussion around the tensions between Telefónica's official narrative and the fabulations of the local community in Conil, the previous section argues that storytelling is a powerful tool to relate anew to technosocial infrastructures. Embracing this hypothesis, this section weaves a speculative assembly around the relations between the lost city of Atlantis, submarine ruins, and the internet's material infrastructure, referencing elements from my creative

⁵¹ Interview with an anonymous telecommunications engineer, 10 April 2021.

ethnographic mediation of Atlantis-2 and its cable station in the south of Spain. The purpose of this story is to highlight what Star and Bowker (2006) have already pointed out when they refer to "the importance of the metaphors that we use to think through technology" (p. 233). Infrastructural metaphors bring certain aspects of technology to light while simultaneously hiding others from view, and upon close examination they reveal aspects of technology that we might take for granted. Even though names are not the same thing as metaphors, this story starts with a discussion on the names of submarine cables as an important feature in exploring new ways of relating to submarine cable infrastructure.

I want to bring our attention to how the names of some submarine cables insert the internet into geopolitical and mythological histories. Most cables are named as acronyms that bring together the places that they connect. For example, PENCAN-6, the cable that branches out of Atlantis-2 from the Canary Islands to continental Spain, comes from "Peninsula" and "Canarias". Other cables are named after historical figures as a reminder of the origins of modern telecommunications. For example, the Alonso de Ojeda (Aruba-Curaçao) and the Columbus-III (United States-Portugal-Spain-Italy), both bear the names of Spanish colonizers who claimed off-shore territories in America for the Spanish crown in the fifteenth and sixteenth centuries. Naming these two cables after these colonial figures is reminiscent of the bronze plaque at the entrance of Conil's submarine bunker, a representational gesture that creates a direct relationship between colonial connectivity and modern telecommunications. However, some other cables are named after Ancient Greek mythology, one of the common origin stories shared by Western Europe, from where many concepts in science, technology, and language itself can trace their roots. Cables such as Hermes -1 (United Kingdom-Belgium), Minerva (Cyprus-Italy), Aphrodite-1 (Greece-Cyprus), and Ulysses-1 (United Kingdom-France) refer to Greek mythology in order to emphasize both the shared past of European heritage as well as the traits of each God and Hero. Hermes reinforces communication, Minerva reinforces wisdom and the arts, Aphrodite reinforces beauty, and Ulysses is the first Greek hero who crossed the Ocean before returning home. Bearing these six names in mind, one could characterize the internet as a beautiful and wise journey to connect Europe with faraway lands. In other words, a euphemism for colonialism. However, for the final section of this thesis I want to focus my attention on Atlantis-2, which invites me to perform a speculative detour about the relationships between the internet, ruins, and the Ocean.

Atlantis-2 is named after the mythological city of Atlantis, which has occupied the minds of philosophers since it was first mentioned by Plato. In the introduction to a recent publication of Plato's *Timaeus* and *Critias* dialogues where Atlantis is mentioned, Andrew Gregory (2008) observes that the lost city of Atlantis is most likely an embellished fiction used by Plato to convey his ideas. As an allegory, Atlantis had multiple meanings, of which the impossible dream of transoceanic connectivity became remembered by many. Both dialogues refer to Atlantis as a technologically advanced island that stretched from just outside of the Pillars of Heracles-what is today the Gibraltar Strait—to the mainland on the other side of the Atlantic Ocean. This description has led people to speculate that Atlantis could have occupied a vast portion of the Atlantic Ocean, and that it connected Europe and America in ancient times. For example, Athanasius Kircher, the Jesuit Renaissance scholar who wrote on a wide variety of topics such as math, geology, history, and technology, drew a map situating Atlantis as a huge island in the middle of the Atlantic Ocean, reorienting the map by placing the south on top (see fig. 13). During my time in Andalucía, whenever I asked about Atlantis, several people confirmed the idea that the mythological island was supposed to be located just outside of the Pillars of Heracles, which can be seen on the horizon from the beaches of Conil.

In one of our conversations, José Ligero mentioned a theory that suggests that Al-Andalus (الأنذئي), the Arabic name for Andalucía during the eight centuries it was under Islamic control, originates from the myth of Atlantis. After searching online for anything that could prove this theory, I found a book review written by Antonio Arjona Castro (1986) where he discusses a theory by Joaquín Vallvé Bermejo suggesting that Al-Andalus derives from Atlantis, the same etymological origin for the Atlantic Ocean and the Atlas mountain range in northern Morocco. This hypothesis suggests that Atlantis, the lost mythological city, could have been part of the southern portion of the Iberian Peninsula as well, where the Atlantis-2 landing station in Conil is located. In the *Critias* dialogue, Plato mentions that Atlantis and the Atlantic Ocean are derived from the name of the king Atlas, son of Poseidon, the god of the Oceans. Plato mentions that Atlas was Poseidon's eldest son and king of all of Atlantis. Despite the true origin of the word, it is clear that there is a profound relationship between Andalucía, Atlantis, and the Atlantic Ocean that runs back to Ancient Greek mythology. Furthermore, the region of Cádiz is also part of this mythological genealogy. Plato mentions that the twin of king Atlas was given the edge of the



Figure 13. Map of Atlantis, Athanasius Kircher (1678), Mundus Subterraneus, Vol. 1, Amsterdam. Source: https://doi.org/10.3931/e-rara-52686

island closest to the Pillars of Heracles, which he named Gadeira, the ancient name of the city of Cádiz. Just like island of Atlantis, the Atlantis-2 cable connects Europe and South America today. Located in Andalucía, whose possible historical origin is located in Atlantis, the cable is the only remnant of Atlantis, the lost echelon in the mythology of the lost city. Today, in the absence of the vast island that connected the Mediterranean and Caribbean seas, Atlantis-2 inherits the might of the Atlantean civilization. Atlantis-2 leaves the coast of ancient Gadeira, from where the Spanish colonial ships departed to colonize America, and crosses the shoals beyond the Gibraltar Strait before reaching the American coast. Could the undulations in the Atlantic Ocean floor that the cables pass through be the remains of Atlantis? Does Atlantis-2 cross the submarine ruins of this ancient mythological civilization?

The city of Atlantis, as the dwelling place for the children of Poseidon, had an intimate relationship to the Ocean. In the dialogue *Critias*, Plato describes Atlantis' highly advanced water

channels that both protected and connected the center of the main city to the Ocean. These channels were a crucial element of the island's wealth, as they provided the commercial connectivity between the center of power and the multiple regions to which the Atlantean civilization traded with. Just like Atlantis, Atlantis-2 also depends on the Ocean to function. The internet bears a deep relation with the Ocean, not just because of the hundreds of undersea fiber optic cables that cross it, but also because the Ocean grounds the electrical current that powers the submersible signal repeaters.⁵² In other words, the internet's submarine network depends entirely on the Ocean's electrical conductivity. As Starosielski (2012) puts it, "the Ocean completes the cable circuit" (p. 201). The Ocean not only contains the internet, but it is also an integral part of it. Recent experiments in Microsoft are also harnessing the Ocean's physical properties, creating datacenter designs that leverage the heat exchange of computing through the cool subsurface of the sea.⁵³ Digital infrastructure, such as submarine cables and more recently datacenter facilities, bear an intimate relationship with the Ocean, similarly to how the lost city of Atlantis did thousands of years ago. The internet is part of a wide historical genealogy of humans harnessing the power of their material surroundings for the creation of technological systems (Peters, 2015).

Despite its wealth and technological advances, the city of Atlantis was still susceptible to the destructive forces of its ecological surroundings. Atlantis was shaken by earthquakes and floods in the course of a single day, until the entire island "sank beneath the sea and vanished" (*Timaeus*, 25d). The fragility of Atlantis is reminiscent of the fragility of the internet's infrastructure, composed of cables of 60mm in diameter that inhabits the unstable environments created by Oceans.⁵⁴ For example, the iron ballasting shells that protect the Atlantis-2 cable as it lands on Conil's beaches can be seen when the tide is very extreme. The Atlantic Ocean's extreme weather, which erodes the internet's protecting layers of sand and rock, is also evident in the exposed cement structure that contains the cable's manhole in the beach of Fuente del Gallo in Conil (see fig. 6). Besides the erosion from natural forces on the terrestrial segments of the internet, undersea cables are also subject to constant pressure from geological forces and

⁵² Interview with an anonymous telecommunications engineer, 7 April 2021.

⁵³ See: Roach, J. (2020) Microsoft finds underwater datacenters are reliable, practical and use energy sustainably, Microsoft News. Available at: https://news.microsoft.com/innovation-stories/project-natick-underwater-datacenter/ (Accessed: 30 July 2021).

⁵⁴ Interview with an anonymous telecommunications engineer, 7 April 2021.

transoceanic ships. The TAT-5/MAT-1 cable installed in Conil in 1970 failed soon after it was installed. An engineer at AT&T reported that the cable was found dangling on both sides of a tenfoot trench, and apparently a Russian factory fishing boat had accidentally dragged its anchor across the buried cable.⁵⁵ Similarly, the Atlantis-2 cable suffered several damages due to the infrastructural work conducted for the Olympic Games in Brazil, which were detected at the NOC in Conil.⁵⁶ The internet 's infrastructure is as susceptible to its material surroundings as Atlantis was thousands of years ago.

One of the primary functions of a NOC, such as the one in the underground bunker in Conil, is to monitor the status of submarine cables and detect potential failures. When there is an alarm at the NOC, engineers disconnect the fiber pair and plug it into a subsidiary electrical system called a Coherent Optical Time Domain Reflectometer (C-OTDR), which sends a light signal and according to how long it takes to get back it determines the exact location of the damage within a fault range of 10 meters.⁵⁷ One of the engineers I interviewed said that in the summer of 2019 there were many failures detected at the bunker in Conil, mostly caused by fishing vessels or debark anchors in coastal areas. However, one cable had been rubbing against a geological fault at a depth of 5,000 meters, and its protective layer had been heavily eroded. When this happens, all landing stations where any given cable passes through call each other to coordinate the timing for the repair. Inside Conil's bunker I saw an old phone with a paper taped on it that contains the codes to call each of the stations where the Atlantis-2 cable lands. If damaged, the cable cannot be turned off or turned back on until all landing stations are in a simultaneous teleconference, which still today is not done through a videoconference but through an old phone line built around 30 years ago. On average, there are around 100 reported failures per year on submarine cables, discounting the other probable hundreds of small damages and failures that need constant repair and revision.⁵⁸ Typically, failures are caused mostly by other ships' anchors or fishing trawlers, and sometimes the friction at the bottom of the Ocean caused

 ⁵⁵ Burns, B. History of the Atlantic Cable & Undersea Communications: from the first submarine cable of 1850 to the worldwide fiber optic network. Available at: https://atlantic-cable.com (Accessed: 21 May 2021).
⁵⁶ Cañas, J. A. (2016) El búnker antinuclear que 'visitas' diariamente, El País. Available at:

https://elpais.com/elpais/2016/06/16/ciencia/1466071888_693692.html?utm_content=bufferdf70e&utm_medium=so cial&utm_source=facebook.com&utm_campaign=buffer&fbclid=IwAR1Zi9Otqgxj8wK1qUwFnaoMhameGtPFEx mvIvJdYxvbQ7K_kXM-wBpxucM (Accessed: 21 May 2021).

⁵⁷ Interview with an anonymous telecommunications engineer, 10 April 2021.

⁵⁸ Interview with Anahí Rebatta, senior analyst at TeleGeography, 21 April 2021.

by geological forces erodes the cable's outer protection.⁵⁹ This demonstrates that throughout their working lives, cables are not stable structures.

Submarine cables do not last forever; they have an approximate life expectancy of 20 to 25 years. When cables cannot be fixed or reused anymore, they are typically just turned off and left at the sea bed since dismantling the entire infrastructure is a very expensive effort.⁶⁰ However, sometimes cables are either repurposed to create other connections or become a recycled infrastructure for other species to dwell in. Starosielski (2015) mentions that at the end of the 1990s, several cables retrieved by AT&T from the seafloor were deposited on the Ocean floor close to Maryland to create a Cable Wire Reef, which is inhabited now by many marine species. When cables become submarine ruins, they also become the home for other forms of life. These inhabited ruins slowly turn into an anthropogenic geological layer, which actually populate the Ocean floor much more than we could imagine. Juan Luis Suárez de Vivero reminded me that Ocean infrastructures are usually thought of as invisible, since we do not see lines outlining shipping or cable routes on top of the Ocean surface. However, the Ocean's surface is just one expression of a marine geography that is constantly changing. The Ocean floor, for example, is filled with anthropogenic debris such as sunk colonial galleons and telecommunications infrastructure, whose paths trace the transoceanic routes humans have used throughout history. In other words, the footprints of maritime infrastructure are evidenced in the sunk ruins of colonial and modern history.

The ruins at the Ocean floor lead me to speculate on the inevitable question: will the internet's infrastructure eventually become part of an anthropogenic geological layer at the Ocean's depths? Who will inhabit these technological ruins? Jussi Parikka (2015) proposes to think about media from the standpoint of geological time, raising questions about the deep spatial and temporal roots of contemporary media as well as its possible futures. Drawing from this invitation, I want to highlight the complex multilayered relationship between cables and the Ocean floor. First, deep sea mining is increasingly becoming a topic of discussion in relation to the future of the extractive industries that support contemporary capitalism. Guided by the awareness of the rich layers of bio-geological deposits at the seabed, governments and multinationals have set their eyes on the Ocean's depths in order to continue the extraction of oil,

⁵⁹ Interview with an anonymous telecommunications engineer, 7 April 2021.

⁶⁰ Interview with Anahí Rebatta, senior analyst at TeleGeography, 21 April 2021.

gas, and other minerals.⁶¹ Fiber optic cables could rely on this extraction in the future, as they are composed of polymers, metals, and glass. Cables left on the Ocean floor after being deactivated could eventually become part of the same Ocean floor from where its constitutive parts are extracted from. This cycle of extraction and retribution in the form of waste is characteristic of the contemporary capitalist world that has led to the current climate crisis, and yet, surprisingly, some species find ways of quickly adapting to these changing environments. For example, when Microsoft brought its submersible datacenter out of the Ocean off Scotland's Orkney Islands in 2020 after two years, it was covered in algae, barnacles, and sea anemones.⁶² If the city of Atlantis is indeed sunk somewhere in the Atlantic Ocean as Plato narrated, it has probably been undetected by modern machines because of how quickly life spreads at the Ocean floor. Recognizing this cycle of media as a material phenomenon increases our awareness of the ecological impacts of technology, which produce large amounts of debris capable of altering the geological composition of the Ocean floor and its inhabitants.

Atlantis-2 will soon become part of this geological history at the Ocean floor. One of the engineers I talked with was surprised that I was conducting research of Atlantis-2, an old cable that will probably be put out of service in 2021, the year in which I conducted this research.⁶³ With a capacity of 72Tbps, EllaLink is a last generation fiber optic cable that will soon replace Atlantis-2 as the single direct connection between Europe and South America.⁶⁴ When Atlantis-2 is dismantled, there will be only one remaining cable functioning at Conil's landing station, since Columbus III was taken out of service at the end of 2020. Besides the irreversible deactivation of the cables that arrive at Conil, the cable station itself is also very fragile and slowly turning into a ruin as well. The outside walls are cracked everywhere and filled with plants. Despite the 1960s suburban style house hiding the cable station, upon closer inspection the bunker becomes evident due to cracks on the pavement, probably caused by erosion and the movement of the soil over the last fifty years. On the garden there are several land antennas and two structures that look like mushroom sculptures, which used to be radiation detectors but are now completely

⁶¹ Shukman, D. (2021) 'Deep sea mining may be step closer to reality', BBC News, 1 July. Available at: https://www.bbc.com/news/science-environment-57687129 (Accessed: 5 August 2021).

⁶² Roach, J. (2020) Microsoft finds underwater datacenters are reliable, practical and use energy sustainably,

Microsoft News. Available at: https://news.microsoft.com/innovation-stories/project-natick-underwater-datacenter/ (Accessed: 30 July 2021).

⁶³ Interview with an anonymous telecommunications engineer, 10 April 2021.

⁶⁴ For more information on EllaLink, see: https://ella.link/ (Accessed: 15 February 2021).

dysfunctional.⁶⁵ The entire place, even before entering, has the air of a Cold War ruin, a piece of architectural memorabilia with remnants of the nuclear paranoia that characterized the second half of the twentieth century. As I write this thesis, I cannot help but think that I am writing an elegy for Atlantis-2 and the landing station at Conil, both slowly turning into technological ruins.

The cable station feels old and decaying, as if it will soon become indistinguishable from the ruins of watchtowers and bunkers that fill Conil's coastline. The symbolic and material layers of infrastructure on the Atlantic coast of Spain create a rich and complex historical narrative, which is mostly evident today in the omnipresence of ruins along the region's coast. During our interview, Diego Tirado told me that he had recently discovered a tower sunk beneath a modern building. He said, "it's been hiding there for almost five centuries".⁶⁶ Conil, and most of the towns in the coast of Cádiz, are the result of a semiotic and material layering of infrastructures based on the repurposing of ancient ruins. However, some of these buildings did not have to wait many years to become ruins. José Ligero tells me that Conil's bunkers look almost as if they had never been finished or were never really used, most likely because the allies from World War II never waged war against Franco in Spain, and they did not defeat Nazi Germany through the Spanish coast. The bunker of the Fuente del Gallo beach in Conil, where I began this research, is almost an undistinguishable part of its surroundings less than one hundred years after its construction (see fig. 14).⁶⁷ Even though the submarine cable bunker is not a complete ruin yet, the station is embedded in the omnipresence of infrastructural ruins in Conil. I dare to say that it will become another ruin sooner rather than later. The watchtowers from the wars between the Catholic and Islamic kingdoms, the Spanish Civil War bunkers, and the submarine cable station create a visual landscape of technological decay throughout Conil.

Despite their apparent disposability, these ruins have historically been used in multiple ways. The watchtowers built during the Catholic and Islamic wars in the south of Spain were not only used to spot attacks from the people coming from Morocco. They were also used for spotting tuna, a species that traditionally migrates from the Atlantic Ocean to the Mediterranean Sea to lay their eggs throughout springtime. The ancestral tuna fishing technique in the coast of Cádiz is called *almadraba*, an Arabic word that designates a ritual that goes back to the time of

⁶⁵ Interview with an anonymous telecommunications engineer, 10 April 2021.

⁶⁶ Interview with Diego Tirado, president of the association of the Barrio de los Pescadores, 8 May 2021.

⁶⁷ Interview with José Ligero, fisherman and filmmaker from Conil, 5 May 2021.



Figure 14. Spanish Civil War bunker in Conil, Spain. Photo: Juan Pablo Pacheco Bejarano, 2021.

the Phoenicians who lived in the south of Spain.⁶⁸ Guzmán el Bueno (Guzmán the Good), who defended Tarifa from the Islamic armies during the thirteenth century, was given the ownership of all the *almadrabas* of the coast of Cádiz. The only tower still standing in downtown Conil is named after him. From his time up until today, the tuna fishing industry is essential to the livelihood of the people who live on the Atlantic coast at the south of Spain. The overlap between fishing and military infrastructure reveals the deep relation between these coastal communities and the Ocean, both as a threat and as a means for survival. This multiple function of the Ocean and of the infrastructure around it is deeply embedded in the internet's maritime infrastructure, which not only provides connectivity and security, but can also be appropriated as a coral reef by marine species.

These infrastructural ruins have also historically been remodeled and repurposed for different reasons, by both human and non-human actors. The tower of Castilnovo in Conil is currently being reused as a nesting spot by Ibis Eremita, a bird species from the Mediterranean that was thought to be extinct (see fig. 15). This tower has become almost like a naturecultural

⁶⁸ Interview with José Ligero, fisherman and filmmaker from Conil, 5 May 2021.

museum, with informational plaques that tell both the past history of the watchtower as a military and fishing infrastructure, and as a present-day dwelling for a species in recovery. Several people told me that the tower of Guzmán in downtown Conil used to look like the tower of Castilnovo, until it was renovated in 1992 during the beginning of the touristic boom that swept the Spanish Atlantic coast. In the last three decades, Conil has slowly turned into one of the most popular touristic destinations in Spain, and its deep infrastructural history is being slowly renovated as cultural heritage. The fishermen's neighborhood used to be one of the poorest areas in town during the twentieth century, with unpaved dirt roads, and a significant amount of poverty and illiteracy.⁶⁹ However, after its traditional inhabitants organized and began to better their living conditions and demand more help from the local authorities, it has become one of the town's touristic hotspots. Today, it is the site of intense economic speculation that is driving the prices up and forcing many of the local people to retreat to the cheaper outskirts.⁷⁰ I speculate that the future internet ruins will be another touristic site in Conil. As a crucial node in the history of internet communications between Europe and South America, the bunker might become a museum open to the public and play its role in the configuration of future social relations between Conil's inhabitants and infrastructural ruins.

The bunker already feels like a Cold War museum. Upon entering the house that hides the bunker's entrance, the first thing I saw to my right was the framed bronze plaque commemorating the inauguration of the TAT-5/MAT-1 cable, adding to the museum atmosphere. After crossing the two steel doors that guard the bunker's entrance there is a small room to the right with showers in it, which would have been used in case of a nuclear attack to cleanse workers from radiation. Although the showers are still there, they are currently used for storage and filled with what mostly looks like junk. Past the NOC room inside the bunker here is what the engineers call a "museum", a small corner filled with memorabilia from the station's history. There are scrap coaxial cables, fiber optic cables, ballasting shells, another bronze plaque just like the one at the entrance, and many photos. The pictures depict the moments when TAT-5/MAT-1, Atlantis-2, and Columbus-III cables were laid. As the cable station is already partly a museum, I have the impression that it will continue to evolve in such direction. The touristic visits to the station organized by Telefónica, which I discussed in the previous section, reinforce

⁶⁹ Interview with Diego Tirado, president of the association of the Barrio de los Pescadores, 8 May 2021.

⁷⁰ Interview with Isabel Tomé, teacher of languages and history at the Academia Andaluza of Conil, 27 May 2021.



Figure 15. Tower of Castilnovo in Conil, Spain. Photo: Juan Pablo Pacheco Bejarano, 2021.

this speculation. I wonder if, in the future, going to Conil's bunker will be a similar experience than going to the museum of Magellan or Columbus in Seville and Huelva, which have replicas of the ships used to explore, exploit, and colonize the world (see figs. 16 and 17). When I visited these two museums, they barely mentioned the colonial history of the Spanish Empire's transatlantic voyages, and instead highlighted the heroic feat of the discovery of America and the beginning of global connectivity. Will the future museum in Conil tell the story of Atlantis-2 as a heroic feat of transatlantic connectivity achieved by the internet? What histories would a future museum of the internet's material infrastructure not tell?

The lost city of Atlantis was also described as a vast colonial empire with the capacity of extracting multiple metals from the Earth. The city was founded by the god of the Ocean himself, and it was gifted with an advanced set of metallurgic technologies. Plato mentions that Atlanteans had all kinds of metals, "solid or fusible, that could be mined from the ground" (*Critias*, 114e), including orichalcum, a rare metal that was most likely an alloy of gold and bronze. In a similar way to contemporary society, Atlantis depended on the extraction of minerals in order to power their technology, harnessing the energy contained in underground matter. The story of Atlantis points at how the geological ruins of past moments in the history of Earth's



Figure 16. Magellan's museum in Seville, Spain. Photo: Juan Pablo Pacheco Bejarano, 2021.



Figure 17. Columbus' caravels museum in Huelva, Spain. Photo: Juan Pablo Pacheco Bejarano, 2021.

biosphere have become the fuel for anthropogenic technology. The high development and ample wealth of Atlantis engendered a very strict set of social and political customs, which guaranteed that the various kings would never take up arms against each other. However, after the divine portion of Atlanteans began to fade, Plato says that "they became incapable of bearing their prosperity and grew corrupt" (*Critias*, 121b), ushering the destruction of the island by the hands of the Olympian gods. Atlantis, the antithesis of the philosophers' city of Athens, collapsed because of the greed and corruption of its rulers in the face of high technological advancements.

The tragic story of Atlantis inspired Francis Bacon to write New Atlantis in 1627, which emphasized that science and technology should play an important role in the creation of modern utopias. New Atlantis proposed the emergence of a future society where scientific knowledge was organized in order to produce increased wealth and welfare, clearly reflecting the emergence of early modern thinking and the trust it deposited in rationalism and technoscience. Susan Bruce (1999) identifies that these utopian narratives from early modernity were heavily influenced by "the explosion of knowledge about the globe which took place over these years: underlying the construction of the early modern utopia was the sense of discovery and possibility afforded by the Renaissance voyages of exploration" (p. x). Actually, at a point of the narrative Bacon mentions that Atlantis is just another name for America, and points at the ancient might of amerindian civilizations. The convergence of myth and reality during the European colonization of America and most of the Global South, reveals that the story of Atlantis was revived in order to make sense of a new world order marked by a particularly western mode of globalization and to explain the destruction of the powerful indigenous civilizations they encountered. If Atlantis was the antithesis of Athens, America became the antithesis of Europe. Moreover, if Atlantis was a cautionary tale during Plato's time inviting Athenians to revise their relationship to technology and prosperity, during the age of European colonial empires Atlantis became a site for speculative imagination about the possibility of a global utopia. Bearing in mind the collapse of Atlantis narrated by Plato, I am tempted to think that the seed for failure is always contained in utopian narratives about the future. In this sense, the seed for the internet's failure is probably contained in the utopian narratives mobilized by telecommunication companies. Here is where storytelling serves as a tool to poke holes in the monolithic narratives of the internet as a frictionless networking technology.

Following this thread, the contemporary global utopia represented by Atlantis-2 as a fragment of the internet is also already seeded with the possibility for failure. As the world faces increased social and environmental instability, Atlantis-2 becomes a cautionary tale for us. If the last city of Atlantis was doomed to flood because of its misuse of the resources it possessed, will our digital society face the same future because of the destabilization of the biosphere ushered in by our extractive technologies? When the climate crisis brings upon us the inevitable flooding of coastal areas, will the internet's cable stations and datacenter be sunk underneath the sea just like Atlantis once was? The ruins of Atlantis have been used as inspiration for the creation of utopian histories, as much as the technological utopia inaugurated by the internet seems to be slowly turning into a ruin itself. What will happen when the internet's submarine infrastructure turns into a ruin? Atlantis-2, the first internet cable that connected Europe and South America, will be remembered as the lost echelon in the mythology of the lost city of Atlantis. Whether the internet's ruins will become coral reefs or nesting grounds for humans as an endangered species, or a museum for the world's future generations remains to be seen.

I began this chapter by discussing the narrative tensions between Telefónica's official discourse and the popular narratives in Conil that surround the internet's infrastructure. Through an analysis of how the community at Conil inserts submarine cable systems into their own historical awareness and lived experiences, I suggest that storytelling is a powerful relational tool that diversifies monolithic narratives on technology. In particular, speculative fiction enables communities at the internet's material nodes to connect their local knowledge to the development of telecommunication infrastructure, situating the role of submarine cables as participants in the social and material relations at their particular landing sites. Then, in the second section of this chapter, I embraced the invitation for storytelling in order to weave my own fabulations around Atlantis-2 and its landing site in Conil. Drawing from the cable's name, which is inspired by the mythological lost city of Atlantis, I create a speculative narrative on the relationships between the internet, submarine ruins, and museums. So, what is the lesson of the speculative fable I have weaved throughout this chapter? The overlap between submarine cables, ruins, and museums highlights the internet's materiality as a fragile system that is prone to decay and infrastructural repurposing by human and non-human agents.

Conclusions

Having arrived to the end of my speculative non-linear assemblies around Atlantis-2 and its landing site at Conil, I want to return to the problem I set out to explore at the beginning of this thesis: What new relations to the internet are possible when critically examining how its submarine cable infrastructure is embedded in the social, material, and historical relations at its landing sites? This question emerged from my hypothesis that if undersea cable systems are studied from interdisciplinary perspectives, it is possible to reveal the concealed material and social relations at the core of the internet, connecting it to other phenomena across time and space. In order to address the problem and thesis presented at the outset of this thesis, the first chapter established the theoretical and methodological backbone of my research. First, I established that undersea cables are infrastructures inserted into the natural and social surroundings where they are embedded (Parks and Starosielski, 2015) and, as such, they are relational systems that assume different roles depending on the specific place and time in which they are located (Star, 1999). The internet's physical infrastructure is, therefore, situated within particular contexts. In order to critically approach the submarine cable systems in the south of Spain, this thesis is based on an understanding of Atlantis-2 and Conil's cable station as agents in the construction of social and material relations in Conil.

Drawing from this definition of infrastructures, this thesis sought to understand how the Atlantis-2 fiber optic cable system, the first to connect Europe and South America, is inserted in the history of Andalucía, the southernmost region in continental Europe. In order to achieve this, I conducted fieldwork in Conil throughout three months, bringing together archival, ethnographic, and creative methodologies. This thesis weaves together a discourse analysis of documents related to Atlantis-2 and the cable station in Conil and a creative ethnographic mediation of the same infrastructure, based on interviews, observations, auto-ethnographic considerations, and an audiovisual mediation of multiple sites. Considering that archival analysis tends to privilege institutional narratives, creative ethnographic mediation intended to grasp the ways in which people at Conil create meaning around the internet's infrastructure. Throughout the time I spent in Conil, I allowed the objects and people I encountered to lead me towards unexpected realizations through long conversations and active contemplation. These insights constitute the basis of my discussion on the deep spatial and temporal roots of the internet's

infrastructure in the south of Spain, and further enabled me to gain insights into how local stories around submarine cable systems challenge institutional narratives, inserting the internet into a counter-hegemonic relational proximity.

Like archival methodologies, the creative ethnographic mediation I conducted also encountered crucial limitations, mostly because it relies too heavily on personal experience and interpretation. A more traditional approach to studying infrastructures, for example digging deeper into historical archives and technical specificities, could be better equipped to create a more general picture about the internet. However, instead of considering the internet as a monolithic technology that can be accurately described as a singular thing, I believe that digital technology plays a contentious role in the production of reality at each place that it occupies. Therefore, steering away from clear causal explanations, I decided to study the internet's infrastructure from the associations that emerged from my conversations with people in Conil as well as from my own experience during my time there. As I walked throughout Conil I encountered bunkers, towers, antennas, cables, ruins, and stories non-linearly, as they arrived, inhabiting the same space all at once, evidencing the layered complexity I was seeking to address. Because of their emphasis on experience and interpretation, speculative non-linear assemblies enabled me to trace the manifold symmetries and correspondences embedded in submarine cables. Seeking to stay away from traditional linear forms of knowledge production, I constructed a network of associations that bring together the intersubjective, spatial, and temporal layers that emerge from the archival documents, interviews, observations, and my own experience at the Atlantis-2 landing site in Conil.

The first set of assemblies woven throughout the second chapter discuss the connections between the internet and other infrastructures designed to create and secure the geopolitical frontier in the south of Spain. The Atlantis-2 cable and Conil's cable station are embedded in a deep web of historical relations that define the Atlantic coast of Southern Spain as both a place for global connectivity and of frontier-building. As the Spanish crown consolidated the western borders of Europe in 1492, constructing watchtowers along its southern coasts, caravels sailed from the very same region to cross the Atlantic Ocean and consolidate the colonial dominion of America. The maritime path followed by Atlantis-2 mirrors the voyages of Spanish colonial explorers, who in the sixteenth century charted the transoceanic routes that enabled the rise of colonial and modern capitalism. Due to its strategic proximity to the Gibraltar Strait, the coast of

Cádiz was also filled with bunkers throughout the Spanish Civil War and World War II, which concluded in the construction of Conil's submarine cable station during the Cold War as an antinuclear bunker. The non-linear assemblies presented in this chapter reveal that infrastructures do not emerge from a vacuum. Instead, every media infrastructure has a deep genealogy that can be historically traced through looking into the non-linear spatial and temporal relations produced by seemingly different infrastructures operating in the same place. Atlantis-2 and the cable bunker in Conil are part of an architectural genealogy of infrastructures designed to sanction the mobility of bodies, commodities, and information across geopolitical borders. In this sense, the internet can be thought of as a frontier of sorts, a contested technosocial space deeply embedded in the configuration of modernity and coloniality.

The assemblies from the second chapter emphasize that contemporary capitalism cannot be divorced from the worldwide spread of the internet. Christian Fuchs (2008) has also suggested that computing has enabled the emergence of network capitalism, a set of "regimes of accumulation of economic, political, and cultural capital on transnational network organizations that make use of cyberspace and other new technologies for global coordination and communication" (p. 110). However, more than simply using digital technologies as mere coordination tools, the signals that move through undersea cables are a valuable asset in the global market. The Silicon Valley model, which defines the rise of companies such as Google, Amazon, and Facebook, is precisely based on the extraction of user data (Zuboff, 2019). Submarine cables are the backbone of this system of extraction, allowing multinational companies and governments to expand their tentacles at ever-increasing speeds and efficiency. Considering capitalism's increased dependence on the movement of data, I argue that it is crucial to study the how submarine cables are deeply related to other historical configurations at their landing sites. As technosocial infrastructures, submarine cables provide a dynamic space where the colonial past and the modern present become entangled, enabling the production of relations based on capitalist notions of connectivity, extraction, and securitization.

After discussing the historical genealogies of submarine cable infrastructure in the south of Spain, the third chapter of this thesis addressed the contested semiotic relations around Atlantis-2 and Conil's cable station. As one of the largest telecommunication company in the Spanish-speaking world, Telefónica strictly administers the kind of information shared with the public about the infrastructures it operates. These companies' institutional narratives are usually characterized by an emphasis on technical considerations, opposing them to science fiction and popular narratives. However, through the interviews and observations I conducted at Conil, I found that the town's inhabitants have created multiple stories that place submarine cable infrastructure in relation to their lived experience, always informed by an acute awareness of their immediate historical context. Popular stories around the internet's materiality are part of a genealogy of extra-logistical uses of transoceanic infrastructures, which take advantage of the networks created by geopolitical powers in order to produce unsanctioned movement of bodies, things, and ideas. Cables, ships, bunkers, and watchtowers are porous material and semiotic infrastructures, which serve multiple purposes and mean different things depending on who relates to them. Local narratives around the internet's submarine cables challenge the institutional monopoly over the meaning of contemporary networking infrastructures, diversifying and enriching how we relate to the expansion of digital worlds.

Storytelling is a powerful tool that enables local communities and researchers to relate anew to technological infrastructures such as the internet through the connection between seemingly disparate elements across time and space. This thesis agrees with Haraway (2016) when she claims that "it matters what stories we tell to tell other stories with [...] It matters what stories make worlds, what worlds make stories" (p. 12). I believe that in order to expand our understanding of the internet, it is crucial to consider the stories created by the communities who cohabit with its material infrastructure. Submarine cables also connect histories across time and space, serving as conduits for light signals as well as for deep non-linear relations. This thesis creates and interprets a set of connections between the elements gathered throughout my research, allowing me to address the complex construction of reality in which the internet's material infrastructure is immersed in the south of Spain. The assemblies I created resurface the submerged historical, social, and material entanglements at the core of Atlantis-2 and Conil's cable station, revealing that technosocial infrastructures are unstable constructions deeply related to the spatial history of the places they occupy. Considering the possibilities opened up by storytelling as a relational tool, the last section of the third chapter spins a speculative fable around undersea cables and the mythological city of Atlantis. This last speculative non-linear assembly highlights the internet's fragility as a technosocial system rooted in the material world.

Through interpreting the complex entanglements between the internet and the situated material and social histories it is part of, it is possible to find new ways of relating to the

omnipresence of the internet in our lives and its relation with the socioecological crisis we are currently faced with. Sean Cubitt (2017) and Matthew Fuller (2007) have discussed the environmental implications of contemporary networked computing, emphasizing the importance of critically and creatively addressing the material dimensions of digital technologies. Two years after the COVID-19 pandemic started, the internet is expected to increase its growth by 30 percent, which also means that there will be more submarine cables deployed across the world (Rebatta, 2020). Considering that telecommunication companies are moving towards increasing the reach of undersea cable networks, it is vital to further challenge the metaphors of intangibility that serve the internet. I argue that interdisciplinary research and storytelling around submarine cables and their landing sites unveil the historical entanglements between colonial, capitalist, and digital configurations, enabling us to relate anew to the internet as a connecting technology.

Artists concerned with the internet as a technosocial configuration have been using interdisciplinary and speculative methodologies to study submarine cables for a longer time than scholars in the humanities. The shift of methodological paradigms proposed by artistic research contains important clues to move forward in the research on the internet's materiality. Latour (2005) precisely suggests that sociologists could learn a lot from artists, who embrace fiction and experimentation as ways to resignify the connections between objects, humans, and the world. For example, through his projects *Landing Stations* (2016a) and *Undersea Cables* (2016b), Trevor Paglen uses photography and participatory research in order to bring attention to the submarine fiber optic cables off the coast of Miami, which are some of the most geopolitically sensitive infrastructures in the coastal areas of the United States. Paglen's work bridges archival, visual, and anthropological methodologies to highlight the geographical materiality of the internet's submarine cables and their geopolitical implications. In this case, creative ethnographic mediation opens unexpected ways to relate to the internet's materiality.

In her video *Deep Down Tidal*, visual artist Tabita Rezaire explores the colonial genealogy of submarine cables, tracing the deep historical connections between colonial and technological infrastructures that cross the Ocean.⁷¹ Through a visual approach that could be situated in post-internet aesthetics, Rezaire assembles found material and original footage to comment on the relationship between slavery, submarine cables, and the Ocean's waters. Starosielski argues that Rezaire's video "offers a different kind of relational scale: one in which

⁷¹ Deep Down Tidal can be watched at: https://vimeo.com/248887185

the plane of the present is linked, via cables, to the oppressions of the past" (2020, p. 283). The creative and speculative research of artists situate cables as non-linear meditators between different spaces and across deep temporalities, revealing the co-constitutive relations between digital technologies and the material and social relations they are part of. Both Rezaire and Paglen place submarine cables in a historical continuum with other geopolitical networks at the core of contemporary capitalism. While this thesis did not focus on the analysis of artworks, the entanglements between cables, frontiers, bunkers, and ruins that I weave throughout the second and third chapters are profoundly influenced by my own creative practice. I argue that it is crucial to look at emerging artistic methodologies around the internet's materiality in order to create counter-hegemonic narratives on the internet, to surface its historical roots, and to propose new ways to decolonize our relationship to the global movement of digital information.

At the start of my third month in Conil I succumbed to my tourist role and began surfing lessons with Joshua Rodríguez. The patience involved in sensing and reading the ocean, as one waits to foresee the perfect wave before jumping on the surfboard, was very intriguing to me. Steinberg and Peters (2015) claim that, as opposed to rationalists and romantics, "those who actually engage the ocean, like sailors and, perhaps even more profoundly, surfers and swimmers, become one with the waves as the waves become one with them, in a blend of complementarity and opposition" (p. 250). Actually, the few times I was able to seize and surf a wave, it felt more as if the wave was seizing me, emphasizing this profound connection enabled by surfing. Typically, the perfect moment to catch a wave is right before it breaks, which, according to Joshua, happens when the wave's height is equal to its depth under the surface. In a way, surfing is deeply tied to an aquatic energy that seeks balance and proportion. Just like when surfing waves, surfing the internet is an act of deep interdependence with the ocean's energy. Undersea cables are located on the seabed and rely on the ocean's electrical conductivity to amplify the signals travelling through them. Considering the deep relations between the sea, surfing, and the internet, I wonder how can we imagine new ways of surfing the internet's waves that bear in mind the entanglements between digital technology and the socio-material relations that it is part of. Hopefully this thesis, as well as future interdisciplinary research into submarine cables and their landing sites, open up new ways of relating to the internet as a fragile ecosystem to care for.

Bibliography

- Aguiar, A. R. (2020) España y Portugal están ante la oportunidad histórica de ser un nodo imprescindible para conectar cables submarinos de Europa, África y América, según los expertos, Business Insider España. Available at: https://www.businessinsider.es/espanaportugal-hub-global-cables-submarinos-fibra-optica-770951 (Accessed: 15 February 2021).
- Álvarez, V. (2015) *Big Data: secretos bajo el Mar*. Available at: https://www.youtube.com/watch?v=LQU0kht9Ysk (Accessed: 21 May 2021).
- Arjona Castro, A. (1986) 'VALLVE BERMEJO, Joaquín: La división territorial de la España musulmana, Madrid, C.S.I.C., 1986, 351 págs.', *Boletín de la Real Academia de Córdoba, de Ciencias, Bellas Letras y Nobles Artes*. Available at: http://repositorio.racordoba.es/jspui/handle/10853/114.
- Avanessian, A. (2014) 'The Speculative End of the Aesthetics Regime', *Texte Zur Kunst*, (93: Spekulation/Speculation), pp. 52–65.
- Brodsky, P. (2020) Internet Traffic and Capacity in Covid-Adjusted Terms, TeleGeography. Available at: https://blog.TeleGeography.com/internet-traffic-and-capacity-in-covidadjusted-terms (Accessed: 12 May 2021).
- Brodsky, P. (2021) International Bandwidth Soars to New Heights, TeleGeography. Available at: https://blog.TeleGeography.com/2021-international-bandwidth-trends-demand-globalnetworks (Accessed: 12 May 2021).
- Bruce, S. (1999) *Three Early Modern Utopias: Thomas More: Utopia / Francis Bacon: New Atlantis / Henry Neville: The Isle of Pines*. London: Oxford University Press.
- Burns, B. History of the Atlantic Cable & Undersea Communications: from the first submarine cable of 1850 to the worldwide fiber optic network. Available at: https://atlanticcable.com (Accessed: 21 May 2021).
- Cañas, J. A. (2016) *El búnker antinuclear que 'visitas' diariamente, El País*. Available at: https://elpais.com/elpais/2016/06/16/ciencia/1466071888_693692.html?utm_content=buf ferdf70e&utm_medium=social&utm_source=facebook.com&utm_campaign=buffer&fbc lid=IwAR1Zi9Otqgxj8wK1qUwFnaoMhameGtPFExmvIvJdYxvbQ7K_kXM-wBpxucM (Accessed: 21 May 2021).

- Cubitt, S. (2017) *Finite Media: Environmental Implications of Digital Technologies*. Durham: Duke University Press.
- Craig, M. (2012) 'Desperate Mobilities: Logistics, Security and the Extra-Logistical Knowledge of "Appropriation", *Geopolitics*, 12(2), pp. 355–376. doi:10.1080/14650045.2011.562941.
- Devonshire-Ellis, C. (2021) 'China's Submarine Digital Fiber Optic Belt and Road', Silk Road Briefing, 17 March. Available at: https://www.silkroadbriefing.com/news/2021/03/17/chinas-submarine-digital-fiber-opticbelt-and-road/ (Accessed: 21 May 2021).
- Escobar, A. (2010) 'Afterword', in Mignolo, W. D. and Escobar, A. (eds) *Globalization and the Decolonial Option*. New York: Routledge.
- Ferreira da Silva, D. (2016) *Fractal Thinking*. Available at: https://accessions.org/article2/fractal-thinking/ (Accessed: 28 April 2021).
- Fuchs, C. (2008) Internet and Society: Social Theory in the Information Age. London: Routledge.
- Fuller, M. (2007) Media Ecologies: materialist energies in art and technoculture. Cambridge (MA): MIT Press.
- García-Sanjuán, A. (2016) 'Rejecting Al-Andalus, exalting the Reconquista: historical memory in contemporary Spain', *Journal of Medieval Iberian Studies*. doi: http://dx.doi.org/10.1080/17546559.2016.1268263.
- George, R. (2013) Ninety Percent of Everything: Inside Shipping, the Invisible Industry that Puts Clothes on Your Back, Gas in Your Car, Food on Your Plate. New York: Metropolitan Books.
- Haraway, D. J. (1988) 'Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective', *Feminist Studies*, 14(3), pp. 575–599.
- Haraway, D. J. (1997) Modest Witness@Second_Millenium.FemaleMan©_Meets_On coMouseTM: Feminism and Technoscience. New York: Routledge.
- Haraway, D. J. (2003) The Companion Species Manifesto: Dogs, People, and Significant Otherness. Chicago: Prickly Paradigm Press.
- Haraway, D. J. (2016) *Staying With the Trouble: Making Kin in the Chthulucene*. Durham: Duke University Press.

Helmreich, S. (2007) 'An Anthropologist Underwater: Immersive Soundscapes, Submarine Cyborgs, and Transductive Ethnography', *American Ethnologist*, 34(4), pp. 621–641.

- Hyndman, J. (2004) 'Mind the gap: bridging feminist and political geography through geopolitics', *Political Geography*, 23, pp. 307–322. doi:10.1016/j.polgeo.2003.12.014.
- Information Gatekeepers Inc. (2000) 'Embratel Launches International High-Capacity Fiber Optic Network', *Submarine Fiber Optics Communications Systems (SFOCS)*, 8(5).
- Kember, S. and Zylinska, J. (2012) *Life After New Media: Mediation as a Vital Process*. Cambridge (MA): MIT Press.
- Klein, N. (2020) How big tech plans to profit from the pandemic, The Guardian. Available at: http://www.theguardian.com/news/2020/may/13/naomi-klein-how-big-tech-plans-toprofit-from-coronavirus-pandemic (Accessed: 18 February 2021).
- Latour, B. (1993) *We Have Never Been Modern*. Translated by C. Porter. Cambridge (MA): Harvard University Press.
- Latour, B. (2005) *Reassembling the Social: An Introduction to Actor-Network-Theory*. New York: Oxford University Press.
- Melo Carrasco, D. and Vidal Castro, F. (eds) (2012) A 1300 años de la conquista de Al-Andalus (711-2011): Historia, cultura y legado del Islam en la Península Ibérica. Coquimbo: Centro Mohammed VI para el Diálogo de Civilizaciones.
- Méndez, M. (2013) 'Autoethnography as a research method: Advantages, limitations and criticisms', *Colombian Applied Linguistic Journal*, 15(2), pp. 279–287. doi: https://doi.org/10.14483/udistrital.jour.calj.2013.2.a09.
- Mignolo, W. D. (2011) *The Darker Side of Western Modernity: Global Futures, Decolonial Options*. Durham: Duke University Press.
- Mignolo, W. D. and Escobar, A. (2010) 'Delinking: The Rhetoric of Modernity, the Logic of Coloniality and the Grammar of De-Coloniality', in *Globalization and the Decolonial Option*. New York: Routledge.
- Mingas, M. (2021) DE-CIX, EllaLink, Interxion and TeleGeography put connectivity on the map. Available at: https://www.capacitymedia.com/articles/3829045/de-cix-ellalink-interxionand-TeleGeography-put-connectivity-on-the-map (Accessed: 4 August 2021).
- Mustakeem, S. M. (2016) *Slavery at Sea: Terror, Sex, and Sickness in the Middle Passage.* Chicago: University of Illinois Press.

- Paansi, A. (2003) 'Boundaries in a Globalizing World', in *Handbook of Cultural Geography*. New York: Sage Publications, pp. 462–472.
- Pacheco Bejarano, J.P. (2020) *The Blue Dot*. Available at: https://www.juanpablopacheco.com/the-blue-dot/ (Accessed: 20 February 2021).
- Paglen, T. (2016a) *Landing Sites*. Available at: https://paglen.studio/2020/04/09/landing-sites/ (Accessed: 25 February 2021).
- Paglen, T. (2016b) *Undersea Cables*. Available at: https://paglen.studio/2020/05/22/undersea-cables/ (Accessed: 25 February 2021).
- Parikka, J. (2015) A Geology of Media. Minneapolis: University of Minnesota Press.
- Parks, L. (2016) 'Earth observation and signal territories: U.S. broadcast infrastructure, historical network maps, Google Earth, and fieldwork', in Rust, S., Monani, S., and Cubitt, S. (eds) *Ecomedia: Key Issues*. London: Routledge, pp. 142–161.
- Parks, L. and Starosielski, N. (eds) (2015) *Signal Traffic: Critical Studies of Media Infrastructures*. Chicago: University of Illinois Press.
- Peters, J. D. (2015) *The Marvelous Clouds: Toward a Philosophy of Elemental Media*. Chicago: The University of Chicago Press.
- Plato (2008) *Timaeus and Critias*. Edited by A. Gregory. Translated by R. Waterfield. New York: Oxford University Press.
- Quijano, A. (2010) 'Coloniality and Modernity/Rationality', in Mignolo, W. D. and Escobar, A., *Globalization and the Decolonial Option*. New York: Routledge.
- Rebatta, A. (2020) *The Global Internet, Post-Pandemic, TeleGeography*. Available at: https://blog.TeleGeography.com/the-global-internet-post-pandemic (Accessed: 12 May 2021).
- Rezaire, T. (2017) *Deep Down Tidal*. Available at: https://vimeo.com/248887185 (Accessed: 25 February 2021).
- Roach, J. (2020) Microsoft finds underwater datacenters are reliable, practical and use energy sustainably, Microsoft News. Available at: https://news.microsoft.com/innovationstories/project-natick-underwater-datacenter/ (Accessed: 30 July 2021).
- Rubiera Mata, M. J. and de Epalza, M. (2007) 'Al-Andalus: Between Myth and History', *History* and Anthropology, 18(3), pp. 269–273. doi: http://dx.doi.org/10.1080/02757200701393339.

Sandvig, C. (2013) 'The Internet as Infrastructure', in Dutton, W. H. (ed.) *The Oxford Handbook of Internet Studies*. Oxford: Oxford University Press.

Sekula, A. (1995) Fish Story. Rotterdam: Witte de With/Richter Verlag.

- Serrano Cueto, J. M. (2019), 30 años del "Caso Conil", Diario de Cádiz. Available at: https://www.diariodecadiz.es/noticias-provincia-cadiz/anos-Caso-Conil_0_1370263466.html (Accessed: 30 May 2021).
- Shaviro, S. (2014) 'Speculative Realism a primer', *Texte Zur Kunst*, (93: Spekulation/Speculation), pp. 40–51.
- Shukman, D. (2021) 'Deep sea mining may be step closer to reality', BBC News, 1 July. Available at: https://www.bbc.com/news/science-environment-57687129 (Accessed: 5 August 2021).
- Star, S. L. (1999) 'The Ethnography of Infrastructure', *American Behavioral Scientist*, 43(3), pp. 377–391. doi: 10.1177/00027649921955326.
- Star, S. L. and Bowker, G. C. (2006) 'How to Infrastructure', in Lievrouw, L. A. and Livingstone, S. (eds) Handbook of New Media: Social Shaping and Social Consequences of ICTs. London: Sage Publications, pp. 230–245.
- Star, S. L. and Griesemer, J. R. (1989) 'Institutional Ecology, "Translations" and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39', Social Studies of Science, 19(3), pp. 387–420.
- Starosielski, N. (2015) The Undersea Network. Durham: Duke University Press.
- Starosielski, N. (2020) 'Depth Mediators: Undersea Cables, Network Infrastructure, and the Deep Ocean', in Redrobe, K. and Scheible, J. (eds) *Deep Mediations: Thinking Space in Cinema and Digital Cultures*. London: University of Minnesota Press, pp. 262–285.
- Steinberg, P. and Peters, K. (2015) 'Wet Ontologies, Fluid Spaces: Giving Depth to Volume through Oceanic Thinking', *Environment and Planning D: Society and Space*, 33(2), pp. 247–264. doi: https://doi.org/10.1068/d14148p.
- Wallerstein, I. (1980) The Modern World-System: Mercantilism and the Consolidation of the European World-Economy, 1600-1750. New York: Academic Press.
- Winrow, M. (2021) 'Tech giants fight "cloud wars" deep in the Ocean', *BBC News*, 24 May. Available at: https://www.bbc.com/news/business-57070318 (Accessed: 26 May 2021).
- Zielinski, S. (2006) Deep Time of the Media: Toward an Archaeology of Hearing and Seeing by

Technical Means. Translated by G. Custance. Cambridge, MA: MIT Press. Zuboff, S. (2019) Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power. London: Profile Books.