CONTROLLING THE GREAT COMMON: HYDROGRAPHY, THE MARINE ENVIRONMENT, AND THE CULTURE OF NAUTICAL CHARTS IN THE UNITED STATES NAVY, 1838-1903

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Jason W. Smith
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Examining Committee Members:
Gregory J.W. Urwin, Temple University
Beth Bailey, Temple University
Andrew C. Isenberg, Temple University
John B. Hattendorf, United States Naval War College

ABSTRACT

This dissertation uses hydrography as a lens to examine the way the United States Navy has understood, used, and defined the sea during the nineteenth century. It argues, broadly, that naval officers and the charts and texts they produced framed the sea as a commercial space for much of the nineteenth century, proceeding from a scientific ethos that held that the sea could be known, ordered, represented, and that it obeyed certain natural laws and rules. This proved a powerful alternative to existing maritime understandings, in which mariners combined navigational science with folkloric ideas about how the sea worked. Hydrography was an important aspect of the American maritime commercial predominance in the decades before the Civil War. By the end of the century, however, new strategic ideas, technologies, and the imperatives of empire caused naval officers and hydrographers to think about the sea in new ways. After the Spanish-American War of 1898, the Navy pursued hydrography with increased urgency, faced with defending the waters of a vast new oceanic empire. Surveys, charts, and the language of hydrography became central to the Navy's war planning and war gaming, to the strategic debate over where to establish naval bases, and, ultimately, it figured significantly in determining the geography of the American empire. Throughout, however, the sea continued to be a dynamic, powerful force in itself that flouted hydrographers' and naval officers' attempts to represent and control it. Charts and the cartographic process that produced them are full of meaning. By placing hydrography and the sea environment at the center of the narrative, historians can better understand the role of science, knowledge, and cartographic representations in expanding American commercial and naval power over the ocean.

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Expressing gratitude is without a doubt the most satisfying aspect of this work. A mentor once urged me to accept that I would never finish graduate school without the sacrifices of others. Dissertating is often a solitary pursuit, but it is nevertheless impossible without the support, criticism, guidance, friendship, and love of others. That said, any errors of fact or analysis in the following pages are my own. For the last seven years, thank yous have had to suffice, but I hope this work represents the debts I have incurred to many people and the beginning of my professional life paying it forward.

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don't know much about history,
don't know much biology,
don't know much about science book,
don't know much about the French I took,
but I do know that I love you,
and I know that if you love me too,
what a wonderful world this would be

To my family

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

Queequeg was a native of Kokovoko, an island far away to the West and South. It is not down in any map; true places never are.

-Herman Melville, *Moby-Dick*[1]

History is seldom written about the sea. Yet it has been central to the settlement of the United States, its economic prosperity, and its military power. This dissertation attempts to historicize the marine environment, using hydrography to examine the ways the United States Navy and the nation understood and sought to impose meaning on the ocean during the nineteenth century. Hydrography is the study of ocean depths, currents, winds, tides, and meteorology. In the nineteenth-century U.S. Navy, hydrography was a fundamentally practical science, producing nautical charts and sailing directions for naval and merchant vessels. These hydrographic charts and navigational texts, along with the process of surveying and publishing that produced them, are full of significance. Hydrography provides an insightful lens into the way Americans have made sense of the sea—an environment that, during the nineteenth century, was quite dangerous, dynamic, and largely unfathomable.

Drawing on the prevailing culture of nineteenth-century science, naval hydrographers believed that the sea could be understood and thus controlled through knowledge and cartographic representation. They believed hydrography to be a powerful way to understand the sea, to harness its winds and currents, and to pierce the ocean's surface, however superficially, to show the mariner and the naval officer what lay beneath the keels of their ships. Hydrography, more than any other aspect of naval or maritime activity, had the power to construct and recast ideas about the marine environment. These ideas largely followed the broader mission of the American navy

[1] Herman Melville, *Moby-Dick, or The Whale* in *Redburn, White-Jacket, Moby-Dick* (New York: Library of America, 1983), 852.

during the nineteenth century. For much of that period, the Navy's hydrographers sought to chart the sea in order to stake a commercial claim to it, portraying the ocean as an ordered environment, obeying natural or divine laws that American mariners might use to make quicker and safer voyages. By the 1890s, however, the Navy began gradually to look beyond its role as a coast defense and commerce raiding force. The Spanish-American War and the subsequent period of imperial expansion caused the Navy to think about and use the sea in new ways. Naval officers in and outside the Hydrographic Office constructed charts for strategic purposes, reflecting their intent to see the marine environment as a space for the Navy to command in the emerging philosophy of sea power articulated by Captain Alfred Thayer Mahan and others at the turn of the twentieth century. Hydrography, I argue, was central to the Navy's nineteenth-century roles. I believe that it provides a new and insightful way for historians to think about science, the marine environment, and the importance of the sea to the Navy.

Hydrography was not consistently among the Navy's most pressing duties, but it was nevertheless an important function for the service, pierced occasionally by periods of extraordinary productivity and vision. In the two decades preceding the Civil War and at the turn of the twentieth century, hydrography and the nautical chart emerged as potent symbols of the nation's burgeoning maritime and naval prowess. They were culturally powerful ways for mariners and naval officers to envision the marine environment. This dissertation is thus more episodic than chronologically comprehensive in scope. It examines the most significant moments in American naval hydrography from the United States Exploring Expedition in 1838 to the close of the naval base debate in 1903, rather than documenting every hydrographic survey that the Navy undertook. Nevertheless, I have sought to place these particular moments within their larger naval and scientific contexts, uniting these narratives over this sixty-five year period.

In the nineteenth century, American naval science was fraught with dispute and dissension, reflecting uncertainty about the place of science, about changing technologies, an increasingly technical naval profession, and an officer corps that sought command and glory in battle. From informal beginnings studying the Gulf Stream, the American coast, and hazards to navigation, the Navy institutionalized hydrographic science in 1830 when the Board of Navy Commissioners established the Depot of Charts and Instruments. This office went through many changes during the nineteenth century, becoming a part of the Naval Observatory in 1842 and then, in 1866, the Hydrographic Office. Beginning with the United States Exploring Expedition, 1838 to 1842, and Lieutenant Matthew Fontaine Maury's studies of ocean winds and currents at the Naval Observatory soon after, the Navy began to make original contributions to hydrographic science. But officers like Lieutenant Charles Wilkes, Maury, and, later, Commander Royal B. Bradford, were often singular in articulating their hydrographic vision. Against the traditional measures of professional achievement, surveying the sea hardly seemed a glorious charge. Many naval officers during this period had neither the time nor the inclination nor the expertise to conduct extensive hydrographic work. Some officers, like Wilkes and Maury, believed in the importance of naval science, but quarreled with one another over form and method. Moreover, both the federal government and the Navy Department remained uncertain of their roles in patronizing science. For its part, the Hydrographic Office never articulated a sustained hydrographic policy above the individual vision of its most important hydrographers, and often others outside the Depot, Observatory, or Hydrographic Office played a role in increasing hydrographic knowledge or in bringing it to the forefront of naval affairs. This dissertation is therefore not intended to be an institutional history of the Hydrographic Office and its antecedents, but rather a broader study examining the role of hydrography and the nautical chart within the service.

The historiography of naval hydrography is relatively brief, consisting mostly of institutional histories that, however important on their own merits, do not place hydrography within the larger naval, scientific, and cultural contexts that frame this study. Historians Gustavas Weber, Marc Pinsel, and, more recently, Steven Dick have all written histories that deal with the Naval Observatory or the Hydrographic Office.[2] While useful, this scholarship is outdated or otherwise incomplete. Dick, for example, is primarily interested in the history of the Naval Observatory, an astronomic as well as a hydrographic institution. He does not examine hydrography after it split from the Observatory as the Hydrographic Office in 1866. Many of the other works touching on naval hydrography deal specifically with the United States Exploring Expedition and Maury's work at the Observatory. By and large, these studies stand alone, neither integrated into the broader narrative of American naval hydrography nor into the naval, scientific, or cultural questions that inform this study.[3]

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[2] Gustavus A. Weber, *The Hydrographic Office: Its History, Activities and Organization* (Baltimore: Johns Hopkins Press, 1926); Marc I. Pinsel, *150 Years of Service on the Seas: A Pictorial History of the U.S. Oceanographic Office from 1830 to 1980*, 2 vols. (Washington, D.C.: Government Printing Office, 1982); Steven J. Dick, *Sky and Ocean Joined: The U.S. Naval Observatory, 1830-2000* (New York: Cambridge University Press, 2003).

[3] William Stanton, *The Great United States Exploring Expedition, 1838-1842* (Berkeley: University of California Press, 1975) ; Nathaniel Philbrick, *Sea of Glory: America's Voyage of Discovery, The U.S. Exploring Expedition, 1838-1842* (New York: Penguin Books, 2003); Herman J. Viola and Carolyn Margolis, eds., *Magnificent Voyagers: The U.S. Exploring Expedition, 1838-1842* (Washington, D.C.: Smithsonian Institution Press, 1985); Frances Leigh Williams, *Matthew Fontaine Maury: Scientist of*

This dissertation is interested in larger questions of significance, which are similar to those that naval historians commonly ask. The American navy has sought to control the sea since its founding. It has done so, of course, by various means, for different purposes, and with varying degrees of success. Historians have traditionally answered the question, "How has the Navy controlled the sea (or not)?" by examining naval combat, technological innovation, and strategic change. All of these appear in this dissertation, but I argue that naval hydrography and nautical charts and texts offer a different and equally compelling answer.

The question of controlling the sea, of course, has animated historians of science as well, though they have rarely engaged naval historians in this common interest. Scholars like A. Hunter Dupree, John Leighly, Thomas G. Manning, and Susan Schlee credit the Navy among the first institutions to study the sea scientifically. They rightly acknowledge that the relationship between naval and civilian science was often a troubled one, arising from professional rivalries, philosophical disagreements, and differing social and intellectual backgrounds.[4] But it seems that these historians have often let historic rivalries influence their historiographical interpretations, dismissing the practical and

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the Sea (New Brunswick: Rutgers University Press, 1963); Charles Lee Lewis, *Matthew Fontaine Maury: The Pathfinder of the Seas* (Annapolis: Naval Institute Press, 1927); Thomas G. Manning, *U.S. Coast Survey vs. Naval Hydrographic Office: A 19th-Century Rivalry in Science and Politics* (Tuscaloosa: The University of Alabama Press, 1988); Vincent Ponko, *Ships, Seas, and Scientists: U.S. Naval Exploration and Discovery in the Nineteenth Century* (Annapolis: Naval Institute Press, 1974); George M. Brooke, *John Mercer Brooke: Naval Scientist and Educator* (Charlottesville: University Press of Virginia, 1980).

[4] Susan Schlee, *The Edge of an Unfamiliar World: A History of Oceanography* (New York: E.P. Dutton and Company, Inc., 1973); John Leighly, "Introduction," in *The Physical Geography of the Sea and Its Meteorology*, by Matthew Fontaine Maury (Cambridge: Harvard University Press, 1963); Thomas G. Manning, *U.S. Coast Survey vs. Naval Hydrographic Office*; A. Hunter Dupree, *Science in the Federal Government: A History of Policies and Activities to 1940* (Cambridge: Harvard University Press, 1957); an exception is Harold L. Burstyn, "Seafaring and the Emergence of American Science," in *The Atlantic World of Robert G. Albion*, ed. Benjamin W. Labaree (Middletown, CT: Wesleyan University Press, 1975), 76-109.

strategic importance of science to the Navy and the nation. Rather than examining naval science on its own merits, these historians have often lamented it as a lost opportunity to pursue the larger (in their eyes, more important) theoretical questions that increasingly interested scientists and oceanographers in the twentieth century. That said, a new generations of historians of science led by Gary Weir, Helen Rozwadowski, D. Graham Burnett, and Michael Reidy have begun to cross subfields and to examine civilian science with a critical eye, acknowledging that the history of science in the military is an important, insightful lens to examine the ways in which humans studied, experienced, and defined the marine environment.[5] This dissertation borrows from them, while more firmly placing the narrative of the U.S. Navy in dialogue with their work.

In seeking to historicize the sea, I have borrowed from the methods of several other subfields of history, not least, environmental history. Here too, historians have largely overlooked the sea. Indeed, the marine environment, as Jeffrey Bolster has argued in *Environmental History*, has "existed outside of time and beyond the pale of history."[6] The exception that proves the rule is fisheries history, which has been a fruitful area for

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[5] Gary Weir, *An Ocean in Common: American Naval Officers, Scientists, and the Ocean Environment* (College Station: Texas A&M Press, 2001); Helen Rozwadowski, *Fathoming the Ocean: The Discovery and Exploration of the Deep Sea* (Cambridge: Harvard University Press, 2005); Helen M. Rozwadowski and David van Keuren, eds., *The Machine in Neptune's Garden: Historical Perspectives on Technology and the Marine Environment* (Sagamore Beach, MA: Science History Publications, 2004); D. Graham Burnett, *Masters of All They Surveyed: Exploration, Geography, and a British El Dorado* (Chicago: University of Chicago Press, 2000); Burnett, "Hydrographic Discipline Among the Navigators: Charting an 'Empire of Commerce and Science' in the Nineteenth-Century Pacific," in *The Imperial Map: Cartography and the Master of Empire*, ed. James R. Akerman (Chicago: The University of Chicago Press, 2009), 201-13; Burnett, "Matthew Fontaine Maury's 'Sea of Fire:' Hydrography, Biogeography, and Providence in the Tropics," in *Tropical Visions in the Age of Empire*, ed. Felix Driver and Luciana Martins (Chicago: University of Chicago Press, 2005), 113-34; Gary Kroll, *America's Ocean Wilderness: A Cultural History of Twentieth-Century Exploration* (Lawrence: University of Kansas Press, 2008); Michael S. Reidy, *Tides of History: Ocean Science and Her Majesty's Navy* (Chicago: University of Chicago Press, 2008).

[6] W. Jeffrey Bolster, "Opportunities in Marine Environmental History," *Environmental History* 11 (July 2006): 575.

historians to examine the intersection among labor, government regulation and science, and river, lake, and sea environments.[7] But environmental history has not gone far beyond this. Seven-tenths of the world is covered in water, yet environmental historians remain largely interested in the land. Nevertheless, environmental history has much to offer, and I have borrowed from one of its central historiographical debates—that is, wilderness—to examine the cultural importance of hydrography in organizing knowledge of the marine environment. I am particularly influenced by Roderick Nash and his book *Wilderness and the American Mind*, in which he contended that wilderness was not a state of nature, but an idea. In it, he suggested that wilderness might be applied to other environments such as outer space and the ocean. In historicizing the marine environment, I have sought to show that wilderness transcends environments as a powerful way that nineteenth-century Americans made sense of their experience on land and at sea.[8]

Nash's book was part cultural history and American Studies as well, and so I have likewise been influenced by scholars who have examined the past from literary and cultural perspectives. Richard Slotkin, Henry Nash Smith, and Leo Marx have studied the

[7] See, for example, Arthur F. McEvoy, *The Fishermen's Problem: Ecology and Law in the California Fisheries, 1850-1980* (New York: Cambridge University Press, 1986); Joseph E. Taylor, *Making Salmon: An Environmental History of the Northwest Fisheries Crisis* (Seattle: University of Washington Press, 1999; Michael J. Chiarappa and Kristin M. Sylvian, *Fish for All: An Oral History of Multiple Claims and Divided Sentiment on Lake Michigan* (East Lansing: Michigan State University, 2003); See also D. Graham Burnett, *Trying Leviathan: The Nineteenth-Century New York Court Case That Put the Whale on Trial and Challenged the Order of Nature* (Princeton: Princeton University Press, 2007); Robert C. Deal, "Laws of Honour: The Laws and Customs of Anglo-American Whaling, 1770-1880 (Ph.D. dissertation, Temple University, 2010).

[8] Roderick Nash, *Wilderness and the American Mind* (New Haven: Yale University Press, 1967); Philip E. Steinberg, *The Social Construction of the Ocean* (Cambridge: Harvard University Press, 2001); On wilderness, see also, William Cronon, "The Trouble with Wilderness, or Getting Back to the Wrong Nature" *Environmental History* 1 (January 1996): 7-28; Alan Taylor, "'Wasty Ways:' Stories of American Settlement" *Environmental History* 3 (July 1998): 291-310; Lisa M. Brady, "The Wilderness of War: Nature and Strategy in the American Civil War" *Environmental History* 10 (July 2005): 421-47.

American cultural landscape and the idea of frontier, which I have applied to the sea.[9] The work of Greg Dening, Gananath Obeyesekere, and other anthropologists has been valuable in thinking about competing cultural meanings for the sea and the interactions among American mariners and the indigenous people of the Pacific Ocean. Thomas Philbrick and Mary K. Bercaw Edwards' studies in American sea fiction have also enriched my work.[10] As I argue, ideas of wilderness, the frontier, and the cannibal animated naval hydrographers in the early nineteenth century. Environment, science, and culture often converged in nautical charts and texts, and they should not be considered exclusively.

Finally, this work is grounded in the scholarship of cultural geography, which, for many years, has considered the importance of cartography in the expansion of empire. As scholars like Edward Said, Neil Smith, Matthew Edney, D. Graham Burnett and many others have argued, the map was both a navigational instrument and a powerful representation of the world as imperialists saw it, or intended to see it.[11] Cartography was

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[9] Henry Nash Smith, *Virgin Land: The American West as Symbol of Myth* (Cambridge: Harvard University Press, 1978), 61; Richard Slotkin, *Regeneration Through Violence: The Mythology of the American Frontier, 1600-1860* (Middletown, CT: Wesleyan University Press, 1973); Leo Marx, *The Machine in the Garden: Technology and the Pastoral Ideal in America* (New York: Oxford University Press, 1964).

[10] Greg Dening, *Islands and Beaches: Discourse on a Silent Land, Marquesas, 1774-1880* (Honolulu: University Press of Hawaii, 1980); Dening, "Deep Time, Deep Spaces: Civilizing the Sea," in *Sea Changes: Historicizing the Sea*, Klein and Mackenthun, eds. (New York: Routledge, 2004), 13-36; Gananath Obeyesekere, *Cannibal Talk: The Man-Eating Myth and Human Sacrifice in the South Seas* (Berkeley: University of California Press, 2005); Thomas Philbrick, *James Fenimore Cooper and the Development of American Sea Fiction* (Cambridge: Harvard University Press, 1961); Mary K. Bercaw Edwards, *Cannibal Old Me: Spoken Sources in Melville's Early Works* (Kent, OH: Kent State University Press, 2009).

[11] Edward Said, *Culture and Imperialism* (New York: Vintage, 1993); Neil Smith and Anne Godlewska, eds., *Geography and Empire* (Cambridge: Blackwell Publishers, 1994); Matthew H. Edney, *Mapping an Empire: The Geographical Construction of British India, 1765-1843* (Chicago: The University of Chicago Press, 1997); Burnett, *Masters of All They Surveyed*; Katherine G. Morrissey, *Mental Territories: Mapping the Inland Empire* (Ithaca: Cornell University Press, 1997).

an act of control over people and environments. In nineteenth-century America, this included the sea, a space the United States hoped to claim commercially and strategically. But as Edney, Burnett, and others have argued, maps and charts rarely matched their makers' intentions. Just as environmental historians are interested in environmental agency and the resulting unforeseen consequences when humans believe they can change nature, cultural geographers similarly acknowledge the futility of representing environments on the map. Nowhere was this truer than at sea. The ocean is perhaps the most dynamic, violent, disorienting, and vast environment on Earth. "Controlling the great common," a phrase borrowed from Captain Alfred Thayer Mahan, is itself a contradiction in terms.[12] The sea was its own master. Even as the Americans sought to impose meanings on it, it remained a great common of conflicting and competing forces, undermining the Navy's ability to understand and claim it.

The dissertation is thus informed by various subfields of history, all of which have been interested in various forms of the same question. That is, "How have humans attempted to control the sea?" The narrative of hydrography in the U.S. Navy during the nineteenth century forms one answer to that question. In the course of researching and writing about it, the sources have taken me in often widely disparate directions from *Moby-Dick* and cannibals to the war gaming classrooms of the Naval War College and the strategic discussions of the General Board of the Navy. These are no doubt strange bedfellows. But they testify to the nineteenth-century naval officer's diverse and changing range of interest in the marine environment and the natural world throughout this period. They also speak to the tremendous scientific and military transformations that

[12] Captain A.T. Mahan, *The Influence of Sea Power upon History, 1660-1783* (Boston: Little, Brown, and Company, 1896), 138.

occurred in the United States from the 1830s to the 1900s. The dissertation's chapters are as follows:

Chapter One, "The Bound[less] Sea," establishes the cultural and scientific contexts that framed the early nineteenth-century American maritime world. It argues that mariners often imagined the sea as a kind of wilderness, which was a powerful idea in America during this period. Wilderness at sea was both similar to and different from Americans' sense of wilderness on land. For mariners, wilderness conveyed the danger, mystery, and disorientation of a marine environment understood as much through navigational science as long-standing folkloric meanings. At the same time, natural philosophers, hydrographers, and scientifically-minded naval officers were framing the sea as an environment that could be understood and mastered. They invoked a powerful scientific ideal, countering the supposed chaos of wilderness with the progressive idea that the ocean was an ordered environment that obeyed natural laws. The science of marine navigation and the construction of charts quantifying and delineating the ocean environment suggested that mariners might control the sea by studying and understanding it scientifically. In the early nineteenth century, then, scientists' ideas of an ordered ocean met mariners' long-standing folk understandings. As the following two chapters show, this ideological tension was at the heart of naval hydrography's antebellum mission to serve the needs of the nation's expanding maritime commerce.

Chapter Two, "Fixing-In," considers the process of charting wilderness by examining the voyage of the United States Exploring Expedition, 1838 to 1842, which circumnavigated the globe to chart Pacific islands for the American whaling and merchant fleets. The expedition is perhaps best known for determining the Antarctic continent and for the heavy-handedness of its commander, Lieutenant Charles Wilkes. But its primary purpose was hydrographic, proceeding from the flawed assumption that the trigonometric survey, the expedition's method of charting the sea, could stake an American claim to the Pacific Ocean. The expedition's hydrographic interest, broadly defined, extended from the reefs offshore to the indigenous people of the Pacific, encompassing a broader survey that was cultural as well as hydrographic. The chapter focuses, in particular, on the expedition's survey of the Fiji Islands in the Southwest Pacific from May to August 1840. An ill-charted group whose inhabitants were widely-rumored to be cannibals, the Fijis perhaps represented the most notorious wilderness of the American maritime imagination. To bring order to this fearsome environment, Wilkes and his men drew on military force and diplomacy as well as hydrographic science to construct a knowable, navigable commercial world for American mariners.

Chapter Three, "The Common Highway," examines the hydrographic work of Lieutenant Matthew Fontaine Maury, Superintendent of the Naval Observatory from 1842 to 1861, whose charts and other publications represented the most expansive definition of the sea as a commercial highway. Far from an unknowable wilderness, Maury believed that the sea obeyed laws and that God had created it for mariners to use. His charts were visual spectacles, impressive in their scope and accessibility. They were the product of a novel system of maritime research, in which mariners themselves collected the data for Maury to interpret and publish. Flouting the professionalizing impulse of science, Maury assumed the sailor to be an acute observer of the marine environment and an intelligent participant in the scientific process. Both a sailor and a scientist, Maury was nevertheless an iconoclast in both worlds, and he often struggled to speak to both. Nevertheless, he was an important mediator between these two mutually exclusive communities. His work represents one of the few instances during the nineteenth century when mariners and scientists entered into dialogue with one another, if only indirectly. At mid-century the sea remained largely inhospitable to scientific research. Mariners, however, represented ready and interested observers of currents, winds, meteorology, and other environmental phenomena. As his critics denounced him as a scientific popularizer, Maury established a relationship with mariners, enabling them to understand and use the sea in new ways.

Chapter Four, "'Twixt the Devil and Deep Blue Sea," considers the hydrographic difficulties that the Navy faced during the Spanish-American War. The war raised the tactical and strategic importance of hydrography for a navy that was slowly beginning to think outside the traditional strategic parameters of commerce raiding and coast defense to command of the sea. Cuba's important harbors had been relatively well-charted according to the commercial understandings that had animated hydrography in the United States and elsewhere. But when it came to establishing a tight blockade of Cuba and the Philippines, the Navy found its charts inadequate. In nearly every aspect of the naval war, from storming Spanish-held harbors, engaging gunboats, landing troops and supplies, and intercepting blockade runners, to simply steaming in and out of port, the Navy battled the marine environment as much as the Spanish enemy. The war with Spain proved a significant moment as the nation acquired an overseas empire, and the Navy began to grapple with the question of how to adequately defend it. Naval operations during the war forced naval officers to think about the sea through a strategic lens.

Chapter Five, “The Hydrography of Sea Power,” takes up the significance of hydrography in the new empire, arguing that nautical charts informed strategic thinking and largely determined the geography of the empire between 1898 and 1903. As Chief of the Bureau of Equipment, Commander Royal B. Bradford oversaw the Hydrographic Office as well as the coaling of the fleet, and so it is not surprising that he thought about the logistics of American empire in hydrographic terms. As advisor to the Paris Peace Commission, which ended the war with Spain, as Bureau Chief, and as a member of the General Board of the Navy, Bradford brought hydrography to the highest levels of strategic discourse. By summoning environmental arguments about the advantages and disadvantages of certain islands, Bradford and the General Board articulated a vision of American sea power deeply rooted in hydrography. In the summers of the new century, the General Board convened in Newport, Rhode Island, where it could work out the strategic problems of the day with the staff and students of the Naval War College. Since the 1890s, the War College had also been rethinking the chart’s potential as an instrument of war planning and war gaming as the staff encouraged its students to think about the sea as a strategic space to command. Hydrography was thus central to the strategic discourse as the Navy established bases, planned for war, and attempted to command waters from the Caribbean to the Western Pacific.

Chapter Six, “Territorial Waters,” examines the 1900 Congressional debate over the Naval Appropriation Bill of 1901, in which Republican Congressman Joseph G. Cannon and members of the House Appropriations Committee sought to cut funds for the Navy’s “Ocean and Lake Surveys” in favor of the Coast and Geodetic Survey, which had charted the coasts of the territorial United States since 1807. At stake was the extension of American territoriality to the waters of the new empire. Rather than a debate over imperialism, which had divided the Senate a year before, this debate began as a matter of cost-cutting fiscal efficiency and devolved into a protracted discussion over the degree to which the waters of the empire were, in fact, American territory. Over the course of the debate, both sides renewed the historic rivalry between the Navy and the Coast Survey. They cited old claims of scientific authority and institutional inefficiency given new meaning in the context of empire. After prolonged and often confused consideration of the issue, the House voted to continue funding both the Hydrographic Office and the Coast and Geodetic Survey, unable to legislate the political and legal boundaries of territoriality that had traditionally determined the work of each bureau. Asked to define what exactly the waters of the empire meant to the United States and its Navy, Congress balked, deciding ultimately that the sea was an ambiguous space that should be controlled, but not fully incorporated into the territory of the nation. Such a decision was indicative of America's conflicted attitude toward empire.

An epilogue, "Steinbeck, Ricketts, and the Twentieth Century," briefly considers the strategic context of naval hydrography in the twentieth century. It does so both as an extension of the nineteenth-century narrative and as new scientific collaborations, technologies, and strategic needs challenged the Navy to chart the sea in unprecedented depth and breadth.

The twentieth and twenty-first centuries have seen American sea power most fully realized, but the sea still remains a challenging environment to control. As the service faces new challenges and considers the relevance of sea power, it still grapples with the meaning of the sea and with the consequences of human use of the marine environment.

In 2010, for example, the Department of Defense's Quadrennial Defense Review Report identifies Global Warming's effect on the marine environment as an issue of primary strategic concern. The Navy's recently organized Task Force Climate Change, under the command of Rear Admiral David Titley, Oceanographer of the Navy, also speaks to the service's awareness of environmental issues. As sea levels rise, islands and coastal communities shrink, and water itself becomes an increasingly strategic resource, the Navy has sought to raise awareness of environmental change as an increasingly important aspect of its strategic thinking.

Indeed, the Navy continues to redefine its relationship to the sea, particularly in the cultural constructions that frame its public image. A recent recruiting commercial, portraying the Navy as a "global force for good" and showing American seamen delivering aid to tsunami-ravaged Southeast Asia, suggests that the service wants Americans and potential recruits to think about the sea as a humanitarian space over which it delivers aid in the battle to win hearts and minds. Whether this is indicative of a shift in American naval strategy in the twenty-first century is another question. These public relations efforts, however, are powerful nevertheless and perhaps indicate new strategic and cultural meanings for the sea. But even as the Navy moves in new directions, old ideas remain. Human experience with the sea continues to raise the old specter of wilderness. Tsunamis, hurricanes, oil spills, and other natural disasters to which the Navy has responded continue to humble humans' ability to use the ocean. The sea remains a dynamic, challenging, and hostile environment often difficult, if not impossible, to control. And so, Americans continue to associate wilderness with the sea long after the Navy began to survey it, track its winds and currents, chart its coasts, and explore its depths.

CHAPTER 2: THE BOUND[LESS] SEA

We do not associate the idea of antiquity with the ocean, nor wonder how it looked a thousand years ago, as we do of the land, for it was equally wild and unfathomable always. The ocean is a wilderness reaching round the globe, wilder than a Bengal jungle, and fuller of monsters.

-Henry David Thoreau, *Cape Cod*[1]

A cultural history of hydrography in the United States Navy must begin with the sea, and with American mariners, whose encounter with the marine environment during the early nineteenth century informed the work of hydrographers and the charts they produced. To mariners of this era, the sea was a wilderness. It was an idea that conveyed the mystery, danger, and disorientation of a marine environment that mariners navigated as much through science as through long-standing folkloric understandings about the meaning of the sea and how it worked. Knowledge of ocean winds, currents, depths, tides, meteorology, and biology was fragmentary, incorporated by mariners into their broader worldview on their own terms.

Hydrographers worked against this prevailing maritime definition of the sea as wilderness. In the late eighteenth and early nineteenth centuries, American mariners sailed at a crossroads of understanding about the natural world as scientific knowledge gradually filled in the chart's blank spaces with meaning and gave mariners better tools to fix their place on the sea. But the folk understandings so central to maritime culture were difficult to dispel, even with more accurate charts and more sophisticated navigational tools. Wilderness informed hydrographers' ideas about the importance of their work and about the nautical chart's cultural power to order and frame the sea as a commercial space for an American maritime world reaching its pinnacle in wealth and power.

[1] Henry David Thoreau, *Cape Cod* (New York: Penguin Books, 1987), 219-20.

Before the settlers of Jamestown and Plymouth were colonists, they were seafarers, and therefore it is not surprising that the American encounter with wilderness began on the water. The early voyages to North America were rarely pleasant. In 1609, William Strachey embarked on the *Sea Venture* bound with eight other ships and six hundred colonists for Jamestown. En route, the fleet met with a hurricane, throwing the *Sea Venture* off course. Strachey was shipwrecked on Bermuda. "Greater violence," he remembered, "we could not apprehend in our imaginations. Winds and seas were as mad as fury could make them. . . . all that I had ever suffered gathered together, might not hold comparison with this."[2] Eleven years later aboard the *Mayflower*, William Bradford wrote about a similar experience "over the vast and furious ocean" with all its "perils and miseries."[3] These early trans-Atlantic voyages were full of hardship, particularly for men and women unaccustomed to the sea, but they also hinted at a human encounter with the marine environment that was so bewildering, it challenged these otherwise eloquent men to express it in words and to comprehend it in their minds.

Bradford's experience at sea made the land seem tame by comparison. To the sea-sick colonists of Plymouth Plantation, the land was a haven from the miseries of the voyage. Though holding its own particular mysteries and dangers, the land bore little resemblance to the wildness of the sea. On sighting Cape Cod, the future governor of Plymouth Plantation was "not a little joyful." Though he had never been there before, it was a place that he at least knew. Cartographers had named it; they had roughly outlined

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[2] William Strachey, Esq., "A True Reportory of the Wracke, and Redemption of Sir Thomas Gates, Knight, . . . in *Hakluytus Posthumus, or Purchas his Pilgrimes*, . . . by Samuel Purchas, vol. 4. London: William Stansby, 1625, 1735, http://memory.loc.gov/cgi-bin/query/r?intldl/rbdkbib: @field%28NUMBER+@od1%28rbdk+ d0404%29%29/ (accessed January 23, 2010).

[3] William Bradford, *Of Plymouth Plantation, 1620-1647: The Complete Text*, ed. Samuel Eliot Morison (New York: Alfred A. Knopf, 1952), 59-61.

its features. As solid ground, it seemed at least vaguely familiar. Relieved, Bradford wrote, it was “that land which is called Cape Cod . . . and certainly known to be it.” Once landed, the colonists thanked God. Divine blessing, they believed, had brought them “again to set their feet on the firm and stable earth, their proper element.”[4] Historians of wilderness have examined the colonists’ cultural and environmental encounter with the North American land, but it was, in fact, the sea that often evoked the most dread among women and men who crossed it more by luck, endurance, and prayer than by any scientific understanding of its environmental processes.

These new Euro-Americans and their descendants were bound to the sea, and, as we will see, their impressions of it changed remarkably little over the next three centuries. By the end of the colonial period, of course, seafaring was extraordinarily different, not least, because the sea had become so integrated into the political, economic, and cultural fabric of the new republic. The British mercantile system, of which the colonies had been a vital part, made the new United States a maritime nation.[5] Lucrative seaborne trade brought the country into an extensive system of coastal and transatlantic connections—political, economic, and cultural. Before the Revolution, regular voyages between the British Isles, the American colonies, and the West Indies brought growth and wealth to America’s largest cities, which were nearly all seaports. In 1772, the last colonial year of record, the nation’s five busiest ports saw three thousand incoming vessels and a like number bound away. About half were coming from or destined to some

[4] Ibid.

[5] Benjamin W. Labaree, et al., *America and the Sea: A Maritime History* (Mystic, CT: Mystic Seaport, 1998), 53.

other American port. Another 20 percent set sail for the West Indies.[6] The fishery in cod and mackerel was also central to New England's maritime economy. Between 1815 and 1860, the fishing fleet grew from thirty-seven thousand to one hundred sixty-three thousand tons and ventured farther from shore to exploit the rich grounds off Cape Cod and Newfoundland.[7] Whaling also grew as demand for whale oil and baleen increased. At the height of American whaling in the late 1840s, more than seven hundred of the nine hundred vessels employed in the whale fishery were American.[8] By the early nineteenth century, more Americans were working and living on the sea, but their image of the marine environment nonetheless remained largely unchanged.

The American sea literature of the early and mid-nineteenth centuries reflected the nation's close ties to the sea, but also the precariousness of human life amid so many dangers and mysteries. As the literary scholar Thomas Philbrick argues, this work was a distinct American form, created by James Fenimore Cooper, Edgar Alan Poe, and, later, Herman Melville, among others. They drew in various ways on wilderness to speak to issues of nationalism, the gothic, and, in Melville, the convergence of science and the maritime world. These writers, Philbrick contends, tapped into a powerful vein in literature and in popular dime novels as well in which the sea was closely associated with the identity of the young republic.[9] Befitting a nation oriented as much to the sea as the

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[6] Ibid., 105.

[7] Ibid., 259.

[8] Margaret S. Creighton, *Rites and Passages: The Experience of American Whaling, 1830-1870* (New York: Cambridge University Press, 1995), 36.

[9] Thomas Philbrick, "Romanticism and the Literature of the Sea" in *Maritime History – Volume 2: The Eighteenth Century and the Classic Age of Sail*, ed. John B. Hattendorf (Malabar, FL: Krieger Publishing Company, 1997), 280-81; Philbrick, *James Fenimore Cooper and the Development of American Sea Fiction* (Cambridge: Harvard University Press, 1961), 101, 192.

expanding frontier of the West, these writers reflected and influenced a maritime nation that understood the sea as a hostile environment that nevertheless was central to the new nation.

James Fenimore Cooper was the most influential of these writers, a man who, according to his own experience on land and sea, wrote prolifically about the American frontier in both environments. As Richard Slotkin and others have shown, Cooper was the creator of the frontiersman archetype.[10] In Natty Bumppo, he had created the archetypical trailblazing figure of American literature, one at home in the wilderness and uncomfortable with the civilizing process of the expanding American nation. But Cooper, who had spent time at sea as a merchant mariner and in the American navy, wrote sea literature as well. In *The Pilot*, published in 1824, he introduced the coxswain Long Tom Coffin, a salty counterpart to Bumppo that he used to draw out many of the same frontier themes as his Leather-stocking Tales.

Cooper portrayed Coffin as the quintessential mariner, a creature of the wilderness who, in his resolve to fight enemies human and environmental, symbolized the political and cultural independence of the young republic. Philbrick argues that, for Cooper, the sea was a "proving-ground of human nature" precisely because it existed "outside of civilization."[11] Cooper wrote that Long Tom's "whole frame was destitute of the rounded outlines of a well-formed man." His expertise was seamanship, not gentility. In his element, he was larger than life. He had "enormous hands," Cooper described,

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[10] Richard Slotkin, *Regeneration Through Violence: The Mythology of the American Frontier, 1600-1860* (Middletown, CT: Wesleyan University Press, 1973), 496; Henry Nash Smith, *Virgin Land: The American West as Symbol of Myth* (Cambridge: Harvard University Press, 1978), 61.

[11] Thomas Philbrick, *James Fenimore Cooper*, 71.

which exhibited his “gigantic strength.” A wool hat, the sailor’s trademark, “threw an expression of peculiar solemnity and hardness over his harsh visage.” He clutched a harpoon in hand, Cooper wrote, “with a sort of instinct.”[12] In one well-known scene from *The Pilot*, which Cooper set in the American Revolution, Coffin impales his enemy, a British naval officer, to the ship’s mast with his harpoon.[13] In the book’s climactic scene, in which Coffin is confronted with his own fate as his ship is wrecked on a rocky lee shore, the coxswain remains stalwart to the end. As the *Ariel* went “plunging madly into the waves,” he died “with folded arms and an air of cool resignation,” Cooper wrote. In the unfolding drama, the crew had beseeched Coffin to join them in escape. “The cry for the coxswain was earnest and repeated,” wrote Cooper, but he shook them off, fixing his eyes “steadily . . . on the chaos of waters into which they were diving.”[14] In Coffin, Cooper had created a character every bit the counterpart to Leatherstocking, a symbol of the wilderness who did battle against the British and the sea to uphold the honor of the new United States.

Indeed, Cooper made explicit connections between land and sea frontiers. He found the monotonous topography of the prairie particularly reminiscent of the sea. In *The Prairie*, published in 1827, Cooper wrote that the land “was not unlike the ocean. . . . There was the same waving and regular surface, the same absence of foreign objects, and the same boundless extent to the view.” Frontier communities were like islands—bastions of civilization in the wilderness. Here and there, trees resembled so many ship

[12] James Fenimore Cooper, *The Pilot: A Tale of the Sea* (New York: J. G. Gregory, 1862), 21.

[13] Ibid., 262

[14] Ibid., 366, 370.

masts piercing the otherwise unbroken horizon.[15] The sea, of course, was humbling and bewildering in its vastness alone, a feeling also experienced by many Americans when confronted with the seeming infinity of the nation's prairies and plains. For Cooper, like Henry David Thoreau after him, wilderness transcended environments. Whether land wilderness informed this meaning at sea, or vice versa, it is evident that it was a powerful way for Americans to make sense of many different environments. It was an idea that itinerant mariners, many of whom were quite literate, perhaps took along as they voyaged west from the sea or as they returned to the water once again.

Wilderness was a matter of orientation, and here we can begin to see how hydrography and the nautical chart became powerful tools for navigating the sea and the maritime imagination. In *Wilderness and the American Mind*, Roderick Nash argued that wilderness was not a place, but an idea that mediated Americans' relationship with the land. It was as much an invention of the American mind as the frontier. Nash defined it as "the unknown, the disordered, the uncontrolled." It was any place where one felt "stripped of guidance, lost, and perplexed."[16] Nash's definition might easily have been maritime. The sea is perhaps the most disorienting environment on Earth, a space bewildering in its vastness and dynamism. In an era of poor charts and limited understandings of how ocean winds, currents, and weather worked, mariners often struggled to accurately envision their place at sea. Many theories existed, not least the mariner's own set of folk understandings, but it seemed as if the sea rarely followed

[15] Cooper, *The Prairie: A Tale* (New York: W.A. Townsend and Company, 1859), 14-15.

[16] Roderick Nash, *Wilderness and the American Mind* (New Haven: Yale University Press, 1967), xi-xiv, 5; see, in addition to Nash, William Cronon, "The Trouble with Wilderness, or Getting Back to the Wrong Nature" *Environmental History* 1 (January 1996): 7-28; Lisa M. Brady, "The Wilderness of War: Nature and Strategy in the American Civil War" *Environmental History* 10 (July 2005): 421-47.

discernible and universal rules. Rather, storms arose unexpectedly, obscuring the horizon and tossing the ship so that mariners could not tell sea from sky. Up and down were relative. Even in calms, the monotonous uniformity of the sea could be disorienting to the mariner's sense of time and space. Nash himself acknowledged these connections, but he did not pursue them.

To mariners, the sea was often a terrifying environment. Though Americans were going to sea in larger numbers and with greater frequency in the nineteenth century, their references to it were often not far removed from Strachey and Bradford. In 1842, J. Ross Browne shipped on the whaler *Styx* as a green hand—a sailor with no previous experience at sea. One night in the Gulf Stream, he awoke in a fright. The sea crashed. The mates barked orders to take in sail. "Nothing," Browne thought, "can be more bewildering to a youth, whose imagination naturally magnifies all the dangers of the deep, than to be roused up in the dead of night, when the ocean is lashed into a fury by a stiff gale." There was commotion all around. "Thick darkness enshrouds all—darkness so dense, that, but for momentary flashes of lightning, one might fancy chaos had come again. Such was the novel and startling scene that burst upon us with all its wildness on the night of the 19th."[17] Browne's imagery was reminiscent of Cooper's best:

> The sea broke over our bows and swept the decks with a tremendous roar. Momentary flashes of lightning added to the sublimity of the scene. When I looked over the bulwarks, it seemed to me that the horizon was flying up in the clouds and whirling round the vessel by turns, and the clouds, as if astonished at such wild pranks, appeared to be shaking their dark heads backward and forward over the horizon.[18]

[17] J. Ross Browne, *Etchings of a Whaling Cruise*, ed. John Seelye (Cambridge: Harvard University Press, 1968), 24.

[18] Ibid., 25-26.

The sea seemed alive with commotion. But Browne was no Long Tom Coffin. The sea filled him with dread, not exhilaration. Nothing could be seen in the blinding darkness, only the sounds of howling wind and crashing waves and the feeling of the wooden deck pitching beneath his feet. All was chaotic and disorienting to the senses. Cooper's tars would take action under these circumstances. Browne felt only fear and helplessness.

Mariners like Browne often expressed the wildness of the sea by personifying it. Human characteristics, though, did not suffice. Wilderness seemed to require something animal or superhuman. Mariner and writer Herman Melville likened a stormy sea to "a mad battle steed that has lost its rider"—the waves "panting and snorting . . . masterless."[19] Edgar Allan Poe's sea, of course, was more sinister. In the short story *MS. Found in a Bottle*, published in 1833, Poe described a voyage into an otherworldly ocean. "The colossal waters," his narrator observed, "rear their heads above us like demons of the deep."[20] Aboard the *Charles W. Morgan*, on a four-year whaling voyage to the Pacific, Nelson Cole Haley thought waves crashing into rock cliffs made "gigantic groans in despair" as they exploded ashore.[21] In the Pacific, he wrote, the waves breaking over coral reefs let out a "loud and angry roar." He remarked that it was as if the sea were speaking to him, sneering, "we failed to tear you asunder this time, but look out, when we

[19] Herman Melville, *Moby-Dick, or The Whale* in *Redburn, White-Jacket, Moby-Dick* (New York: Library of America, 1983), 1087.

[20] Edgar Allan Poe, MS. Found in a Bottle in *American Sea Writing: A Literary Anthology*, ed. Peter Neill (New York: Library of America, 2000), 137.

[21] Diary of Nelson Cole Haley, *Charles W. Morgan*, Log 145, Collections Research Center, Mystic Seaport Museum, Mystic, CT, 311.

roll in on you next time."[22] For many mariners, the sea was a living, beating, convulsing force; it had an intelligent design of its own that knew no human master.

Death at sea was often violent and sudden. It occurred not just in storms, where danger was most raw, but in the everyday workings of the ship. Falling from the topsail yard, or overboard from the rigging could happen in a calm or gale. "In the midst of life, we are in Death," wrote Susan Fisher who accompanied her husband Nehemiah on a whaling voyage to the North Pacific in 1851.[23] Passed Midshipman William Reynolds echoed Fisher's words during the United States Exploring Expedition in 1838. Looking to the dangers of exploration in icy seas, Reynolds confided that thoughts of death "come without bidding. Death has been near me often; I have been accustomed to look him in his skeleton face. . . . until I have become bewildered."[24] Indeed, mortal danger was central to the sailor's sense of identity. Owen Chase, first mate of the ill-fated whaleship *Essex*, thought that it was the near-death encounter with nature "that makes the sailor." As Chase put it, it was his "distinguishing qualification." Whalemen like Chase could claim the most treacherous work, battling immense creatures in small boats on the open sea. The whaler, he wrote, "is accordingly valued on this account, without much reference to other qualities."[25] Mariners incorporated their experience in the wilderness into their constructed identity. Perhaps not as rough-hewn as Natty Bumppo, they were

[22] Ibid., 142.

[23] Susan Fisher to cousins, June 12, 1854, published in *Whaleman's Shipping List and Merchants' Transcript*, "Journal of a Whaling Cruise," 27 March 1855.

[24] William Reynolds, *The Private Journal of William Reynolds, United States Exploring Expedition, 1838-1842*, ed. Nathaniel Philbrick and Thomas Philbrick (New York: Penguin Books, 2004), 73.

[25] Owen Chase, *Narrative of the Most Extraordinary and Distressing Shipwreck of the Whaleship Essex: With a Supplementary Account of Survivors and Herman Melville's Memoranda on Owen Chase* (New York: The Lyons Press, 1999), 16.

nevertheless acquainted with its power to take life. At the outset of his voyage aboard the *Charles W. Morgan* in 1849, Nelson Cole Haley mulled over the dangers he expected to face—"stormy gales, hurricanes, lee shores, and whales jaws, and flukes. For what?" he grumbled, "not for money!"[26]

By the 1840s, American sea literature more closely reflected this hardscrabble life. Stormy seas still inspired awe and dread, but they were only one part of the seafaring experience. Gone was the grandiose romance of Cooper's early sea fiction, replaced by an acknowledgement of the sea's power to take life and oppress the common sailor. The new writing aspired to realism; it sought to capture life at sea with greater authenticity.[27] Richard Henry Dana epitomized this sea change. In 1842, Dana published *Two Years before the Mast*, his account of shipboard life as a foremast hand packing hides along the coast of Alta California. En route, he witnessed the death of a shipmate, offering a solemn, eloquent, oft-cited eulogy that reflected a marked departure from the glorious fate of characters like Long Tom Coffin:

> A man dies on shore, you follow his body to the grave, and a stone marks the spot. . . . A man is shot down by your side in battle, and the mangled body remains an object, and a real evidence; but at sea, the man is near you—at your side—you hear his voice, and in an instant he is gone, and nothing but a vacancy to show his loss.[28]

Dana was struck by the suddenness of death and the precariousness of life at sea. It was a place, he was sure, "where, in the universal and endless struggle between life and death,

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[26] Haley diary, 330.

[27] Philbrick, *Cooper*, 117.

[28] Richard Henry Dana, *Two Years Before the Mast in Two Years Before the Mast, and Other Voyages* (New York: Library of America, 2005) 35-36.

preservation and destruction, the destroyers have the advantage."[29] Herman Melville, who was Dana's contemporary, wrote in similar terms. "However baby man may brag of his science and skill," Melville wrote in *Moby-Dick*, "yet for ever and for ever, to the crack of doom, the sea will insult and murder him, and pulverize the stateliest, stiffest frigate he can make."[30] There was something timeless and uncontrollable about this danger. The land might be tamed, but the sea could not. Death was an ever-present specter.

Dana, Melville, and many other mariners acknowledged an environmental agency that flouted humans' ability to control it. They knew well that the sea was simply too dynamic, fickle, and obscure an environment for humans to control. Mariners, of course, exercised enough agency to navigate an environment that was fundamentally hostile to human life. Their limited understanding of winds and currents allowed them to harness the sea for their own purposes. But this, they knew, was always subject to nature. Melville ascribed to the axiom that the sea was governed by "no mercy, no power but its own."[31] Other mariners concurred. In 1856, seven months into a three-year whaling voyage aboard the bark *Clara Bell*, Robert Weir bemoaned his circumstances. For him, "the die was cast. Oh!" he confided in his journal, "for two weary years or more must I be knocked about at the mercy of wind and wave."[32] Humphrey Hill, a passenger aboard the bark *Magdala*, was more impatient, but similarly resigned. In the winter of 1849, he

[29] Richard Henry Dana, *To Cuba and Back in Two Years Before the Mast, and Other Voyages* (New York: Library of America, 2005), 407.

[30] Melville, *Moby-Dick*, 1086.

[31] Ibid., 1087.

[32] Diary of Robert Weir, *Clara Bell*, March 27, 1856, Log 164, G. W. Blunt-White Library, Mystic Seaport.

was bound to the gold fields of California. But the *Magdala* had struggled against the westerly winds around Cape Horn. With San Francisco within a day's sail, the ship lay becalmed. "The wind died away about 12 o'clock," Hill wrote, "and left her rolling at the mercy of the rolling waves: and was till morning."[33] As Hill discovered, nature could be maddeningly uncooperative, if not downright hostile.

Nowhere did human agency seem more tenuous than the harrowing passage around Cape Horn. There, at the southernmost point of South America, winds, waves, and bitter cold mixed in a furious amalgam. The narrow passage between the South American and Antarctic landmasses funneled wind and water unobstructed across a relatively shallow seafloor. Natural danger was amplified. Winds ceased to be allies. Waves seemed mountainous. For good reason, mariners named these latitudes the Roaring Forties and the Furious Fifties. In January 1859, the whaler *Atkins Adams* was rounding the Horn when William Abbe wrote, "it now blew a perfect hurricane, with a tremendous and still increasing sea." As a green hand, Abbe thought that it was "surpassing anything I had imagined or read of." From the forecastle, he was driven aft as the bow plunged into the troughs between waves. The sea, Abbe recorded, "flung a deluge of water into and over the ship so that we who were aft could not see the forward part of the ship or rigging."[34] To Abbe, it was disconcerting to witness nature swallow his ship. For Humphrey Hill aboard the *Magdala*, it was the seascape itself that was so fearsome. The gale had broken, restoring his vision momentarily. "That place of terrors,

[33] Diary of Humphrey Hill, *Magdala*, December 6, 1849, Log 908, G. W. Blunt-White Library, Mystic Seaport.

[34] Diary of William Abbe, *Atkins Adams*, January 11, 1859, Log 485, New Bedford Whaling Museum Research Library and Archives, New Bedford, MA.

Cape Horn," he wrote, "was in full view." To him, it "presented an awful and grand appearance—the waves running mountains high."[35] Off Cape Horn, Hill, Abbe, and others felt that life was most precarious. It was a spectacle, dreaded as much by green hands as by those who had rounded and survived it many times.

Cape Horn figured prominently in maritime culture as the climactic, and perhaps the climatic, moment of the outbound and homebound passages. Outbound, it was the ultimate test of the ship and its crew, which needed to be whipped, sometimes literally, into shape or face death at the hands of the Horn's winds and waves. Homebound, it was often the last great trial standing between the crew and their reunion with the safety and security of home. Not surprisingly, mariners referenced Cape Horn in many sea chanteys—songs that set the rhythm of work aboard ship. The capstan chantey "Randy Dandy-O," for example, commonly included these verses:

Chanteyman:	We're bound away around Cape Horn
Chorus:	Way, hey, roll and go
Chanteyman:	Where you'll wish to the Lord you'd never been born
Chorus:	To me rollickin' randy dandy o
Chanteyman:	Around Cape Horn we all must go
Chorus:	Way, hey, roll and go
Chanteyman:	Way off 'round Cape Stiff through the cold rain and snow
Chorus:	To me rollickin' randy dandy o

Around the capstan, as they weighed the anchor, green hands learned of Cape Horn's terrors before they ever witnessed it themselves. Places like Cape Horn, then, were invested with folkloric meanings that often spoke to the dynamism and danger with which mariners could cope, but which they could hardly understand in a scientific way.

Like so many mariners, Humphrey Hill's journey around the Horn in the *Magdala* was the nadir of his voyage. The prevailing westerly winds made sailing in that direction

[35] Hill diary, August 19, 1849.

difficult. Cape Stiff, it seemed, would not let go easily. Exasperated, the Forty-Niner wrote that it had been twenty-one long days since the *Magdala* had first reached the latitude of Cape Horn. In his journal, Hill had carroted the word "long," as if, in reviewing his account, a matter-of-fact number could not express the trial that he had endured. The *Magdala* had been mired in "days of almost successive head winds . . . gales, squalls of rain, hail, snow, cold weather, fields of ice." This, Hill remarked, was accompanied by "the horrible thought of being shipwrecked on the coast of those terrible regions."[36] Cape Horn, the legendary graveyard of ships and sailors, was the wildest wilderness. Sailors were often helpless—sometimes literally visionless—in the face of nature. To them, it was an amplified microcosm of everything that was wild about the sea.

Wilderness at sea was linked with the sublime, a term nineteenth-century Americans used to express scenes in nature—sometimes violent, sometimes surreally beautiful—that they could not easily express in words.[37] To the mariner, there was a strange juxtaposition between fear and inspiration. "Awful," a word many used to describe both storms and sunsets had at least two meanings. A sailor's life, wrote Richard Henry Dana, "is at best but a mixture of a little good with much evil, and a little pleasure with much pain. The beautiful is linked with the revolting, the sublime with the commonplace, and the solemn with the ludicrous."[38] Cruising southwest of the Cape of Good Hope aboard the whaleship *Morrison* in 1844, Reverend Thomas Douglass stood

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[36] Hill diary, September 5, 1849.

[37] On the sublime at sea, see Barbara Glenn, "Melville and the Sublime in Moby-Dick," *American Literature* 48 (May 1976): 165.

[38] Dana, *Two Years Before the Mast*, 37.

admiring the seascape with the ship's master, Samuel Green. Darkness was gathering on the horizon. These were cumulonimbus clouds, with their fat, black bottoms and billows of white cascading skyward. The scene, Douglass observed, filled Captain Green with both awe and fear. "No painter on earth," Green exclaimed, "can paint like that." Douglass agreed. As much as he wished to seek refuge from the storm, he also felt the peculiar impulse to be "lashed to the mast . . . to behold and admire the awful sublimities of a terrific storm at sea."[39]

Mariners found sublimity in calm seas as well. Passed Midshipman Reynolds of the United States Exploring Expedition wrote home inspired by the Antarctic sea. In 1840, he related the seascape to his mother. "Tell me no more of Earth!" he exclaimed, "I have seen its fairest portions, but never have I looked upon so much vast, sublime and wondrous beauty as this rising and setting of the Sun presented in the midst of the Icy Sea."[40] Aboard the *Atkins Adams* in warmer climes, William Abbe was certain that "no pen could describe" the incredible scenes of beauty that he had witnessed during his cruise."[41] At the masthead, high above the ship, Abbe had an incomparable view of the seascape. There alone, he wrote, "can you see and appreciate all the authentic majesties of the ocean"—the "blue curling sea" and the wind's "fresh untainted . . . pure breath, a continual wonder, to me a fountain of fancy."[42] Melville wrote in similar terms about the

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[39] Reverend Thomas Douglass, *Morrison*, November 30, 1844, Log 343, G. W. Blunt-White Library, Mystic Seaport; Douglass Diary, November 25, 1844.

[40] Anne Hoffman Cleaver and E. Jeffrey Stann, eds. *Voyage to the Southern Ocean: The Letters of Lieutenant William Reynolds from the U.S. Exploring Expedition, 1838-1842* (Annapolis: Naval Institute Press, 1988), 127.

[41] Abbe diary, December 22, 1858.

[42] Ibid., July 27, 1859.

view from the masthead. At that “thought-engendering altitude,” he mused in *Moby-Dick*, “a sublime uneventfulness invests you.”[43] Mariners could hardly convey these scenes on paper, so wild, terrifying, or beautiful they were to behold. Perhaps storms, waves, and currents could be explained in dispassionate scientific terms, according to one of the often various and competing theories of the day. But to mariners they were affecting, and, quite often, they were central to the notion of wilderness at sea.

If the wonders and dangers of the sea could not be easily explained, mariners often turned to religion as a bulwark against wilderness. Seamen, of course, were not known for their religious faith.[44] Such a difficult, solitary, itinerant life was often relieved at the inns and brothels of so many port communities. Aboard ship, not all captains uniformly observed the Sabbath; the nature of the whale fishery, in particular, deemed any day of the week fit for work. There was also truth to the familiar caricature of the blasphemous sailor. Aboard the whaleship *Morrison*, Reverend Douglass observed that “[God’s] name is indeed often upon the lips of many on board, but only in the way of oaths and imprecations.”[45] Yet if sailors were not among the most zealous converts of the Second Great Awakening, they were far from immune to its reach.[46] Most men from antebellum New England, which was then the primary source of maritime labor, would likely have been familiar with certain biblical passages, including those pertaining to the sea. The Old Testament story of Jonah and the fish was perhaps the most familiar

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[43] Melville, *Moby-Dick*, 797.

[44] Marcus Rediker, *Between the Devil and the Deep Blue Sea: Merchant Seamen, Pirates, and the Anglo-American Maritime World, 1700-1750* (New York: Cambridge University Press, 1987), 161-179; Glenn S. Gordinier, “Faith, Sailortowns, and the Character of Seamen’s Benevolence in Nineteenth-Century America,” in Labaree, *America and the Sea*, 252-255.

[45] Douglass diary, October 31, 1844.

[46] Creighton, *Rites and Passages*, 80.

reference. For whalemen, in particular, it carried a meaningful association to their work, evinced by the branding of any shipboard pariah as a "jonah." Most American mariners would also have been familiar with the New Testament passages in which Jesus calmed the storm on the Sea of Galilee and in which the Apostle Paul was saved from shipwreck in the Adriatic.

Believers felt God's presence even in a place as wild as the sea. Mary Brewster, who shipped with her husband, the captain of the whaleship *Tiger*, was relieved at the familiarity brought by Sabbath observance. One Sunday, early in the cruise, she confided to her diary that she felt "thankful that God is not confined to places but will meet His children in the Ocean's wave."[47] There was a hint of surprise in Brewster's relief. The ship was not a stone and mortar church; God's presence was perhaps as difficult to discern at sea as in the biblical desert. In Brewster's words, the ocean was not a place, which accounted, perhaps, for her surprise in finding God there. Others, though, felt that the sea bolstered their faith. Inspired by the seascape around him, Robert Weir praised God for its beauty. "Oh God how beautiful are all thy works in wisdom hast thou made them all. Can we [sailors] not be Christians—for truly we cannot help feeling how God continually watches us while on the stormy deep."[48] An unknown poet expressed similar sentiments in The *Sailor's Magazine and Naval Journal*, which was widely read among mariners for much of the nineteenth century:

> Ocean, what power and wisdom meet and shine,
> Within thy confines glorious and sublime!
> And clearly point a hand rich in design,
> Almighty, infinite, in skill divine.

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[47] Mary Brewster, *"She Was a Sister Sailor:" The Whaling Journals of Mary Brewster*, ed. Joan Druett (Mystic, CT: Mystic Seaport Museum, Inc., 1992), 23.

[48] Weir diary, September 1, 1855.

O may the works of this Almighty King,
Inspire our hearts his praise devout to sing!
While in the deep our eyes thy wonders see,
Lord, may our souls devoutly rise to Thee.[49]

The perils of the sea were not to be feared, except by non-believers. To them, The *Sailor's Magazine* preached that "every storm when you are at sea, should read you a lecture of God. . . . To be sinking at sea, and have no bottom for thy poor soul to build its hopes upon," it admonished, "will daunt the stoutest mariner, and terrify the most hardened sinner in the world."[50] To the faithful mariner, however, it seems that religion provided peace of mind in the wilderness. A maritime reading of the Bible convinced mariners that storms happened; surviving them was an affirmation of faith. "Who but [God]," Reverend Douglass asked, "can shut [the sea] up with doors, where it breaks forth, and make clouds the garment thereof and thick darkness a swaddling band for it."[51] If mariners' observance of religion generally fell short of Douglass' standards, many embraced the comfort afforded by faith on their terms.

But no matter the view from high atop the masthead, one incontrovertible fact remained—mariners could not pierce the water's surface to see what existed beneath the waves. A fin, a spout, or some thrashed and foamy water stirred the imagination. One dark night aboard the *Atkins Adams*, William Abbe noticed a strange glow "flitting about" in the water. He recorded the moment in his diary:

> The silence was doubled by this strange phenomenon—patches of glowing phosphorescence would appear here and there and then disappear—unlike anything we had before seen—and the strangeness of the sight and the silence and stillness of

[49] Unknown Author, "Ocean," *The Sailor's Magazine and Naval Journal* 3 (October 1830): 48.

[50] Joshua Leavitt, ed., *The Sailor's Magazine and Naval Journal* 3 (November 1830), 73.

[51] Douglass diary, November 25, 1844.

> everything combined with the gloom wakened, I must confess, a feeling of dread—and a sense of superstitious fear—that I should be ashamed of.[52]

That night Abbe was moved beyond reason. Scientists would later name this phenomenon bioluminescence, attributing it to, among other creatures, tiny phosphorescent dinoflagellates. But aboard the *Atkins Adams* in 1858, Abbe hardly understood this phenomenon in scientific terms. Instead, he was forced to reconcile it in his own mind. For the mariner, the unknown when observed in a dark, silent sea was unnerving.

From the masthead of the *Charles W. Morgan*, Nelson Cole Haley also discerned something unfamiliar. By its immense size, he surmised that it was not a whale. "If a man's hair ever did stand on end," he remembered, "mine approached that point nearer then, than it ever did before, or since." A council with the mates and captain convinced Haley that the mysterious monster had been a giant squid—a rare sighting for even the saltiest mariner. The captain confessed that "one hundred dollars would not have tempted him to miss the sight." In forty years on the sea, he had never spotted one. Like some mythical sea monster, Haley recounted the folk history of the animal in his journal: "Many stories have been told of such submarine denizens that have thrown their long arms over vessels, and destroyed them, boats have been dragged beneath the water and never seen more." Having seen the creature with his own eyes, and judging by its size, Haley "had no doubt . . . that any of the stories told about them are correct."[53] This was in an era in which sea serpents still regularly captured the American imagination. For example, the well-known case of a mysterious creature spotted intermittently off

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[52] Abbe diary, December 30, 1858.

[53] Haley diary, 175-76.

Gloucester, Massachusetts from 1814 to 1817 proved a great frustration for scientists and amateur classifiers and a boon for locals intent on capitalizing on Gloucester's new notoriety.[54] But these incidents were, in fact, less fantastic than simply an accepted fact of life on and near the sea where the vastness and obscurity of the ocean could seemingly harbor innumerable mysteries. The sea aglow, the squid's tentacles—all seemed to lend credence to the wildest conjectures.

But the most infamous story about a sea creature attacking a ship was true and well-documented. Indeed, the tragedy of the *Essex*, a Nantucket whaleship, was known to virtually all American whalers who set out from the island and neighboring New Bedford. In 1820, First Mate Owen Chase and the crew of the *Essex* were sailing west of the Galapagos Islands when their ship was rammed twice in the bow by a sperm whale. The ship sank. Its crew, adrift in the vastness of the Pacific, floated for ninety-four days and twenty-five hundred miles. Only eight of twenty survived—some, by eating their shipmates. For days afterward, marooned in his whaleboat, Chase relived the attack. He thought that there was something deeply appalling in the whale that stove his ship. It seemed that "anything but chance . . . directed [the whale's] operations." Its charge, he surmised, appeared "calculated to do us the most injury." The whale, Chase thought, seemed to possess a higher intelligence, turning the whaleship from hunter into hunted. He concluded that its attack "indicated resentment and fury" toward them.[55] The true fate of the *Essex* circulated among other equally fantastic stories of sea monsters both real

[54] See Chandos Michael Brown, "A Natural History of the Gloucester Sea Serpent: Knowledge, Power, and the Culture of Science in Antebellum America" *American Quarterly* 42 (September 1990), 402-36.

[55] Chase, *Essex Narrative*, 27-28.

and imagined. Somewhere in the Pacific, in yarns told by one sailor to the next, Herman Melville overheard it and became fascinated.

Indeed, out of these sorts of incidents emerged a rich culture of folk understandings about the natural world in which mariners attributed environmental processes to beliefs and actions inferred from long experience at sea. Many of these were no more than superstitions, but they nevertheless represented an important way to make sense of the confusing, bewildering, and often terrifying environment in which mariners struggled to work and live. There was, for example, the well-known case of the albatross immortalized in Samuel Taylor Coleridge's "Rhyme of the Ancient Mariner." Aboard the *Atkins Adams* once again, two of William Abbe's shipmates managed to catch one. As Abbe related, the cook taunted the bird, dancing and crying out, "how to do old fellow—come aboard to see me?" This was immediately cut short by the captain, who wished none of the bird's bad luck to rub his ship. "The old man," Abbe observed, "told us to let him go lest we would have a gale of wind." Abbe thought the superstition about harming these birds an "unreasonable fear in the seaman."[56] The crew, however, set it free despite Abbe's circumspection, a telling demonstration of the sailor's folklore trumping naysayers who did not ascribe to it.

At the mercy of the sea, it is not surprising that mariners constructed such a complex system of associations to explain its workings. Aboard the merchantman *Indramayo*, an unnamed diarist remarked on the portent of a comet. It shot across the sky, lighting the scene like the "brightness of a full moon." According to sailors, he continued,

[56] Abbe diary, December 21, 1858.

these kinds of occurrences were said to be “forerunners of disaster.”[57] Others ascribed to the widespread belief that whistling a tune aboard ship could antagonize the wind. Still others believed, conversely, that whistling during a calm could summon a much-needed wind by imitating the sound it made while running through the ship’s rigging.[58] Lacking scientific consensus to explain how winds and other natural phenomena worked, mariners drew on their own rich heritage of experience on the water to explain why the natural world acted in the ways that it did. Indeed, as we will see, natural philosophers, scientists, and hydrographers of the nineteenth century were not always closer to the mark. And mariners rightly were suspicious of scientific savants, many of whom neither spoke the mariner’s social and occupational language, nor had actually been to sea themselves.

But if the sea obscured its creatures and the workings of winds and currents, it was the sheer vastness that the mariner found most confounding. Indeed, in the early nineteenth century the sea was an environment nearly impossible to study, challenging all those—mariners and scientists alike—who sought to understand it. Henry David Thoreau, of course, believed that the ocean was wilder than any Bengal jungle, perhaps because he understood, from his own experience around Walden Pond and his native Concord, that land wilderness would inevitably yield to the axe and spade. But, in his ramblings on Cape Cod, he sensed that the sea was different. “Serpents, bears, hyenas, tigers, rapidly vanish as civilization advances,” Thoreau wrote in *Cape Cod*, “but the most populous and civilized city cannot scare a shark far from its wharves.”[59] Sea

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[57] Diary of Unknown Author, *Weymouth/Indramayo*, Log 507, June 12, 1823. G. W. Blunt-White Library, Mystic Seaport.

[58] See Mary K. Bercaw Edwards, *Cannibal Old Me: Spoken Sources in Melville’s Early Works* (Kent: The Kent State University Press, 2009), 25-26.

[59] Thoreau, *Cape Cod*, 219-20.

wilderness flaunted the civilizing impulse, a wilderness that in Thoreau's estimation would remain unfathomable to humans and eternally outside their control.

For all the commonalities that sea and land wilderness broadly shared, it must be acknowledged that the sea was a unique environment, requiring different tools if humans were ever to control it. Settlers could physically change terrestrial environments to suit their needs. They felled trees, dammed rivers, fenced fields, and sewed crops, sometimes, as historian Alan Taylor has shown, to wanton and wasteful ends.[60] In short, the land could be transformed to suit Americans' political, economic, social, and cultural needs, albeit with dangerous and often unforeseen environmental consequences. But maritime people simply could not remake the sea in similar ways. Rather, navigating the sea was primarily an act of the mind. If mariners were to use the ocean for commercial or military purposes, they would necessarily have to understand the environmental processes that could both aid and destroy a ship. The sea was thus the quintessential cultural environment—a space whose parameters were made and remade by the mariner's folkloric worldview and the increasingly sophisticated scientific understandings of navigational science.

Despite the prevalent beliefs of maritime folklore, mariners had been using navigational science for many centuries. The nautical chart can be traced back two thousand years to the charts and sailing directions of Ancient Greece, Phoenicia, and Rome. For more than four hundred years, mariners had been finding latitude by the noonday sun or by Polaris. They navigated using the nautical compass, the cross staff, the quadrant, and various iterations of nautical almanacs that provided calculations for

[60] See Alan Taylor, "'Wasty Ways:' Stories of American Settlement" *Environmental History* 3 (July 1998): 291-310.

finding latitude and the sun's declination from the equator. From the medieval portolans, or pilot charts, to the Dutch waggoner and the English rutter, nautical charts became increasingly complex and precise over this time as mariners pushed the bounds of their known world and increasingly oriented their place within the larger dimensions of the world's oceans.[61] Together, these charts and instruments constituted a sophisticated system of practical navigational science rooted in the belief that the sea could be observed, understood, quantified, and set down in the graticule of latitude and longitude so that, by the nineteenth century, it afforded mariners an increasingly better understanding of their place on the water.

American mariners, so long an integral part of Great Britain's commercial empire, were the heirs to these understandings and, in many ways, the American maritime world built on this system of knowledge as one of the earliest and most powerful national claims to scientific legitimacy. By the end of the eighteenth century, the young nation had a reputation in navigational science and astronomy befitting its close ties to the sea and the growing dominance of its merchant marine and whaling fleet. Edmund March Blunt's *American Coast Pilot*, published in 1796, and Nathaniel Bowditch's *New American Practical Navigator*, published six years later, revised and improved upon existing British navigational texts to become the standard works for American and many European shipmasters in American waters and beyond. Blunt's *Coast Pilot* provided sailing directions for navigating the reefs, rocks, and shoals studding American ports while Bowditch's *Practical Navigator* combined charts, a

[61] See Lawrence C. Wroth, *The Way of a Ship: An Essay on the Literature of Navigation Science along with Some American Contributions to the Art of Navigation, 1519-1802*, ed. John B. Hattendorf (Providence: The John Carter Brown Library, 2011), 11-92.

navigational text, and a nautical almanac in one.[62] These were significant contributions for a young maritime nation as yet uncertain of the role of science in its government and society, but determined to stake a commercial claim at sea.[63]

Navigational science in the United States at the turn of the nineteenth century was therefore fundamentally practical, but, in many ways, it also blurred the boundaries between application and theory, taking up the question of how the marine environment actually worked in order to better guide mariners on their voyages. Perhaps no other environmental phenomenon at sea fascinated American natural philosophers and scientists more than the Gulf Stream, a current that had long bewildered trans-Atlantic packet service between Great Britain and the United States. By 1770, Benjamin Franklin had taken up the subject. He inquired about it among New England's mariners, charted it, and measured its temperatures with Thomas Truxtun, a merchant captain and would-be American naval officer, on a voyage from London to Philadelphia in 1785.[64] Franklin was the quintessential scientist of his time, a man who pursued knowledge across a variety of scientific fields. In bringing together the observations of mariners with his own and presenting his work to the American Philosophical Society, Franklin was a representative figure of American science in the early republic, dabbling in theoretical questions that were nevertheless fundamentally practical as well.[65]

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[62] Wroth, *The Way of the Ship*, 173-76.

[63] See A. Hunter Dupree, *Science in the Federal Government: A History of Policies and Activities to 1940* (Cambridge: The Belknap Press of Harvard University Press, 1957), 1-19; Harold L. Burstyn, "Seafaring and the Emergence of American Science" in *The Atlantic World of Robert G. Albion*, ed. Benjamin W. Labaree (Middletown, CT: Wesleyan University Press, 1975), 76-80.

[64] Eugene S. Ferguson, *Truxtun of the* Constellation*: The Life of Commodore Thomas Truxtun, U.S. Navy, 1755-1822*, 2nd ed. (Baltimore: Johns Hopkins University Press, 2000), 57-59.

[65] Dupree, *Science in the Federal Government*, 7-8.

But the state of science at the turn of the nineteenth century by no means convinced mariners that it offered a compelling alternative to their folk beliefs. Longitude, in particular, was the bane of the navigator and the astronomer, requiring a number of complicated, but equally elusive and inaccurate measurements. More often, mariners relied on what they called "dead reckoning," a rough estimation of their east-west position based on the vessel's speed. Science offered few definitive answers to the larger workings of ocean winds, currents, and meteorology. Nautical charts, many of which originated from the British Admiralty, gradually filled in blank spaces in hydrographic knowledge, but there remained vast parts of the ocean full of uncharted or reported dangers. Moreover, in explaining away the mysterious creatures of the sea and their habits, classifiers and zoologists encountered challenges of their own, unable, for example, to agree whether a whale, like the one that rammed the *Essex*, belonged more appropriately to mammalian quadrupeds or to fish.[66] In the early nineteenth century, scientific consensus about all aspects of the marine environment was far from certain. Science represented an alternative, but by no means compelling answer to mariners' own ideas about the forces that governed the ocean and its creatures.

Perhaps no other mariner in this era considered the intersection of folklore and science at sea as deftly or as eloquently as Herman Melville. Indeed, in *Moby-Dick* his entire chapter "Cetology" is one long, scathing critique of the assumptions that underlay zoological classification in the mid-nineteenth century, and thus the broader belief that

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[66] Harriet Ritvo, *The Platypus and the Mermaid and other Figments of the Classifying Imagination* (Cambridge: Harvard University Press, 1997), 46-50; D. Graham Burnett, *Trying Leviathan: The Nineteenth-Century Court Case That Put the Whale on Trial and Challenged the Order of Nature* (Princeton: Princeton University Press, 2007), 44-144; see also John Dupré, "Are Whales Fish?" in *Folkbiology*, ed. Douglas L. Medin and Scott Atran (Cambridge: The MIT Press, 1999), 461-76.

science could make sense of the sea. The chapter revolves around the controversial nineteenth-century question of whether a whale should be classified as a mammal or a fish—a debate, it turns out, that interested scientists as well as American merchants and mariners.[67] After an extended discourse in which Ishmael, or perhaps more appropriately Melville, arranges whales in the tradition of classifiers from Carl Linnaeus forward, he ultimately concluded that the project was impossible. It would be perpetually unfinished, he said, "even as the great cathedral at Cologne was left."[68] Here, Melville mocked scientific pretensions, wrapping his classification in the Latin that, by its nature, lent an air of authority to the whole system—"penem intrantem feminam mammis lactantem . . . ex lege naturae jure meritoque."[69] But such language, of course, meant little to whalemen who themselves knew a great deal about the anatomy and habits of the leviathan.

Melville understood that all this was a way to veil the whale in the intellectual language of science while dismissing other competing systems of knowledge—such as the mariner's—that existed largely, though not completely, outside scientific discourse. Proceeding from Linnaeus and his fellow classifiers to Ishmael's fictional shipmates, the whalemen Simeon Macey and Charley Coffin, Melville writes that these mariners "united in the opinion that the reasons set forth [by scientists] were altogether insufficient. Charley profanely hinted they were humbug." Then, in his final statement on the intersection of science and what psychologist Douglas L. Medin and anthropologist Scott Atran have termed folkbiology, Ishmael concludes, "waiving all argument, I take the

[67] See Burnett, *Trying Leviathan*, 10-18, 190-222.

[68] Melville, *Moby-Dick*, 946.

[69] Ibid., 935.

good old fashioned ground that the whale is a fish, and call upon holy Jonah to back me."[70] The whale was a mysterious creature, which perhaps was Melville's larger point, defying easy classification and beguiling scientists as much as, if not more than, mariners. Dismissing the taxonomists for the whalemen, who had spent years searching for and cutting into whales themselves, Melville suggests that there are other voices with a stake in defining the natural world in their own terms and with their own language. Rather than consensus, the nineteenth-century discourse over the sea was more complex. It was not entirely clear to mariners that science offered a better framework than their traditional understandings.

Nevertheless, science proved a powerful lens through which to interpret the sea environment, and so mariners incorporated it in various ways into their folkbiology and the broader vernacular meanings of the wilderness mythos at sea. If mariners could not actually see what existed beneath the keel of their ship, they could nevertheless rely on a combination of sounding lead, nautical chart, and their own intimate understandings of the coastal sea floor to determine their location. Aboard the merchantman *Alert*, the crew heaved the sounding lead every two hours as the vessel neared Boston in a dense fog. The muddy sludge, Richard Henry Dana observed, gave way to sand. By this, he knew that Nantucket South Shoals was near. A good navigator knew the sea bottom in this way and could mark the ship's location roughly by it. Dana wrote:

> The soundings on the American coast are so regular that a navigator knows as well where he has made land, by the soundings, as he would by seeing the land. Black mud is the soundings of Block Island. As you go toward Nantucket, it changes to a dark sand; then, sand and white shells; and on George's Banks, white sand; and so on.[71]

[70] Ibid., 936; see Medin and Atran, *Folkbiology*, 1-15.

[71] Dana, *Two Years Before the Mast*, 339.

In one common maritime folktale, the crew of an oyster fisherman planted chicken manure on the captain's sounding lead. When he brought it up, the captain took a sniff and a taste, trying to discern the character of the bottom. "Luff up, boys!" he cried out, "Something's wrong! We're in Mrs. Murphy's hen yard on Smith Island."[72] However apocryphal, the anecdote illustrates how the mariner's vernacular knowledge commingled with the tools and understandings of navigational science. Indeed, taking bottom samples was an activity in which nineteenth-century naturalists and scientists were quite interested, albeit for quite different purposes.

In marine navigation, science met folklore and rigorous method met rule of thumb. The mariner incorporated the instruments of marine science into his already deep knowledge of the sea that was culled from experience and observation. That the mariner did not fully understand the processes of the marine environment did not preclude him from using what he did know. The Gulf Stream was one example. Mariners were unsure of the principles creating this great channel of water that propelled them northward. "I have heard it often said," wrote ship surgeon Theodore Lewis in 1835, "that it could not be easily accounted for." [73] Its function to the mariner, however, was easily graspable. Returning from a long voyage, the mariner looked expectantly for signs of the current. It could be a natural ally and a symbol of home. From the masthead of the *Clara Bell*, Robert Weir noticed the prevalence of seaweed in the water all around him. It had been three years since he last saw his home and the discovery filled him with anticipation. It

[72] Helen M. Rozwadowski, *Fathoming the Ocean: The Discovery and Exploration of the Deep Sea* (Cambridge: Harvard University Press, 2005), 70.

[73] Diary of Theodore Lewis, *Atlantic*, May 26, 1836, Log 822, G. W. Blunt White Library, Mystic Seaport.

served “to show the advance we are making towards the outer currents of the Gulf Stream,” he wrote, “and home.”[74] He imagined the ship’s progress by observation as well as by latitude. Weir noted the seaweed at the same time that he began recording the *Clara Bell*’s position in his daily journal entry as if every minute change in position signified the closing of a long journey.

Like Weir, the ship’s boys took the presence of the Gulf Stream as a sign of their long-awaited return. One night, Weir observed, the ship’s steward played on their naivety. With some boiling water from the galley, he pretended to take a water sample, the warmth of which would indicate whether they were in the Gulf Stream. At this, “several green ones rushed to the side,” Weir observed, “and almost simultaneously thrust their hands into the bucket—but drew them back as quick. . . . There was an uproarious laugh just then which they did not seem to enjoy.”[75] The Gulf Stream was just one of these folk-science markers. Some were islands, some were particular weather phenomena, others were based on the color and temperature of the sea or the character of the bottom. Some, like Cape Horn, became natural monuments, invested with mythical, historical, environmental, and geographical meaning. All were sign-posts on the sea, a whole system of knowledge deeply rooted in the vernacular and scientific meanings that framed the nineteenth-century maritime world.

But despite these understandings, mariners still often found the sea too vast to fully comprehend. No sextant or chart could represent the enormity of it, especially on the open deep. Its size alone was baffling. Mariners commonly described the sea as “boundless” or “trackless”—emphasizing just how difficult it was to envision in their

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[74] Weir diary, April 15, 1858.

[75] Ibid., April 30, 1858.

imagination. In the novel *Mardi*, published in 1849, Melville wrote that the sea was a "watery waste," a term many mariners used to express its seemingly infinite spaces. There, the mariner's sense of place could lose all meaning. Melville wrote that the sea tempted the disoriented landsman "to recant his belief in the eternal fitness of things." No sextant, nautical chart, no coordinates of longitude and latitude really identified a place. At sea, parallels and meridians were little more than "imaginary lines." The chart with all its depths and Mercatorial gridlines was only a representation of space. To the mariner, image and reality looked nothing alike. The sea, in Melville's words, had no "local angularity."[76] Instead, each degree and minute looked much like any other.

The sea, Washington Irving once wrote, was "like a blank page in existence."[77] Day and night continued as before—the systematic changing of the watch aboard ship ensured that it did—but the monotony of life aboard ship could confuse the mariner's long term senses. News from home, in the form of letters and newspapers, were the mariner's tenuous link to the known world. Maritime historian Margaret Creighton has shown that, however distant, whalers still remained closely oriented to their homes and families.[78] That some letters actually reached sailors halfway around the world is a testament to the complex web of political and social connections that framed the Euro-American maritime world, even in the early nineteenth century. When these letters reached their anxious recipients, however, they were at best many months old, often more. The mariner lived in this otherworld, where time was fluid and relative. At sea,

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[76] Herman Melville, *Mardi and a Voyage Hither* (Evanston: Northwestern University Press, 1970), 9-10.

[77] Washington Irving, *The Sketch Book of Geoffrey Crayon, Gent.*, vol. 2 (New York: C.S. Van Winkle, 1819), 11.

[78] Creighton, *Rites and Passages*, 195.

Melville observed, "you hear no news; read no gazettes; extras with startling accounts of commonplaces never delude you into unnecessary excites; you hear of no domestic afflictions; bankrupt securities; fall of stocks."[79] Mariners, he wrote, lived in "a state of existence, where existence itself seems suspended."[80] From the Indian Ocean, Reverend Douglass wondered who had won the election of 1844. It was not until late March 1845 when the *Morrison* reached Hawaii that Douglass learned of James K. Polk's victory.[81] When Harvey Brown arrived at San Francisco aboard the bark *Selma* in 1849, he was relieved to have returned to the temperate climate of his native New England. En route, he remarked that he had "passed through seven seasons in five months," a disorienting feeling that had confused his sense of the normal cycle.[82] At sea, space played with the mariner's normative sense of time. Often, its changeless, monotonous face convinced mariners that the sea was an environment that existed outside of time. It seemed eternal—as Melville wrote, it "rolled on as it rolled five thousand years ago."[83]

Many mariners were convinced that they had left civilization behind for the wilderness of the sea. Robert Weir and the *Clara Bell* were bound to the Indian Ocean whaling grounds—"far enough out of the world," he thought, to "wish I was home again."[84] There he decided he would rather be "somewhere near civilization."[85] For

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[79] Melville, *Moby-Dick*, 958.

[80] Melville, *Mardi*, 9.

[81] Douglass diary, March 27, 1845.

[82] Diary of Harvey G. Brown, *Selma*, September 17, 1849, Log 310, G. W. Blunt-White Library, Mystic Seaport.

[83] Melville, *Moby-Dick*, 1407.

[84] Weir diary, March 1, 1856.

[85] Ibid., January 12, 1857.

whalers, in particular, whose voyages commonly lasted three or four years with few ports of call, the environment seemed to exact a physical toll. Melville thought that sailors could always discern a homebound whaler by the appearance of its crew. The men of the fictional *Albatross*, which spoke Ishmael's *Pequod* in the Pacific, "seemed clad in skin and bones, so torn and bepatched the raiment that had survived nearly four years of cruising."[86] Using a common wilderness trope, Melville attributed the whaler's common condition to "long exile from Christendom and civilization," which had reduced the men to savagery.[87] For the survivors of the *Essex*, who turned to cannibalism out of necessity, the transformation from civilized to savage reached its ghastliest extreme. In eating their shipmates, they violated the most sacrosanct taboo and indulged in an act notoriously associated with the mythical wilderness. In accounts of their rescue, the imagery speaks for itself. To mariners aboard the whaleship *Dauphin*, some of the survivors appeared to be "in a most wretched state." Commodore Charles Goodwin Ridgely, in command of the United States Pacific Squadron at Valparaiso, recorded in his journal that "they were unable to move when found sucking the bones of their dead Mess mates, which they were loath to part with."[88] With their tattered clothes, bulging eyes, and sallow visage, gripping human bones, they must have appeared to be the embodiment of wilderness survival—a despicable sight, no matter how desperate their circumstances.

It is not surprising that many American mariners readily attributed cannibalism to the indigenous people of the Pacific. In American myth, wilderness was the haunt of the

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[86] Melville, *Moby-Dick*, 1045.

[87] Ibid., 1082-83.

[88] Ridgely quoted in Nathaniel Philbrick, *In the Heart of the Sea: The Tragedy of the Whaleship Essex* (New York: Penguin Books, 2001), 240.

uncivilized savage. Owen Chase and the *Essex* survivors, at least, could be reclaimed from savagery. To mariners, however, the indigenous islanders of the sea had been born into it. In the Pacific Ocean, a frequent cruising ground in the nineteenth century, whalers often sought respite among the islands of Oceania. There, they could restock food and water supplies and procure wood for repairs. While many islands were known by whalers to be peaceful sources for these essential resources, others gained notoriety in the mariner's imagination for their apparent savagery. When the foundering hulk of the *Essex* could be of no more use, Owen Chase and the other officers mulled over their options. There was some uncertainty among them concerning the best destination. The Marqueasas, Paumotu, and Society Islands, over one thousand miles to the west of their position, could be reached well within the parameters of their food supply. The coast of South America, somewhere over two thousand miles distant in the opposite direction, was considerably farther and would require a strict rationing of the bread, tortoises, and water that they had salvaged from the ship. Together with the mates, the captain decided on the latter course.[89] According to Chase, the overriding consideration was the character of the indigenous people that inhabited the western islands. The crew feared a hostile reception. Chase remembered that they "were entirely ignorant" of these islands. "If inhabited, we presumed they were by savages, from whom we had as much to fear as from the elements, or even death itself."[90] It was a fateful decision; the irony of it can hardly be missed. In shunning the presumed cannibalism of the Pacific islanders, they were compelled to become cannibals themselves.

[89] Philbrick, *In the Heart of the Sea*, 95-103.

[90] Chase, *Essex Narrative*, 34.

Among mariners, the cannibal represented all that was wild about the sea. Historians and anthropologists debate whether the indigenous people of the Pacific actually consumed human flesh. It is clear, however, that American mariners were fascinated by the practice, and they easily convinced one another of its prevalence. Aboard the *Charles W. Morgan,* Captain John Sampson faced a dilemma. He had not lost his ship like the *Essex* men, but some of his crew were suffering from scurvy and would soon die if fresh fruit could not be found. Given his location, Sampson had little choice but to provision at the Fiji Islands, a group whose inhabitants were notorious for their hostility to American seamen and their propensity for eating human flesh. As Sampson noted, one of the large islands in this group was reputed to be half-friendly and inclined to peaceably trade with calling ships. The other side, Sampson told his mate, "would massacre any one that set within reach."[91] Unfortunately, his chart did not differentiate one end of the island from the other. A whaleboat made its way to shore with Sampson and Nelson Cole Haley among its crew. A lone Fijian stood on the beach with a bushel of bananas held high overhead. All signs pointed to the prospect of friendly trade. Sampson, though, urged caution. He ordered the crew to keep the whaleboat safely offshore in the event the lone trader intended to lull the mariners into an ambush on the beach. His suspicion was prescient.

As the boat neared shore, an army of Fijians rose from the underbrush to swamp the boat. Haley took aim with his oar. One, in particular, would not release his hold on the boat's gunwale. He described the Fijian in these terms:

> [He] turned upwards one of the most horrible, devil looking faces, and with a diabolical grin, that showed almost every tooth in his head, the upper front ones filed sharp like the

[91] Haley diary, 159.

> teeth of a saw, no doubt to give him a more ferocious appearance, and better chance of tearing human flesh, the cursed look he gave me and what the [captain] had said, aroused what little bull dog I had in me, that let follow what might, I would hit him one for some of the poor devils he pulled the meat off their bones, with that set of shark-like, looking teeth, he seemed longing, to insert in some part of my body.[92]

Haley's description of the Fijian reveals his assumptions about these islanders. He had not witnessed cannibalism with his own eyes, but the appearance of the Fijian in the midst of the wilderness bolstered his certainty. It was exactly this kind of encounter, weakened by malnutrition and without adequate firearms that the *Essex*'s crew sought to avoid. Haley escaped with his life. By process of elimination, the crew of the *Charles W. Morgan* had determined the friendly side of the island. As they made their way there, Haley observed that the island was marked by beautiful open spaces. These were "quite lovely spots of tropical scenery . . . reposing so peaceful"—almost garden-like, he thought. But he could not shake the fright of the previous hour and noted the strange juxtaposition between tranquility and savagery in the scene before him. "One might well expect to see lambs and children," he imagined, "sporting on the patches of bright green grass." To know, however, that "around those peaceful spots lurked the most devilish cannibals . . . watching to steal each other's children, drag them in the bush, and eat them," left him unsettled.[93] For Haley, the cannibal and the environment were inextricably linked. Mariners like him thought that such savagery could occur only in the wilderness, far from the civilized world.

For the whaler, who followed his prey into the world's unknown waters, the sea represented a kind of frontier. On land, of course, wilderness was central to the frontier

[92] Ibid., 161.

[93] Ibid., 163.

myth. The same was true at sea. There, the mariner met with natural dangers, unexplainable phenomena, and indigenous people who were sometimes hostile and whose customs were strange and occasionally appalling. For some mariners, the pioneer icon seemed particularly fitting. William Abbe thought of himself as a kind of seaborne trailblazer:

> Beyond a doubt [the whaler] is a fearless seaman, penetrating among the tumbling mountains of ice in the blustering outrageous Northern Seas, or under the frozen Serpent of the South, or he vexes with his hull keel the milder waters of the Indian or Pacific Oceans. Geography and empire honor him among their best contributors, but it is no love of fame, no ambition of honor, no desire to assist science or increase knowledge—to make discoveries or carry his country's flag to unknown shores—that makes him a hardy navigator and a bold discoverer. It is the pursuit of oil and the chase of his tremendous prey. It is the interest of owners—of himself and crew—not the interest of mankind that urge his keel among unknown seas and amid unusual dangers.[94]

In Abbe's paean to the fishery, the dull drudgery of sea life wore a mythical sheen. The characterization owed much to James Fenimore Cooper. It also evoked Melville's ideas of a sea frontier, reflected in this passage published eight years before Abbe's cruise:

> For many years past the whale-ship has been the pioneer in ferreting out the remotest and least known parts of the earth. She has explored seas and archipelagos which had no chart, where no Cook or Vancouver had ever sailed. If American and European men-of-war now peacefully ride in once savage harbors, let them fire salutes to the honor and glory of the whale-ship, which originally showed them the way, and first interpreted between them and the savages.[95]

Like the land, frontier and wilderness were inextricably linked together on the water. If Americans were increasingly oriented westward during the nineteenth century, mariners nevertheless believed themselves to be blazing similar trails all over the deep blue sea.

But when, at long last, mariners returned from the sea to port, their feelings reflected the contrast between land and the wild sea from which they had come. Port was

[94] Abbe diary, 189.

[95] Melville, *Moby-Dick*, 910.

an idea that they kept close to the heart. Mariners were ever mindful of it, pined of it to shipmates, and wrote about it in their journals and diaries. The land seemed everything the sea was not. It is no coincidence that mariners commonly referred to the sea as "landless;" to Melville, its spaces were similarly "unshored" and "harborless."[96] Robert Weir had mulled over life at sea for a few months before definitively concluding, "the land is best after all . . . give me a home on the solid land."[97] Nothing drove home the need for something firm underfoot more than the prospect of being left alone to float on the sea. To Nelson Cole Haley, it seemed that the *Charles W. Morgan* would never return for him. As he hung to a piece of his whaleboat, stove by the flukes of a sperm whale, he watched his ship disappear over the horizon. "No one but he who has been clinging to some frail support on the wide open ocean, can tell the agony of such moments," Haley observed. But the ship returned to search for the missing boat. "Oh how good she looked," Haley thought, "to me she seemed the biggest spot on Earth, or ocean, and to once more tread her white decks, would seem bliss indeed."[98] The ship's deck, however, was only a substitute for the land itself.

Land was a refuge from the wilderness. Swaying lazily in some glassy harbor, the common anxieties of seafaring lightened. Civilization might be found again. As the *Clara Bell* neared St. Helena, Robert Weir recorded that "all hearts are gay . . . here we shall meet friends in a civilized port."[99] Richard Henry Dana likened a safe harbor to a "motherly bosom:"

[96] Ibid., 933.

[97] Weir diary, March 27, 1856.

[98] Haley diary, 206-08.

[99] Weir diary, March 11, 1858.

> Our Mother Earth, forgetting never the perils of that gay and treacherous world of waters, its change of moods, its 'strumpet winds,'—ready is she at all times, by day or by night, to fold back to her bosom her returning sons, knowing that the sea can give them no drink, no food, no light, nor bear up their foot for an instant, if they are sinking in its depths.[100]

For Dana and many other mariners, the land and its safe harbors were invested with feminine qualities of security and nurture while the blustery sea remained a wild masculine environment. To the sea-sick mariner, land was a welcome change. From the mast-head, the cry of "Land, ho!" sent the crew into a frenzy, streaming topside to view the spectacle. Aboard the *Selma*, Harvey Brown recorded the moment. The ship had reached the Azores, the first land sighted since departing New York. "Land ho!" he wrote, "Every one running to the side of the vessel and up in the rigging to catch sight once more of terra firma."[101] Robert Weir reveled in the prospect of a safe harbor. The *Clara Bell* had been almost three years out of Mattapoisett, Massachusetts when it reached St. Helena. Once safely anchored, Weir imagined, he would stow away in the rigging to have "a jolly old smoke, feast my eyes on the terra firma sights, and my lungs upon this delicious breeze directly off shore."[102] These were not past times in which the mariner could indulge with any peace of mind while at sea. Land and sea, then, came to represent two poles of the mariner's geographical and imaginary world. The land promised respite and security from the ocean wilderness.

Indeed, mariners contrasted the chaos and unpredictability of the sea with the order they observed in the land. To them, the land seemed to be a garden brimming with

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[100] Dana, *To Cuba and Back*, 431.

[101] Brown diary, May 4, 1849.

[102] Weir diary, March 12, 1858.

vegetation. After weeks or months at sea, its fertility was striking. As the *Selma* reached Valparaiso, Harvey Brown remarked that the land was "productive to its very tops. Fruits of all kinds grow in abundance."[103] Approaching the Azores, Nelson Cole Haley noticed the green hands watching the advancing land with "eager eyes." It "seemed to them a garden in the ocean," he thought, "as different spots of cultivation showed all the colors it was possible for vegetation to do." To Haley's eye, there was pleasant symmetry in these cultivated fields. They were ordered into "square oblongs and other shapes," he noted pleasingly, making "the prettiest sights in point of garden landscape I ever have seen."[104] However fertile below its surface, the sea did not seem garden-like. To William Abbe, who had seen few whales during his cruise, it was just the opposite. "We are leaving this dismal ground," he remarked, "to us a barren field."[105]

Abbe, like most mariners, was relieved to come home to the land. There, he found the order and safety, if not the profit, which was so fleeting at sea. When the *Clara Bell* finally tied to the New Bedford wharf in May 1858, Robert Weir could barely contain himself. "We touched the wharf and I touched the shore," he wrote, "pure bona fide American land hurrah!" The long voyage was at an end. For some time, he had expressed a desire to leave whaling. "I shall be happy enough to get out of it," he wrote during the voyage, "though everyone says that it will be almost impossible and that I will go to sea again." He was certain, however, that he could "overcome this infatuation . . . the love of friends and country ought to conquer this." Friends and American soil were a welcome reprieve from the dangers of sea life. Reunion meant that he had survived the

[103] Brown diary, August 8. 1849.

[104] Haley diary, 328.

[105] Abbe diary, 194.

wilderness and had perhaps made some money for himself along the way. Land, in fact, represented the antithesis of wilderness on the long-settled communities of the American eastern seaboard. Like William Bradford and the Pilgrims three hundred years before, American mariners similarly believed that the land was a refuge from the sea.

This was the American mariner's worldview during the early nineteenth century, just as the United States Navy began to grasp the need for a hydrographic institution to purchase and disseminate nautical charts and instruments for its own ships. Among the American navy's most important nineteenth-century duties was to insure the safety and prosperity of the nation's burgeoning merchant and whaling fleets on waters all over the world. Hydrography was central to this mission. Adopting the tools, instruments, and assumptions of nineteenth-century science, naval hydrographers and surveyors believed that the sea could be ordered, represented on paper, and that it was governed by principles that could be understood and used. During this time, American mariners, as we have seen, prescribed to a complex and long-standing set of folk and scientific understandings that they incorporated into their sense of how the sea environment functioned. In order to serve them and the commercial development of the United States at sea, the Navy began hydrographic work in the 1830s hesitantly, intermittently, and not without its own internal suspicions and disputes. The object of this chapter has been to examine the set of folkloric and scientific beliefs that framed mariners' understandings of the sea. It is important and insightful to keep these in mind because they informed the way that American hydrographers went about constructing another vision of the sea based in the culture of naval science and the commercial needs of the nation. By and large, this story begins with the United States Exploring Expedition, which, in 1838, set out to chart the wilderness of the Pacific Ocean. As Chapter Two will show, this expedition sailed at the convergence of these two—sometimes complementary, but often conflicting—visions of how the sea worked and what it meant to mariners.

CHAPTER 3: FIXING-IN

And behold! Now a nation, which but a short time ago was a discovery itself and a wilderness, is taking its place among the enlightened of the world, and endeavoring to contribute its might in the cause of knowledge and research. For this seems the age in which all men's minds are bent to learn all about the secrets of the world, which they inhabit.

-Passed Midshipman William Reynolds, 1838[1]

The United States Exploring Expedition sailed at a crossroads of understanding about the natural world. In March 1839, seven months out of Hampton Roads, the six naval vessels of the expedition rounded Cape Horn and set out to chart the Pacific Ocean. For the Americans, the Pacific was still largely unknown. Its waters were ill-charted. Its winds and currents were enigmatic. Its islands were inhabited by cannibals—or so many mariners believed. By the 1830s, however, the Pacific was undergoing profound political, commercial, environmental, and cultural changes. The circumnavigation of the United States Exploring Expedition from 1838 to 1842 was an important moment in this ongoing transformation. While wilderness informed the Americans' understanding of that ocean, they nevertheless participated in the largest scientific undertaking of the day. Three hundred fifty officers, seamen, and scientists sailed eighty-seven thousand miles and conducted nearly two hundred fifty hydrographic surveys. The expedition's work was informed by a faith in progress and in the precision of its cartographic method. The men believed that the marine environment could be understood and put down precisely on nautical charts. This was a deeply-flawed assumption in both a scientific and cultural sense, but it was powerful nonetheless. The expedition created charts and texts that claimed the Pacific Ocean as an American commercial and ideological domain. In the voyage, contrary understandings converged. Wilderness met order. Savage met civilized.

[1] Private Journal of William Reynolds, vol.1, October 29, 1838, 54, transcribed by Thomas Philbrick, Reynolds Family Papers, Archives and Special Collections, Franklin and Marshall College, Lancaster, Pennsylvania.

Mystery met knowledge. These changes—both real and imagined—reveal how Americans understood the marine environment and their place on it.[2]

In May 1840, the expedition began a three-month survey of the Fijis, a maze of uncharted reefs, islands, and cannibals in the Southwest Pacific. The Fiji survey was both representative of the voyage and terribly exceptional. It serves as a lens to more deeply consider the changes coursing through the Pacific world. In the American maritime imagination, the Fijis were a notorious wilderness, a place where environmental and cultural dangers were inseparable. The Americans considered this the voyage's most foreboding survey. By the time they departed in August 1840, some of their greatest fears had been realized. The men struggled to create order in a marine environment that was dynamic and so hostile that Lieutenant Charles Wilkes, in command, turned his scientific expedition into what it always was—a naval force. The expedition razed an island. It left behind two smoldering villages, two slain American officers, and nearly one hundred dead Fijians. Military power thus joined the expedition's charts, texts, and treaties in bringing order to the Fijian wilderness.

The United States Exploring Expedition, dubbed simply the Ex. Ex., emerged out of uncertain ideas about the place of science in the federal government and in the United States Navy. As historian A. Hunter Dupree has shown, American science in the Early Republic through the Jacksonian Era was hampered by a lack of mature scientific institutions and by a government still unsure of how or whether the Constitution

[2] On the United States Exploring Expedition see William Stanton, *The Great United States Exploring Expedition, 1838-1842* (Berkeley: University of California Press) ; Nathaniel Philbrick, *Sea of Glory: America's Voyage of Discovery, The U.S. Exploring Expedition, 1838-1842* (New York: Penguin Books, 2003); Herman J. Viola and Carolyn Margolis, eds., *Magnificent Voyagers: The U.S. Exploring Expedition, 1838-1842* (Washington, D.C.: Smithsonian Institution Press, 1985).

permitted it to patronize science at all. The practical needs of commerce and economic prosperity, however, forced the federal government's hand, and so the Ex. Ex. sailed within an established tradition of exploration, beginning with the Lewis and Clark Expedition, 1804 to 1806, and in continuing efforts to survey and explore the West.[3] Jeremiah Reynolds, an Ohio newspaper editor and the Ex. Ex.'s most strident supporter, conceived of the Exploring Expedition in the same vein as these earlier undertakings. Reynolds was particularly concerned with the expansion of American whaling and the nation's merchant fleets into the Pacific Ocean where poor charts hampered navigation. In a speech before the U.S. House of Representatives in April 1836, he declared that "our extensive interest in those seas" and "national dignity and honor" were at stake.[4] In addition to the practical benefits of hydrography, Reynolds proposed that the expedition must "collect, preserve, and arrange every thing valuable in the whole range of natural history. . . . there should be science enough," he proclaimed, "to bear upon everything that may present itself."[5] Reynolds' vision transcended competing naval and scientific aims, obscuring these very real differences in national honor and glory. In his words, an exploring expedition would "add new lustre to the annals of American philosophy and crown with a new and imperishable wreath the nautical glories of our country."[6] The Ex. Ex. would be a national project, conceived in the tradition of the European exploring expeditions of James Cook, the Comte de Lapérouse, and others in order to stake an American claim to the Pacific Ocean through hydrography and natural history.

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[3] A. Hunter Dupree, *Science in the Federal Government: A History of Policies and Activities to 1940* (Cambridge: The Belknap Press of Harvard University Press, 1957), 9,10, 25-29, 56-65, 91-95.

[4] South-Sea Expedition," Southern Literary Messenger, January 1837, 68.

[5] Ibid., 71.

[6] Ibid., 72.

The British and French navies, however, stood well ahead of the United States in scientific exploration and hydrography. Following the precedent of hydrographic institutions in Spain, Portugal, and later the Netherlands in the fifteenth through the seventeenth centuries, France established its Dépôt des Cartes et Plans de la Marine in 1720. In 1795, the Royal Navy followed, founding its Hydrographical Office of the Admiralty. These developments in the institutionalization of hydrographic departments reflected the growth of maritime and naval power in these European nations. By the early nineteenth century, the Royal Navy, as in all things maritime and naval, led the way, producing Admiralty Charts for all the oceans of the world. Hydrography in the Royal Navy, of course, had been spurred by commercial and strategic necessity as Britain's naval and merchant fleets extended the bounds of the empire across the ocean. Thus, by the early nineteenth century, the most accurate charts of the North American coast were British, resulting from surveys, like those commanded by James Cook in 1759 along the St. Lawrence River during the siege of Quebec, reflecting the Royal Navy's strategic needs in American waters from the Seven Years War through the War of 1812.[7] Indeed, as we will see, this was a pattern followed by the American navy and its own hydrographic office during the late nineteenth century as the burdens of sea power joined preexisting commercial imperatives.

But in 1838, as the United States Exploring Expedition was about to sail, American naval hydrography remained in its infancy. Established in 1830, the Navy's own Depot of Charts and Instruments was only a repository for the service's stock of nautical charts and instruments, both of which were mostly foreign in origin. Lieutenant

[7] G.S. Ritchie, *The Admiralty Chart: British Naval Hydrography in the Nineteenth Century* (New York: American Elsevier Publishing Company, Inc., 1967), 15.

Charles Wilkes, who had gained experience in hydrographic surveying in the U.S. Coast Survey and in surveys of Narragansett Bay, Georges' Bank, and the Savannah River, took command of the Depot in 1833 and expanded its scientific importance by moving it into his Capitol Hill home and adding a small transit telescope for astronomic observations.[8] But even in 1838, the Depot was not an organization mature or large enough to undertake outfitting and planning an expedition on the scale that Reynolds and Congress now proposed. Rather, the Ex. Ex., like all the early hydrographic work in the U.S. Navy, was an ad hoc project, spurred forward by the efforts of people like Reynolds, former President John Quincy Adams, Secretary of War Joel R. Poinsett, and, by 1838, Wilkes himself, rather than from any sustained and overarching vision articulated within the Navy or its Depot of Charts and Instruments.[9]

In conceiving the expedition and preparing it to sail, men like Reynolds and Wilkes shared the common belief that wilderness was unscientific—it was no way to think about an environment that the United States very much wanted to know and claim. Wilkes' orders stated that the expedition had been raised "for the purpose of exploring and surveying," to "determine the existence of doubtful islands and shoals" and "to accurately fix" the positions of these dangers on the charts.[10] It is difficult to overstate the

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[8] See Harold L. Burstyn, "Seafaring and the Emergence of American Science" in Benjamin W. Labaree, ed. *The Atlantic World of Robert G. Albion* (Middletown, CT: Wesleyan University Press, 1975), 85; Steven J. Dick, *Sky and Ocean Joined: The U.S. Naval Observatory, 1830-2000* (New York: Cambridge University Press, 2003), 17-44; Marc I. Pinsel, *150 Years of Service on the Seas: A Pictorial History of the U.S. Naval Oceanographic Office, 1830 to 1980*, vol. 1 (Washington, D.C.: Government Printing Office, 1982), 1-10; Gustavus Weber, *The Hydrographic Office: Its History, Activities, and Origin* (Baltimore: The Johns Hopkins University Press, 1926), 1-17.

[9] See Dupree, *Science in the Federal Government*, 91.

[10] James K. Paulding to Charles Wilkes, Navy Department, August 11, 1838 in Charles Wilkes, *Narrative of the United States Exploring Expedition during the Years 1838, 1839, 1840, 1841, and 1842*, vol. 1 (Philadelphia: Lea and Blanchard, 1845), 364.

economic importance of the sea to mid-nineteenth-century America. In 1838, as the expedition prepared to sail, the nation's maritime trade was worth $223 million with nearly 90 percent of it carried by American vessels.[11] The expedition's orders cited "the important interests of our commerce embarked in the whale-fisheries, and other adventures in the great Southern Ocean." Secretary of the Navy James K. Paulding wrote to Wilkes of his expectation that the charts would "enable future navigators to pass over the track traversed by your vessels, without fear and without danger."[12] Paulding envisioned the expedition as a maritime trailblazer, replacing the unknown with an ordered system of knowledge and presaging commercial expansion in the Pacific.

Many of the expedition's officers had a foot in both worlds. They were sailors too—gentlemen certainly—but also young men enamored with the lures of the Pacific and alternately fascinated and terrified by its perils. The drudgery of surveying was set against a grand backdrop of tropical seascapes, ice-bound exploration, half-clad island women, and cannibals. Passed Midshipman William Reynolds was one of these men, quoted often in histories of the expedition because he kept a private journal against orders that conveyed far more than any of the officers' official journals. Twenty-two years old in 1838, Reynolds had worked under Wilkes at the Depot of Charts and Instruments. But contrary to this experience, Reynolds oozed romanticism. In March 1838, as the expedition departed Cape Horn and set out on the Pacific, he invoked the wilderness mythos: "Seated here alone . . . at the very verge of the Western World, with a waste of

[11] Alex Roland, W. Jeffrey Bolster, and Alex Keyssar, *The Way of the Ship: America's Maritime History Reenvisioned, 1600-2000* (Hoboken, NJ: John Wiley & Sons, 2008), 429; on the centrality of the sea to the history of the United States, see Benjamin W. Labaree, et al., *America and the Sea: A Maritime History* (Mystic, CT: Mystic Seaport, 1998), 3-15.

[12] Paulding to Wilkes, August 11, 1838, *Narrative of the United States Exploring Expedition,* 364.

waters before me that for half the circuit of the Globe rolls on unbroken by a single Isle there was something so imposing in the sublime and solitary nature of the scene, that it seemed to me as if I were like the last man, looking upon Eternity."[13] The other men, Reynolds observed, were "stricken and humbled into fear" by "one of nature's wildest scenes." The wilderness mythos informed even these scientifically-minded naval officers. The convergence of folkloric and scientific understandings was thus mirrored in Reynolds himself and many of the men who set out to chart these waters.

Wilkes, however, was a man of science, possessing a faith in the precision of nineteenth-century cartographic method to order wilderness. He was the Navy's foremost scientist, which is to say that he had the most surveying experience in a decidedly unscientific corps of officers. To be sure, the Navy knew its navigation. Sextants and compasses, nautical almanacs and charts, and log and lead lines were the tools of the American naval officer's profession, constituting a sophisticated system of knowledge in itself. But surveying with any degree of fidelity to the environment was another matter. Unlike many of his fellow naval officers, Wilkes was a devoted hydrographer, beholden to the belief that the marine environment could and should be understood for commercial purposes. "The reliance to be placed upon hydrographical labors," Wilkes harped to his officers, "depends upon the accuracy of the modes employed in obtaining the results."[14] And he took pains to outline this mode, step-by-step, to his officers. It was a system that would merge speed and precision—in Wilkes' words, "the utmost expedition" and "the greatest attainable accuracy." As a surveyor, this was what differentiated Wilkes from

[13] Reynolds Private Journal, vol.1, March 16 1839, 129; Ibid., March 16, 1839, 125.

[14] On Wilkes, see Charles Wilkes, *Autobiography of Rear Admiral Charles Wilkes, U.S. Navy, 1798-1877,* ed. William James Morgan et al. (Washington, D.C.: Department of the Navy, 1978); Wilkes, *Narrative of the United States Exploring Expedition,* vol. 1, 429.

other officers who, in the course of their voyages, would take a few soundings and sail on. As the Ex. Ex. sailed in August 1838, this forty-year-old lieutenant commanded the largest scientific undertaking of its time, armed with powerful beliefs about the ability of science to represent and order the marine environment on paper.[15]

These beliefs derived from the trigonometric survey, a cartographic method rooted in mathematical certainty that surveyors believed could precisely represent the marine environment on paper. As historians Matthew Edney and D. Graham Burnett have shown, the trigonometric survey represented the cutting edge of nineteenth-century cartography, promising the kind of precision that informed colonialism in India and elsewhere. The survey constructed a series of measured angles taken on points and expanded into interlocking triangles such that the measurement of each could be checked by reference to the others. Mathematical precision thus imparted the survey with scientific authority. Edney and Burnett contend that the trigonometric survey was a powerful tool for controlling nature and people, central to colonial expansion during the nineteenth century. So precise was this method that the map seemed to become the land and the land the map in the cartographic imagination. It was, Edney argues, a "cartographic ideal," part of a larger post-Enlightenment scientific culture whose tools and methods convinced Euro-Americans that they were part of a civilizing force that could understand and thus control the environment.[16]

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[16] Matthew H. Edney, *Mapping an Empire: The Geographical Construction of British India, 1765-1843* (Chicago: The University of Chicago Press, 1997), 21-32; D. Graham Burnett, "Hydrographic Discipline Among the Navigators: Charting an 'Empire of Commerce and Science' in the Nineteenth-Century Pacific," in *The Imperial Map: Cartography and the Master of Empire*, ed. James R. Akerman (Chicago: The University of Chicago Press, 2009), 201-13.

The Americans took the trigonometric survey to sea with them. Wilkes had learned it from Ferdinand Hassler who, as the first superintendent of the United States Coast Survey, directed a comprehensive survey of the American coast. Hassler, though, had spent the better part of his government career charting the eastern seaboard, which still remained incomplete as the Ex. Ex. sailed. Wilkes, by contrast, had little time and a lot of water to cover. His variant of Hassler's method employed the ships and small boats of the expedition in measuring baselines and angles to create a series of imaginary, interlocking angles. Unknown waters and coastlines thus emerged on the chart bracketed by triangles and limned with depth soundings. The survey gave meaning to blank spaces, delineating, quantifying, and confirming or eliminating the ominous navigational warnings that littered so many early nineteenth-century charts of the Pacific.[17]

[17] On Hassler see Richard Stachurski, *Longitude by Wire: Finding North America* (Columbia, SC: University of South Carolina Press, 2009), 4-30; Albert E. Theberge, *The Coast Survey, 1807-1867,* vol. 1 (Silver Spring, MD: National Oceanic and Atmospheric Administration, 1998), http://www.lib.noaa.gov/noaainfo/heritage/ coastsurveyvol1/CONTENTS.html (accessed January 30, 2012).

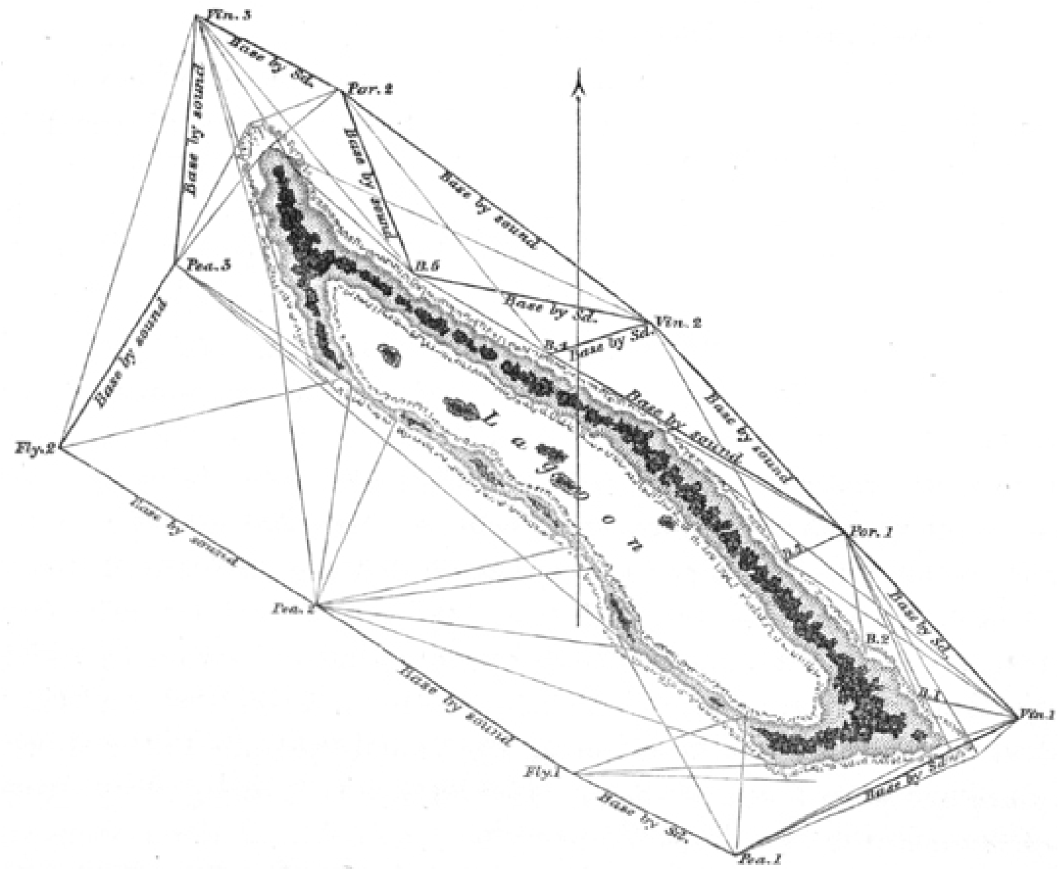

Figure 1: Wilkes' method of surveying coral atolls using the trigonometric method. *Narrative of the United States Exploring Expedition*, vol. 1.

On May 7, 1840, after more than a year of surveying and exploration in Antarctic waters and across the Pacific, the Ex. Ex. arrived in the Fiji Islands, an infamous wilderness second only perhaps to Cape Horn in the American maritime imagination. Spread across ninety-five thousand square miles of the Southwest Pacific, the Fijis existed vaguely on the geographical and ideological periphery, a group whose marine environment and indigenous culture the Americans knew little.[18] Wilkes issued special orders for this survey, urging his men to stay off the beach and to avoid any interaction with the Fijians who were widely rumored to be hostile cannibals. They were "in no case

[18] On cannibalism, literature, and the maritime periphery, see Mary K. Bercaw Edwards, *Cannibal Old Me: Spoken Sources in Melville's Early Works* (Kent, OH: Kent State University Press, 2009).

to be trusted," Wilkes wrote to his officers. "Every precaution must be observed in treating with the natives."[19] The cramped survey boats, useful because their shallow draft could more easily weave among the shoals, now bristled with arms. Blunderbuss, musket, pistol, and cutlass joined sextant and compass in a martial science. This preemptive display struck Reynolds as a particularly ill sign. "You cannot walk about the deck," he noted, "without stumbling over some arrangement of aspect most ominous."[20] The Fijians' reputation preceded them, informed by the Americans' deeply-engrained ideas about the maritime wilderness.

In many ways, the Americans' impressions of the Fijis were in stark contrast to the other island groups that they had visited, highlighting just how central notions about environment and culture were to the wilderness mythos. In the summer and fall of 1839, nearly one year before the expedition arrived in the Fijis, it called at the Tahiti and Samoa groups. Both were in the throes of changes brought about by the increasing presence of Euro-American traders, mariners, and missionaries. Wilkes had admired the progress of civilization at Tahiti, citing literacy and Christianity, as well as architecture that, in his words, resembled no less a symbol of order than the New England schoolhouse. The islands, long a favored port of call for Euro-Americans, had also been relatively well-charted. But as much as this island group impressed Wilkes, to Reynolds the Tahitians

[19] Wilkes to George Foster Emmons, Ovalau, May 12, 1840 in Charles Wilkes, *Narrative of the United States Exploring Expedition during the Years 1838, 1839, 1840, 1841, 1842*, vol. 3 (Philadelphia: Lea and Blanchard, 1845), 404.

[20] Reynolds Private Journal, vol. 1, April 30, 1840, 346.

seemed a disgusting hybrid, adopting the worst characteristics of Euro-American culture while retaining little of the exoticism that made the Pacific so alluring.[21]

Reynolds much preferred the Samoans who had more recently come into the Euro-American maritime world and therefore had kept much of their indigenous romance. Reynolds and his fellow officers were taken with Samoa. It was a maritime “Eden” filled with “dancing nymphs” happy to accompany the Americans on their explorations and to offer places of rest during their boat surveys.[22] Here was wilderness divested of its more terrifying aspects, an idyllic state of nature somewhere on the spectrum between civilized and savage. In Samoa, Reynolds’ views had grown into a belief in cultural relativism. “Who can judge one nation by another?” he wondered as the expedition left Samoa.[23] It was a question that he would soon forget in Fiji. In Tahiti, Samoa, and Fiji, the expedition’s men offered vastly different interpretations of the Pacific’s indigenous people. As Bernard Smith contends in his history of European art and science in Pacific exploration, Europeans (and Americans too) tended to view Pacific islanders variously as ignoble and noble savages, or some combination of the two. Smith attributes these views to the growing presence of European missionaries and scientists.[24] But the American experience adds further complexity to Smith’s argument. Tahiti and Samoa were, to various degrees, incorporated into the Americans’ maritime world, having long ago or more recently shed many of the environmental and cultural dangers

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[21] Wilkes, *Narrative of the United States Exploring Expedition during the Years 1838, 1839, 1840, 1841, 1842*, vol. 2 (Philadelphia: Lea and Blanchard, 1845), 4.

[22] Reynolds Private Journal, vol. 1, 268, 308.

[23] Ibid., August 15, 1839, 200; Ibid., November 15, 1839, 226.

[24] Bernard Smith, *European Vision and the South Pacific, 1768-1850: A Study in the History of Art and Ideas* (Oxford: Clarendon Press, 1960), 317-32.

that the Americans most feared. The Fijis, however, were farther west than these islands. They remained generally outside the Americans' maritime world and thus still retained all the real and imagined dangers of wilderness.

The waters surrounding the Fijis were a labyrinth of uncharted reefs. Many ships had vanished in these waters "for want of a proper survey and sailing directions," Reynolds recorded in his journal. The charts were all poor. One, he remarked, was little more than "a frightful display of rocks and reefs garnished here and there with notices such as 'brig Eliza lost'; 'Am[erican] brig lost;' etc. etc. etc."[25] Another by the British chart-maker Aaron Arrowsmith seemed to Wilkes, "little beyond guesswork. It is impossible," Wilkes complained, "to conceive from which sources it was derived."[26] Wilkes admitted that his own compilation of all the hydrographic information he could obtain was "a very erroneous guide."[27] The few charts that did exist were marked with epitaphs and reported dangers that navigators could neither trust, nor dismiss. An accurate survey, using the trigonometric method, would prove a powerful way to counter the uncertainty and fear that characterized these waters.

[25] Private Journal of William Reynolds, vol. 2, 121, Reynolds Family Papers, Archives and Special Collections, Franklin and Marshall College; Reynolds Private Journal., vol. 1, April 30, 1840, 346.

[26] Charles Wilkes, *Hydrography*, vol. 23 (Philadelphia: C. Sherman, 1861), 148.

[27] Wilkes, *Autobiography*, 455.

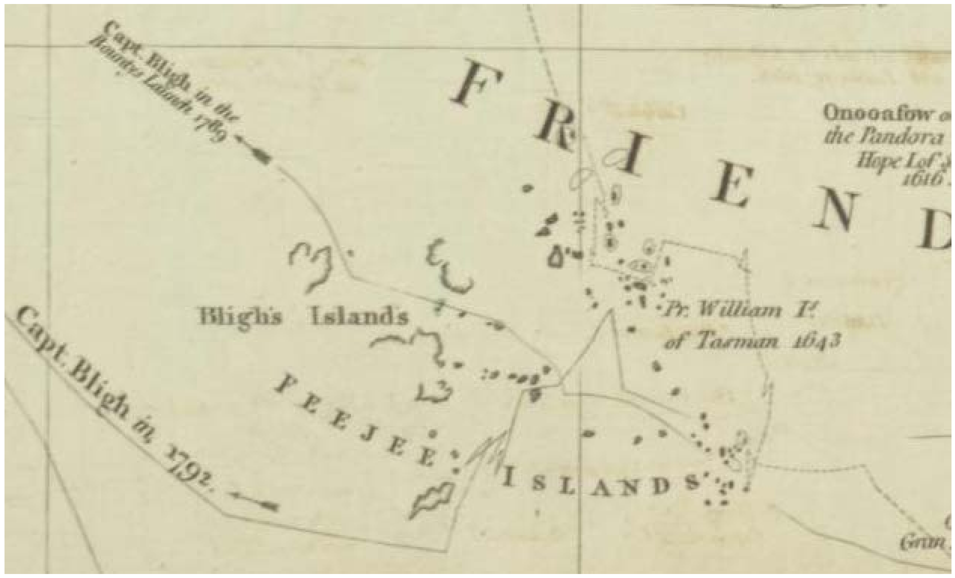

Figure 2: The Feejee Islands, from a section of Aaron Arrowsmith's "Chart of the Pacific Ocean," 1798. Note the half-charted islands as well as the tracks of Bligh, Tasman, Cook and others. Geography and Map Division, Library of Congress.

Fiji's reefs had turned back no less an explorer than Captain James Cook, whom Wilkes and his officers revered. The Americans were constantly mindful of their place on the sea in relation to Cook. As a symbol of Great Britain's preeminence in science, exploration, and naval prowess, Cook was someone whom the Americans wanted to emulate. From the Antarctic to the Fijis, they could claim legitimacy for themselves and their young nation by following in Cook's wake and surpassing those points beyond which the celebrated British explorer would not, or could not, go. This had happened once in the Antarctic in 1839, when the Americans had tried but failed to surpass Cook's Ne Plus Ultra, the point at which he had been turned back by ice in 1774. Wilkes once again invoked Cook's historical presence in Tahiti, where the Americans erected an observatory on Point Venus, the very same spot where Cook and the naturalist Joseph Banks had observed the transit of the planet seventy years earlier. Now, in these dangerous seas where Cook had balked, the Americans sailed on to explore, survey, and claim the Fijis for their nation's mariners. In the context of Euro-American rivalry in the Pacific, it was the Americans who were staking their claim to Fiji and to the glory and honor associated with science and exploration in uncharted waters.[28]

More than these navigational dangers, however, the Fijis were widely feared to be the haunt of the cannibal, that quintessential archetype of the wilderness. To sailors of this period, the group was known as the Cannibal Isles, which perhaps was as much a manifestation of the unknown as it was reflective of any hard evidence. This fear informed the Americans' impressions from the start. "From what I have seen and heard, I think they are the most treacherous and cowardly people on the face of the Earth," remarked Passed Midshipman George Colvocoresses.[29] He was not alone. "I do not like these people," Lieutenant George Foster Emmons wrote of the Fijians, "they are ugly, disgustingly dirty, and cannibals besides."[30] Colvocoresses and Emmons, no doubt, had heard the many yarns spun about the Fijis. Probably little could have changed their minds, so fixed was the idea that this place, with its uncharted reefs and savages, was a wilderness. Environment and culture merged in the mind. The unknown waters seemed to lend credence to the claims that the Fijians, in fact, might actually eat one another and, worse still, that they might eat Americans. "The people are generally believed to be ferocious cannibals," Reynolds observed, "and the numerous reefs and shoals and labyrinths of rocky passages among the cluster are so many snares for the seaman's

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[28] On the precedents of exploration and what D. Graham Burnett has termed "metalepsis," see Burnett, *Masters of All They Surveyed: Exploration, Geography, and A British El Dorado* (Chicago: The University of Chicago Press, 2000), 39; also, Philbrick, *Sea of Glory*, 132.

[29] Journal of George M. Colvocoresses, May 22, 1840, 156, WA MSS 101, Box 1, Beinecke Rare Book and Manuscript Library, Yale University, New Haven, CT.

[30] Journal of George Foster Emmons, May 9, 1840, WA MSS 166, Box 2, Beinecke Rare Book and Manuscript Library, Yale University.

destruction."[31] Reefs and cannibals were thus mutually reinforcing specters of the wilderness such that the Americans rarely considered one without referencing the other. After a week of surveying, Reynolds grumbled, "well we are among the Fijis and have not been killed, nor eaten, nor wrecked yet."

WILD FEEJEE MAN.

Figure 3: Wild Feejee Man. *Narrative of the United States Exploring Expedition*, vol. 3

The survey, therefore, would be more than hydrographic as the Americans set out to chart both Fiji's environment and its culture into the expedition's collected knowledge. Reynolds' first impression is most telling. "The natives began to appear on the beach," he wrote, "and we took our first look at the Feejees—the *survey* was unsatisfactory—for they were ill-looking beyond conception" [italics added]. It was perhaps not coincidental that Reynolds couched his cultural observations in hydrographic terms. Indeed, the men held the question of cannibalism to be one of the survey's most pressing concerns.

[31] Reynolds Private Journal, vol. 1, 346; Ibid., May 16, 1840, 348.

Reynolds wrote that they were all “anxious to have the thing settled without a doubt.”[32] It was an aspect of the wilderness that both fascinated and terrified them. Cultural questions, and cannibalism in particular, entered the pages of the men’s journals and the expedition’s official narrative interspersed with the soundings, baselines, and angles of naval hydrography, representing an extraordinarily broad inquiry into the Pacific world.

But the Americans’ fascination with cannibals also served the practical goals first outlined by Secretary Paulding. Despite the dangers, the Fijis had commercial potential. By the 1830s, Americans were coming there to collect sandalwood, to fish beche-de-mer, and to repair and resupply their ships. “America is a familiar term on every one’s mouth,” Reynolds observed. They were coming to the islands so often that the Fijians apparently thought of them as “their natural customers.”[33] Of course, Americans came at their own peril. When the Ex. Ex. arrived, the islands were still abuzz with the tragedy of the *Charles Doggett*. In 1834, the American brig had been fishing beche-de-mer when eight of its crew were ambushed and killed by a group of Fijians led by the chief Vendovi. One was apparently eaten outright. The survivors bartered for the bodies of the others, which they buried at sea. But, in a gruesome turn, the corpses had floated to the surface and fell again into the hands of the Fijians who “devoured them all,” according to the information Wilkes gathered.[34] The attack on the *Charles Doggett* was only the most recent event to underscore the dangers that mariners faced in the Fijis, and it set the tone for the remainder of the survey. But it also pointed to a simple truth about the practical

[32] Reynolds Private Journal, vol. 1, August 14, 1840, 350; Reynolds Private Journal, vol. 2, 12.

[33] Reynolds Private Journal, vol. 2, 121.

[34] Wilkes, *Narrative of the United States Exploring Expedition during the Years 1838, 1839, 1840, 1841, 1842*, vol. 3 (Philadelphia: Lea and Blanchard, 1845), 103-05.

benefits to be achieved through the expedition's work. A better understanding of the marine environment and Fijian culture would perhaps save mariners from a grisly fate.

So too would diplomacy, and Wilkes immediately sought to establish commercial regulations with several Fijian chiefs to benefit the mariners and traders following the Ex. Ex to the Fijis. In the early nineteenth century, statecraft was as much the purview of the naval officer as the diplomat, and, in places like Fiji, Wilkes represented the military, diplomatic, and scientific authority of the United States in one. Indeed, he would draw on all three to bring order to the Fijian wilderness. On May 13, Wilkes welcomed Tanoa, the most powerful chief in Fiji, aboard his flagship, the sloop *Vincennes*. He had the ship dressed out in flags and the men in their uniforms; he paraded the ship's Marines and fired its cannon. Adorned in all the pomp and regalia of an American man-of-war, *Vincennes* itself symbolized the order that Wilkes hoped to impress and impose on the chief. It was the kind of display, Reynolds observed, "that always pleases a savage."[35] Indeed, Tanoa appeared impressed by the demonstration and not a little frightened. Of course, Wilkes hardly minded if he had struck fear in the chief while extending these obligatory honors. Tanoa affixed his mark to the treaty the following day.[36] The regulations were simply another form of order that, along with the expedition's charts and texts, recast the Fijian wilderness as a safe and profitable place for American commerce.

The regulations, of course, benefited the Americans. They could now appoint a consul to preserve order, broker disagreements, and represent American interests. They could expect that their citizens and shipwrecked sailors would be given safety and

[35] Reynolds Private Journal, vol. 1, 358.

[36] Wilkes, *Narrative*, vol. 3, 54-59.

protection by and from the Fijians. Shipmasters could also count on the Fijians' help in corralling deserters, a particular problem in the rough, exploitative world of nineteenth-century maritime labor. But Wilkes conceded several points to the Fijians. Masters whose ships called in Fiji would be expected to pay port and pilot fees, and it would be illegal to bring alcohol ashore. Wilkes had thus established the basis for an American-Fijian commercial relationship that addressed, through diplomacy, many of the concerns mariners, missionaries, and, indeed, the American government faced in the islands.[37]

Wilkes, meanwhile, began the survey on Ovolau, home to a small Anglo-American community and also to vistas from which the officers and men could orient themselves to the coming survey. Wilkes always began his work this way. He wanted his men, who would soon disperse among the islands, to consider their individual roles as part of the larger survey and to get a sense of the surrounding waters for themselves. Orientation, of course, was central to the trigonometric survey. It was the point on which transformation from wilderness to order began. "Desirous of fixing some of the main points in my own mind, as well as in that of the officers," Wilkes led his surveyors to the island's summit, which afforded sweeping views of the surrounding islands and reefs. These "could be traced for miles," Wilkes wrote of the view, "and every danger that could in any way affect the safety of a vessel was as distinctly marked as though it had been already put upon our charts."[38] The men had yet to take a sighting or measure a baseline in the Fijis, but the imaginative transformation had already begun. From this vantage atop Ovolau, the surveyors had quite literally raised themselves above the

[37] Ibid., 408-09.

[38] Wilkes, *Narrative*, vol. 3, 49-51.

wilderness. As Wilkes suggested, it was as if the sea itself had become the chart and the Americans, the omnipotent navigators, looking down on it. Such was the power of exploration to merge representation with reality in the mind.

But surveying involved more than sketching tropical panoramas, rather the trigonometric method was a complex science, demanding discipline, precision, and choreographed cooperation among men and boats. As D. Graham Burnett has written, naval discipline lent itself particularly well to the demands of the trigonometric survey, and it reflected the order that the Americans sought to impose.[39] By the time they set to work in the Fijis, the men knew the routine. Wilkes' directions had his officers command small whaleboats or launches manned by six to ten sailors, stocked to the gunwales with compasses, sextants, theodolites, and weapons. Working in pairs, with a larger ship of the expedition, or alone, these boats wove their way among Fiji's reefs and islands. The officers measured angles, sounded for depths, and calculated distances. They returned their observations to their commanding officers at the end of a day or week's surveying. Wilkes then anchored the many sub-surveys to the whole by a central position of latitude and longitude taken by astronomic observation from a makeshift observatory on Ovolau. The whole process was thus a complex orchestration—signal flags aflutter, boats tacking, and officers busily taking azimuths, barking orders, and jotting calculations. The Americans were certain that such attention to hydrographic practice assured precision and, by extension, the degree to which the chart could be trusted to reproduce the marine environment on paper.[40]

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[39] Burnett, "Hydrographic Discipline Among the Navigators," *The Imperial Map*, 216.

[40] See Ralph E. Ehrenberg, John A. Wolter, and Charles A. Burroughs, "Surveying and Charting the Pacific Basin," in *Magnificent Voyagers: The U.S. Exploring Expedition, 1838-1842*, Viola and

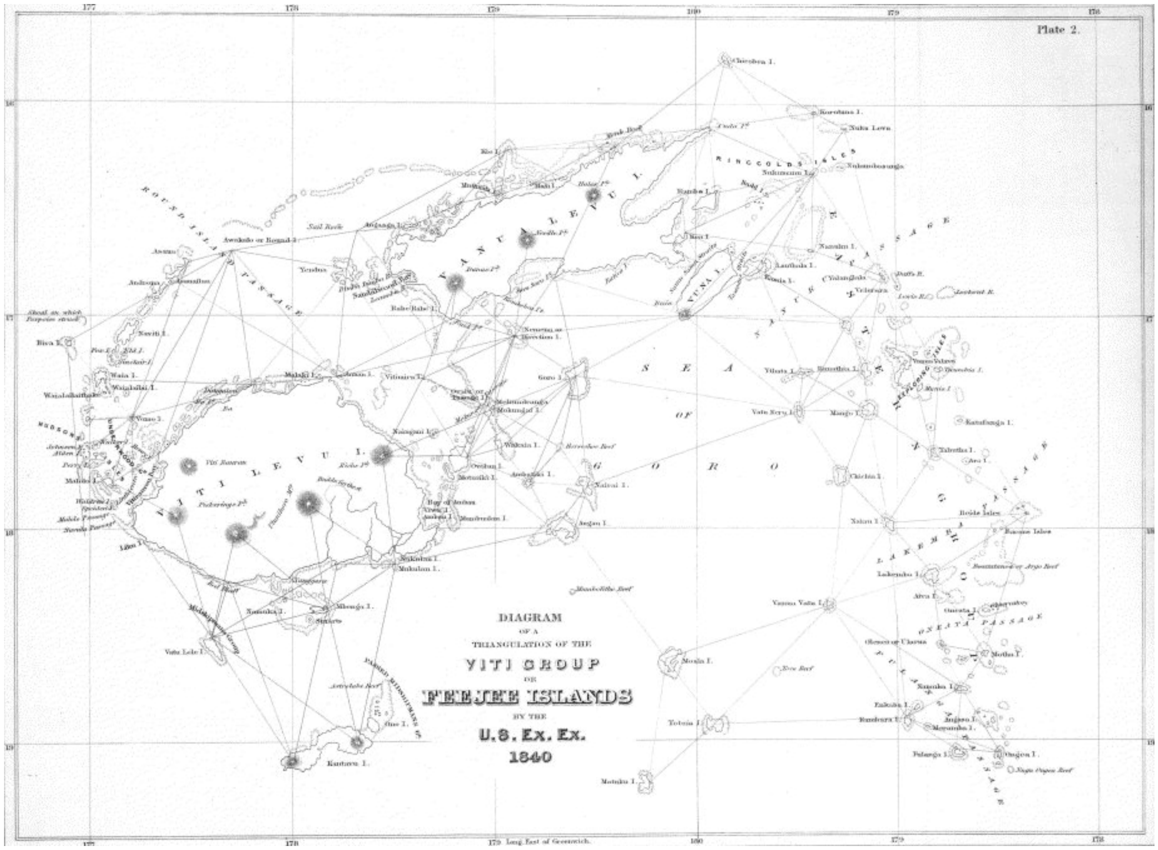

Figure 4: Diagram of the Triangulation of the Viti Group or Feejee Islands, Charles Wilkes, *Hydrography*, vol. 23

Orders in hand, the Americans struck out across the Fijis to chart hazards and safe passages for maritime navigation. Lieutenant Cadwalader Ringgold in the brig *Porpoise* had already begun a survey of the Laus, a group to the southeast of Fiji's main islands. "In discharging this duty," Wilkes ordered Ringgold, "I would call your attention particularly to the necessity of great accuracy in the bearings of the different islands, shoals, and reefs." The chart accompanying these orders was, in Wilkes' words, really "only an apology for one. All due caution is necessary in sailing over space that you have

Margolis, eds. (Washington, D.C.: Smithsonian Institution Press, 1985), 164-87; Stanton, *Great United States Exploring Expedition*, 6; Wilkes, *Hydrography*, 4; Wilkes, "Mode of Surveying the Coral Islands" in *Narrative*, vol. 1, 429-432; Wilkes, *Hydrography*, 5-13; Philbrick, *Sea of Glory*, 119-122.

not already explored."[41] Wilkes, meanwhile, ordered boats from *Vincennes* to survey the northern coast of the large island Viti Levu. Another survey under the direction of Lieutenant George Foster Emmons proceeded along the southern coast. They then turned to Vanua Levu, the second of Fiji's two large islands. The schooner *Flying Fish*, meanwhile, headed north of Viti Levu to chart the string of small islands there. Explicit orders from Wilkes accompanied each sub-survey, identifying the reefs and harbors that required special attention, reminding his officers of the need for precision, and urging caution in all cases.[42]

For three hot, mosquito-infested months, the ships and boats worked among the islands to the benefit of mariners who would follow in the expedition's wake. With his boats off Viti Levu, Emmons found one harbor "clear of shoals." He noted that it was "a good holding ground . . . well sheltered" with "ease of access and egress" and "an abundance of wood and water."[43] Other officers reported similar discoveries. Mariners coveted this kind of environmental knowledge. Indeed, Wilkes acknowledged the survey's potential to construct the sea as a navigable commercial space. Where "many of [Fiji's] fine harbors have never been visited," Wilkes hoped that the finished chart would call attention to the group's "well-sheltered and commodious harbors" and the "large number of anchorages and passages through the reefs."[44] Lieutenant George Sinclair later remarked that the Fijis were "as well surveyed as any group in the Pacific," though,

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[41] Wilkes to Ringgold, Tongataboo, May 4, 1840 in Wilkes, *Narrative of the United States Exploring Expedition*, vol. 3, 400-02.

[42] Ibid., 400-31.

[43] Emmons Journal, Box 2, May 19, 1840.

[44] Wilkes, *Hydrography*, 8.

hedging, he cautioned, “I would advise navigators to keep their eyes open when running in this group, even if they should have a cargo of charts aboard.”[45] Invoking the cartographic ideal, Emmons hoped that the Fijis “may hereafter find their *true position* on the charts.”[46] The survey seemingly brought order to stretches of reef-strewn sea that were once largely unknown. With chart in hand, the mariner could re-imagine the Fijis, not as a wilderness, but as a refuge.

Figure 5: A section from the expedition’s chart of the north side of Vanua Levu showing depth soundings along the lines of triangulation and a note to mariners, “the passages through these reefs are all safe.” Geography and Map Division, Library of Congress.

[45] Lieutenant George Sinclair quoted in Stanton, *Great United States Exploring Expedition*, 213.

[46] Emmons Journal, Box 2, August 11, 1840.

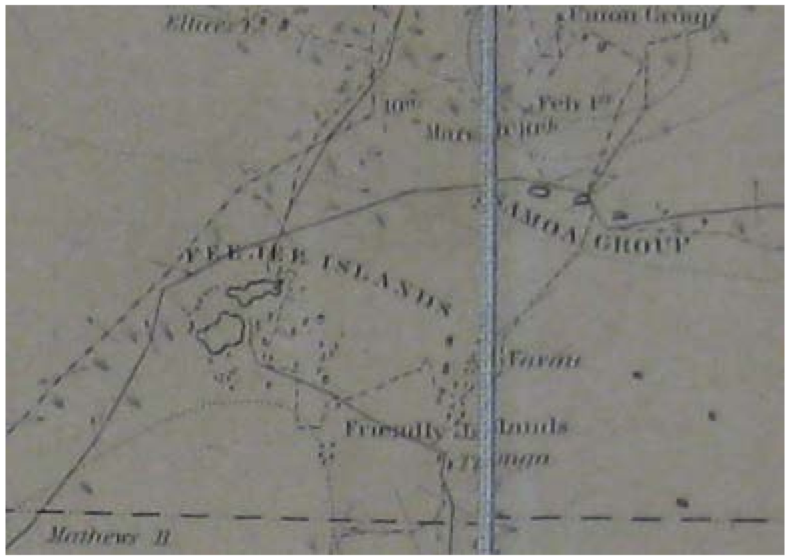
But despite careful attention to method, the Americans encountered environmental and human challenges that belied the accuracy of their survey. The sea itself was perhaps the greatest obstacle to realizing the kind of precision that the trigonometric method promised in theory. The space was simply too vast, the dangers too numerous, the time too short, and the environment too dynamic to accomplish a comprehensive and precise survey. “We were absent . . . ten days,” wrote Lieutenant George Sinclair, regarding one particular sub-survey, “but were not able to do more than half the work that was allotted to us for the simple reason that it was more than twice as much as it was possible to do in that time.”[47] Faced with surveying a maze of reefs, he shrugged, “it would have required an age to fix them all and sound out at the same time.” Meeting the same frustration, Emmons simply accepted the futility of the work. “By dark, our survey was completed—not indeed as I should wish—but as well as the time allowed would permit and well enough for all practicable purposes.”[48] These were hardly testaments to hydrographic precision. Indeed, even as the expedition departed the Fijis in August, Wilkes ordered *Flying Fish* to return. “Captain Wilkes found that he had neglected fixing a certain island upon which much of the survey depended,” Reynolds remarked.[49] The expedition thus worked under constraints, environmental and other, that belied the power of science to precisely represent the marine environment. The charts would be useful—indeed, they were better than any others—but they could not ultimately meet the lofty ideals of cartographic science. Of course, the finished charts conveyed

[47] Journal of George T. Sinclair, May 11, 1840, Records Relating to the U.S. Exploring Expedition, NA 314, Roll 21, National Archives and Records Administration, Washington, D.C.; Burnett, “Hydrographic Discipline,” *The Imperial Map*, 248.

[48] Emmons Journal, Box 1, October 24, 1839.

[49] Reynolds Private Journal, vol. 2, 129.

neither Emmons' frustrations nor Wilkes' miscues. Bearing the authority of the United States Exploring Expedition, these charts were powerful, if flawed, testaments to nineteenth-century imperial science and, ultimately, the extent to which humans could understand, control, and represent the marine environment.



Figures 6 and 7: At left, a section from the expedition's "Chart of the World," showing the Feejee Islands and the track of the expedition. Note the contrast between this and Arrowsmith's chart on page 73. At right, the seal of the Ex. Ex. as it appeared on the "Chart of the Viti Group, or Feejee Islands," bearing the scientific and naval authority of the United States. Geography and Map Division, Library of Congress.

Indeed, the dynamism of the sea meant that cartographic precision was impossible. The chart could never hope to represent an environment in constant motion. Ocean tides and storms perpetually remade coastal waters, to say nothing of the difficulty of taking accurate measurements on unstable boats. “It was difficult in the extreme to make the observations,” Reynolds groused, “the compass whirled like a top from the jumping motion of the boat . . . the seas that broke over us drenched all hands, and were sure to come as I was putting pencil to paper. We could scarce preserve our equilibrium on our seats—it is damnable.”[50] The midday sun left the brass sextants so hot that they were almost unworkable by bare human hands, and the men suffered from almost constant wont of food and sleep in the cramped boats.[51] The Fijians themselves stole instruments and boats and dismantled signal flags. The Fiji survey thus progressed with little resemblance to the system that Wilkes had drawn up in his orders.

But the most elusive aspect of the Fijian wilderness remained the cannibal, and so the officers went about their survey intent on settling this question once and for all. The prospect of cannibalism had animated the men from the beginning. “When we first came to the islands,” Reynolds wrote, “we made particular inquiries about the existence and prevalence of cannibalism among the people.”[52] On July 2, in the midst of the survey, the crew of the brig *Peacock* witnessed what Wilkes and others believed to be compelling evidence. In Naloa Bay north of Viti Levu, the sloop’s crew encountered two Fijian canoes. One contained a skull “yet warmed from the fire . . . and marked with the teeth of

[50] Reynolds Private Journal, vol. 1, 236.

[51] Stanton, *Great United States Exploring Expedition*, 196-97.

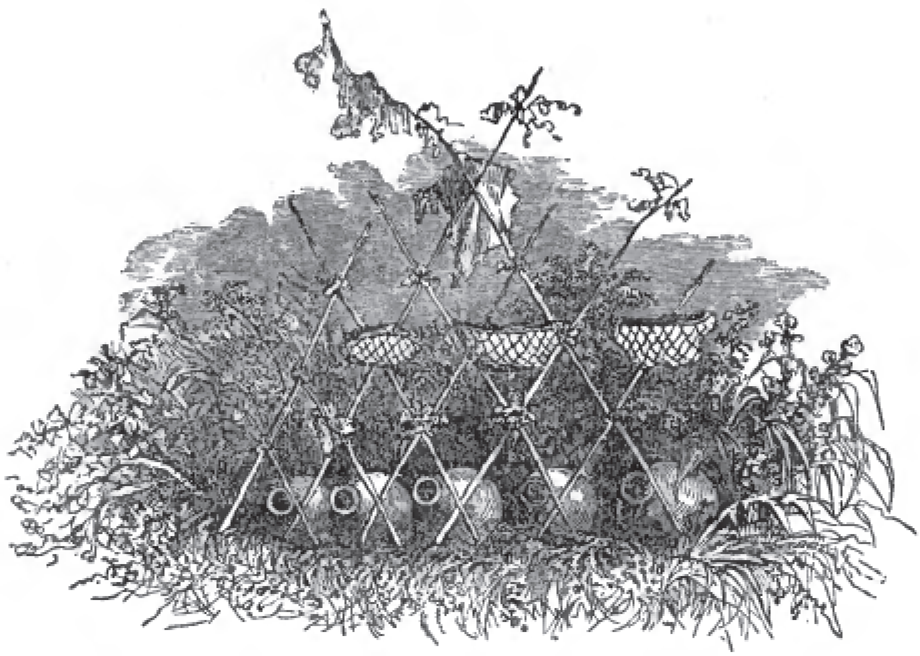
[52] Reynolds Private Journal, vol. 2, 12.

those who had eaten of it" and the other "some roasted flesh." To the men's disgust, one Fijian chewed an eyeball. This "placed it beyond all doubt," Wilkes thought.[53] Frederick Stuart, captain's clerk aboard the *Peacock*, agreed. "Just from what we have seen and heard, and secondly from the phrenological evidence," he concluded, "we have too strong proof."[54] The skull, procured as a specimen of science, joined other discoveries of cannibal cooking pots and charred bones as seemingly irrefutable evidence. Wilkes therefore concluded in his *Narrative* that cannibalism in Fiji was "practiced from habit and taste. So highly do they esteem this food," he was certain, "that the greatest praise they can bestow on a delicacy is to say that it is as tender as a dead man." Whether the Fijians were actually cannibals and, if so, for what purpose, is another question.[55] There is no doubt, however, that cannibalism fascinated the Americans like nothing else.

[53] Wilkes, *Narrative of the United States Exploring Expedition*, vol. 3, 234-35.

[54] Journal of Frederick D. Stuart, May 8, 1840, "Remarks on Bitileb," Records Relating to the U.S. Exploring Expedition, NA 313, Roll 20, NARA.

[55] Greg Dening, *Islands and Beaches: Discourse on a Silent Land, Marquesas, 1774-1880* (Honolulu: University Press of Hawaii, 1980); Gananath Obeyesekere, *Cannibal Talk: The Man-Eating Myth and Human Sacrifice in the South Seas* (Berkeley: University of California Press, 2005), 155; Bercaw Edwards, *Cannibal Old Me*, 92-93.



CANNIBAL COOKING-POTS.

Figure 8: Surveying cannibalism in the Fijis. *Narrative of the United States Exploring Expedition*, vol. 3.

On July 23, however, as the survey was drawing to a close, the Americans' collective fears about the Fijian wilderness became horribly real. On the island of Malolo, Fijians killed two American officers, Lieutenant Joseph Underwood and Midshipman Wilkes Henry—nephew of the commander—as they landed their surveying boat to barter for food. In a confused scuffle, the Fijians bludgeoned the officers to death before nearby boats could come to their aid. To Wilkes, this was a personal blow and one that seemed to undermine the very order that he and his men had worked so long to establish by scientific and diplomatic means. It was another sign that the Fijis would not easily be brought into the American maritime world.

Figures 9 and 10: At left, an illustration of Henry's Island with the schooner *Flying Fish* in the foreground. *Narrative of the United States Exploring Expedition,* vol. 3. At right, the cartographic act of naming as it appeared off the coast of Viti Levu. Note, from left to right, Emmons Island, Reynolds Island, and Henry Island in Underwood's Group. Geography and Map Division, Library of Congress.

At stake was the question of who would control the sea and the human and material flotsam that washed up from the beach. The Americans, by chart and treaty, were in the process of claiming these waters for themselves, proceeding from the assumption that the Fijis would become a safe commercial space for American ships. But such a notion was antithetical, and perhaps alien, to the Fijians. Their culture dictated a different set of beliefs. As Wilkes' men were learning, the Fijians would deem any object washed up on their shores as divinely sent—"an offering to the gods. All that it contained," recorded Passed Midshipman Colvocoresses, "is considered as belonging to the people of the district where the accident happens."[56] This, of course, represented a vexing problem for American traders, shipwrecked sailors, and a distant government trying to protect them. The Americans entered seas already governed by indigenous meanings to say nothing of European claims of exploration, but they nevertheless proceeded to survey and chart the marine environment with little regard for contrary and

[56] Colvocoresses Journal, July 12, 1840, 162.

competing ideas. Indeed, cartographic science and the wilderness mythos assumed that uncharted waters were little more than a blank space on which American explorers and surveyors could impose their own meanings.[57]

Incensed and determined to teach the Fijians a lesson, Wilkes drafted orders to raze the wilderness and compel the Fijians into submission. Command of the punitive force fell to Lieutenant Ringgold with directions from Wilkes that “every man or native capable of using a club, or stone is to be destroyed.”[58] On July 24, Ringgold set out with three divisions of seamen and Marines in a scorched earth march across Malolo, but not before *Flying Fish*, which Wilkes ordered to cover the landing, promptly grounded on a shoal. The Americans pressed on, setting fire to coconut groves and yam fields and flattening two villages. At the village of Sualib, the Fijians mustered a concerted defense behind ditches and palisades, but the assault of American musketry and Congreve rockets proved overwhelming, and they fled into the jungle. Nearly one hundred Fijians perished; all but one injured American emerged unscathed.[59] The expedition had reduced the villages to smoldering ruin. “Everything contained within the walls was utterly destroyed,” remarked Assistant Surgeon Silas Holmes, “it being the object . . . to make the island desolate.”[60] The brutality of the attack, of course, reflected the anger and sadness shared by the men in response to the murder of their shipmates. But it was also a bitter climax to the more general weariness they had experienced, working for two and a

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[57] Greg Dening, “Deep Time, Deep Spaces: Civilizing the Sea,” in *Sea Changes: Historicizing the Sea*, ed. Bernhard Klein and Gesa Mackenthun (New York: Routledge, 2004), 13-36.

[58] Wilkes, *Narrative of the United States Exploring Expedition*, vol. 3, 424.

[59] On casualties see Wilkes, *Narrative of the United States Exploring Expedition*, vol. 3, 281 and Emmons Journal, Box 2, July 28, 1840.

[60] Journal of Silas Holmes, July 26, 1840, WA MSS 260, vol. 2, Beinecke Rare Book and Manuscript Library, Yale University.

half months in a trying marine environment under almost constant fear of Fijian attack. The survey had turned deadly and Wilkes, in desperation, had turned his expedition into a military force capable of imposing the order that had otherwise eluded him through scientific and diplomatic means.

Thus, the attack on Malolo should be considered as part of the expedition's intent to bring order to a wild marine environment—a logical, terrible extension of the survey—rather than some military aberration in an otherwise peaceful scientific expedition. Malolo, of course, had historical precedents in a muscular naval defense of American lives and commerce in the Pacific, but, in the context of the expedition, it was more than this.[61] Wilkes, who felt compelled to defend his actions on Malolo, later claimed that "the punishment was sufficient and effectual." Not surprisingly, he cited as justification both the safety of "our countrymen on their adventurous voyages" and the Fijians' "horrid appetite for cannibal repasts."[62] Wilkes had used the military power of his scientific expedition to bring order to Fiji even as his surveyors worked toward a similar end offshore. When a delegation of Fijian survivors met Wilkes on the afternoon of the twenty-fourth, asking for mercy and an end to the violence, they advanced toward the Americans on their hands and knees. Their leader, Wilkes wrote with obvious satisfaction, "begged pardon, supplicating forgiveness, and pledging that they would never do the like again to a white man." The attack had proved its worth to the Americans. "Such has been its effect on the people of Malolo," Wilkes later recalled, "that they have since been the most civil, harmless, and well-disposed natives of the

[61] Kenneth Hagan, *This People's Navy: The Making of American Sea Power* (New York: Free Press, 1991), 102.

[62] Wilkes, *Narrative of the United States Exploring Expedition*, vol. 3, 284.

group."[63] On Malolo, the Americans could more easily remake the Fijian environment, and they did so with devastating effect. Science, environment, culture, and military force thus converged in the Fiji survey. War was simply another means of conquering wilderness and furthering American commercial interests.

But more than naval combat, the Fiji survey proved that it was naval science that was transforming the sea at mid-century. For the maritime world, nothing was as important as the charts themselves. Facing several courts-martial and political intrigues after the expedition returned to New York City in the summer of 1842, Wilkes went to work on the charts, believing that they would seal the expedition's legacy in the annals of navigation, science, and exploration. The charts, he wrote, were "the best encomium I can bestow on the united work of the officers and men."[64] There were one hundred eighty of them, taken from 236 surveys, bound in a two volume Hydrographic Atlas.[65] They covered waters that spanned the length of the Pacific from Tierra del Fuego to the Philippines, guiding mariners to safe channels through reefs, to fresh water, and, in some cases, away from cannibals. They represented the collected knowledge of four years of surveying and exploration set down in the graticule of latitude and longitude, bracketed by triangles, quantified in depth soundings, and emblazoned with the seal of the United States Exploring Expedition. For an American maritime community reaching its pinnacle in size, wealth, and power, the expedition and its charts might dispel wilderness with science—a powerful testament to American commercial intentions in the Pacific.

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[63] Ibid., 281, 285.

[64] Wilkes, *Narrative of the United States Exploring Expedition*, vol. 1, xvii.

[65] Ehrenberg, "Surveying and Charting the Pacific Basin," *Magnificent Voyagers*, 174; Philbrick, *Sea of Glory*, xix.

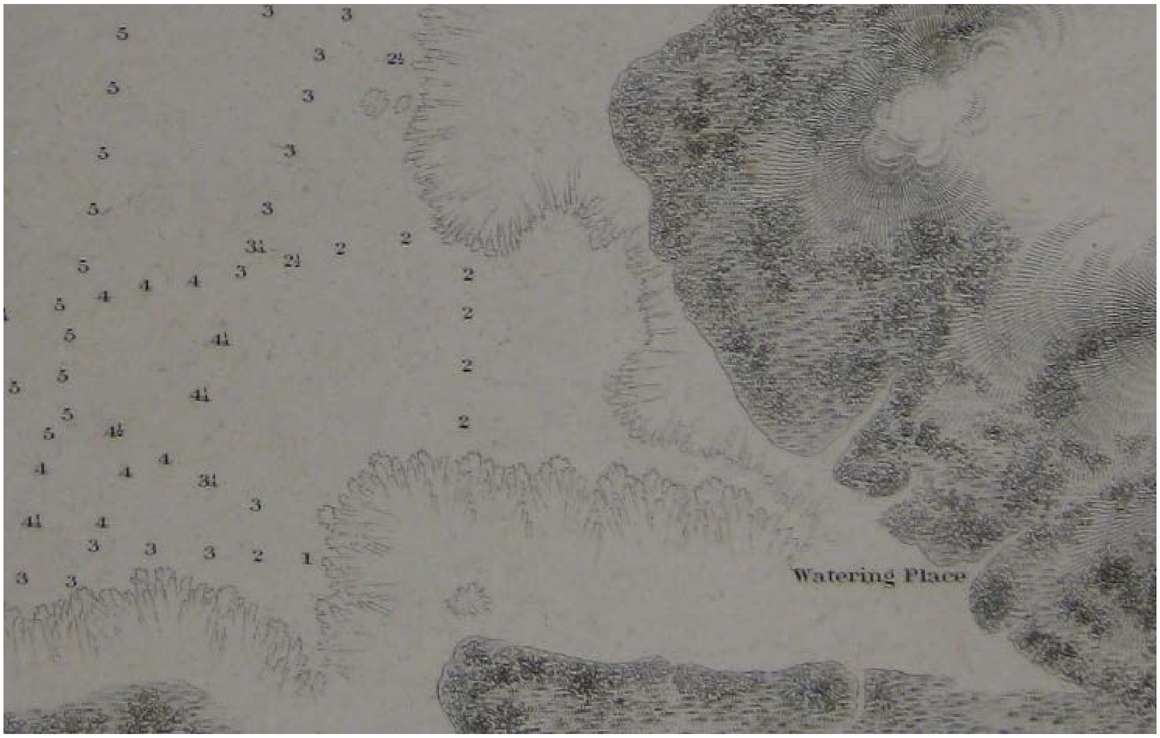


Figure 11: Fresh water and soundings in fathoms from a section of the chart of Vanua Levu. Geography and Map Division, Library of Congress.

But the charts themselves were full of meanings that transcended the prosaics of maritime navigation. Amid so many indigenous places, the navigator saw Reynolds Island, Reynolds Peak, Emmons Island, and a multitude of others so that every officer had himself a place in this cartography of exploration. The Ex. Ex. was staking claim to the Pacific by name, which, of course, had always been the prerogative of the explorer regardless of other, preexisting meanings. Often, particular islands went by any number of conflicting eponyms, reflecting the often confused mingling of maritime interests. There was also Disappointment Bay, Useless Bay, the Adventure Isles, and Murderer's Bay, which suggested to mariners something of the tenor of voyaging in these waters. The Fiji chart bore Henry Island in the Underwood Group in memory of the officers who had been slain there. A chart of the Paumatu Islands of the Southeast Pacific, printed in the pages of the official narrative, even attempted to capture the process of cultural transformation. On it, two dotted lines bisect the archipelago, marking the farthest reaches of the missionaries and the supposed remnants of cannibalism. It is a fascinating artifact of exploration that illustrates the convergence of environment, science, and culture. It demonstrates at once the power and the limitations of the nautical chart to precisely and unambiguously order such a complex environment. But if these cartographic narratives stuck, and some did, the expedition's charts represented powerful claims to control by imposing meaning over waters that previously had been little more than blank spaces on the chart.[66]

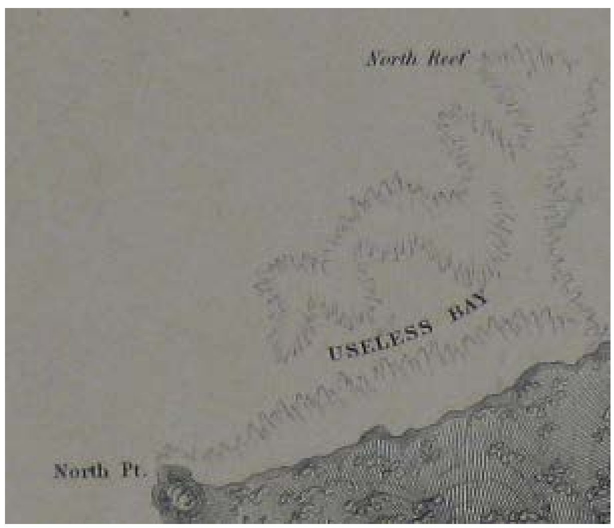
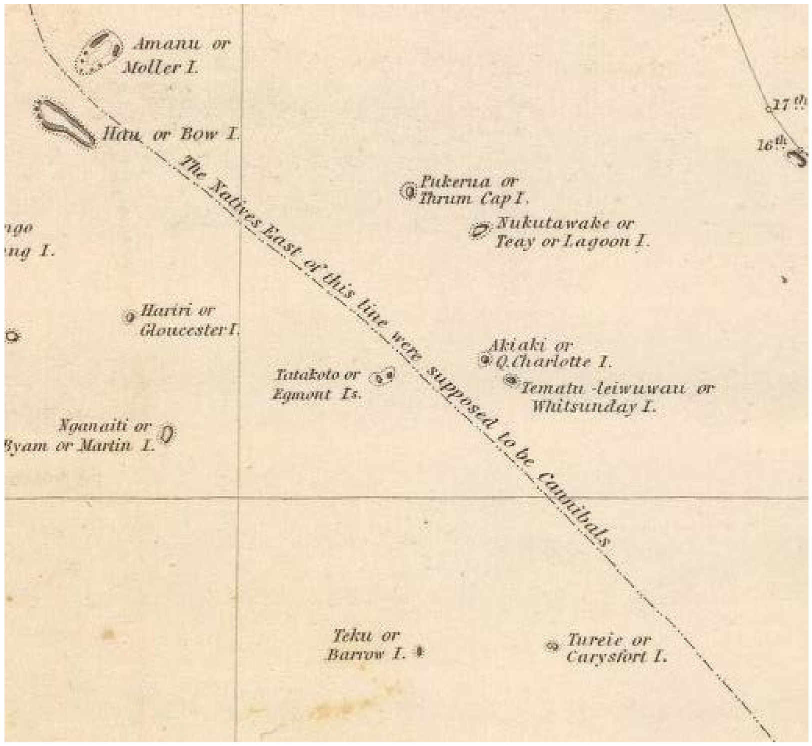
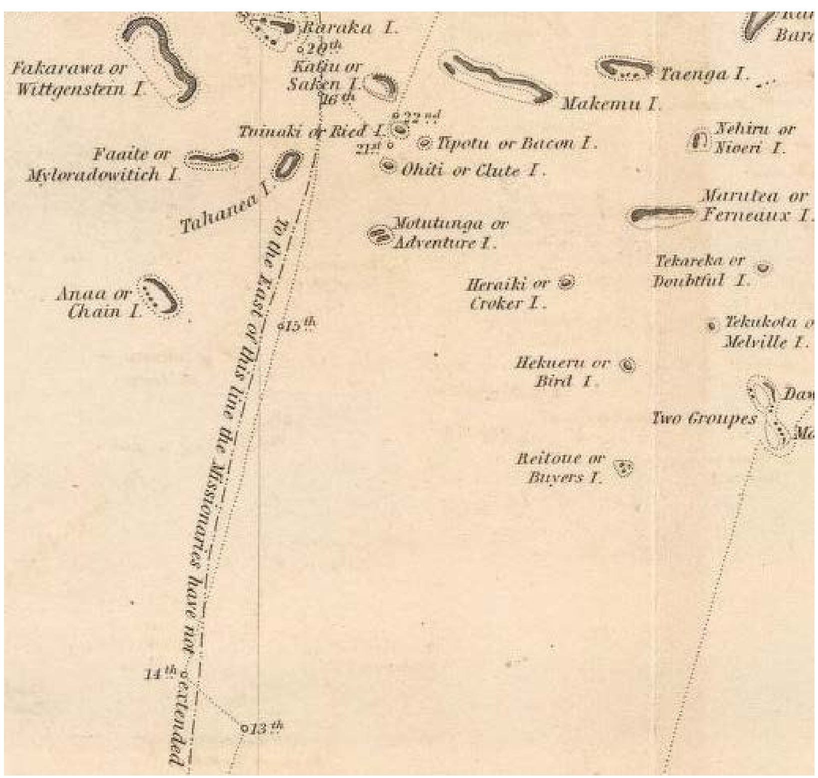


Figure 12: Cartographic Narratives. Useless Bay off the island of Goro—useless, perhaps, because it is surrounded by reefs and exposed to the sea. Geography and Map Division, Library of Congress.

[66] On creating place out of space, see Yi-Fu Tuan, *Space and Place: The Perspective of Experience* (Minneapolis: University of Minnesota Press, 1977).





Figures 13 and 14: Charting cultural change in missionaries and cannibals on a chart of the Paumatu Islands. *Narrative of the United States Exploring Expedition*, vol. 1.

The expedition's twenty-one volumes of text—a four-book narrative and seventeen scientific volumes—represented still another claim of control over nature. The expedition's natural history collection, which became the basis for the Smithsonian Institution, numbered nearly sixty thousand specimens. The scientific books on zoology, botany, conchology, crustacea, geology, and ethnology among others, set down the strange flora and fauna of the Pacific World in beautifully illustrated plates while the texts organized the natural world in the Linneaen tradition of classification—itself a powerful act of control over nature.[67] "I shall cease attempting to describe scenes or objects," Reynolds admitted, "which will appear with all their peculiarities in a glance at the plates."[68] All this came together in *The Official Narrative of the United States Exploring Expedition*, written by Wilkes and published in 1844. Sprawling and uneven, the narrative is nevertheless a remarkable document that demonstrates the Americans' intense interest in all aspects of the Pacific World. But like the charts, Wilkes intended the narrative to be practical. It would "afford an accurate view of the facilities as well as the difficulties" that the mariner might expect amid the islands of the Pacific. Referring to the narrative's third volume, which covered the Fiji survey at length, Wilkes presumed "that no navigator will visit this interesting group without possessing that work."[69] Once again, science took on practical value. The mariner, Wilkes hoped, would draw on the

[67] Donald Worster, *Nature's Economy: A History of Ecological Ideas*, 2nd ed. (New York: Cambridge University Press, 1994), 31-55; David Igler, "On Coral Reefs, Volcanoes, Gods, and Patriotic Geology: Or, James Dwight Dana Assembles the Pacific Basin" *Pacific Historical Review* 79 (February 2010): 23-49; Barry Alan Joyce, *The Shaping of American Ethnography: The Wilkes Exploring Expedition, 1838-1842* (Lincoln: University of Nebraska Press, 2001).

[68] Reynolds Private Journal, vol. 1, 243.

[69] Wilkes, *Hydrography*, 150.

unprecedented breadth of the expedition's discoveries—environmental and cultural—to navigate the marine environment and expand American commerce in the Pacific.

The voyage of the United States Exploring Expedition lasted just four years, but it was nevertheless a transformative moment in the history of the Pacific world and, not coincidentally, for American maritime expansion as well. The Ex. Ex. had charted waters, chastened islanders, and razed villages, turning the Pacific Ocean from a relatively unknown ocean wilderness into a more ordered commercial world set down in texts and illustrations of science and in the trigonometrics of naval hydrography. Indeed, these were powerful ways for mariners to understand and use the sea. But for all its power and precision, these charts and texts could never quite capture the dynamism of the marine environment. Indigenous islanders, meanwhile, undid, undermined, and otherwise contested the cultural meanings that the Americans and other Euro-American missionaries, mariners, and explorers sought to impose. These charts and texts of exploration were thus both powerful and flawed ways to navigate the mind and the sea.

In the summer of 1842, just as the Ex. Ex. returned to the United States, Lieutenant Matthew Fontaine Maury took an assignment as the Superintendent of the Depot of Charts and Instruments, turning the organization, which under Wilkes and a subsequent officer had been primarily astronomic in orientation, to an important institution of hydrography. Where Wilkes' surveying had been rooted in the strict rules of cartographic science, Maury's interest in the sea was broader, and it extended from the shallow coastal waters to the winds and currents of the deep sea. He wanted to know how these currents and winds worked and how whales migrated among many other theoretical questions. His studies were as much practical as theoretical. Long celebrated as "The

Pathfinder of the Seas," Maury articulated a vision of the sea as an ordered, safe place for American maritime commerce. In the course of his work, he enlisted American mariners and seafarers from all over the world as his observers on the water. His *Wind and Current Charts* revolutionized maritime voyages, delineating highways across the sea as the American whaling and merchant fleets reached their pinnacle in the antebellum era. Maury, like Wilkes, was not without his own faults and flawed scientific assumptions. But, as Chapter Three will show, he nevertheless expressed a profoundly powerful vision of the marine environment, not as an unfathomable wilderness, but as the mariner's benevolent, divinely-created ally.

CHAPTER 4: THE COMMON HIGHWAY

The sea, therefore, we may safely infer, has its offices and duties to perform; so, may we infer, have its currents, and so, too, its inhabitants; consequently, he who undertakes to study its phenomena must cease to regard it as a waste of waters. He must look upon it as a part of that exquisite machinery by which the harmonies of nature are preserved, and then he will begin to perceive the developments of order and the evidences of design.

-Lieutenant Matthew Fontaine Maury, *The Physical Geography of the Sea*[1]

"It might seem an absurdly hopeless task thus to seek out one solitary creature in the unhooped oceans of this planet. But not so did it seem to Ahab, who knew the sets of the tides and currents; and thereby . . . could arrive at reasonable surmises, approaching almost to certainties, concerning the timeliest day to be upon this or that ground in search of his prey."

-Herman Melville, "The Chart" in *Moby-Dick*[2]

It is fitting that Passed Midshipman Matthew Fontaine Maury met Cape Horn not with dread, but curiosity. As sailing master aboard the sloop-of-war *Falmouth* in 1831, Maury handled the vessel's navigation around the Horn and into the Pacific Ocean. This responsibility prompted him to consult the Navy's hydrographic and nautical books before *Falmouth* left New York City. He was dismayed, however, to find no guide, no practical advice from his predecessors to inform *Falmouth*'s course.[3] The moment proved inspirational. It was the beginning, as Maury put it, of "a favorite project, long entertained."[4] When Maury, as a lieutenant, became the Navy's superintendent of the Naval Observatory in 1842, he set about constructing a series of charts, which he first published in 1847 as the *Wind and Current Charts* along with a narrative companion *Explanations and Sailing Directions to Accompany the Wind and Current Charts*. These

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[1] Matthew Fontaine Maury, *The Physical Geography of the Sea and Its Meteorology*, ed. John Leighly (Cambridge: Harvard University Press, 1963), 69.

[2] Herman Melville, *Moby-Dick, or The Whale* in *Redburn, White-Jacket, Moby-Dick* (New York: Library of America, 1983), 1003-04.

[3] Frances Leigh Williams, *Matthew Fontaine Maury: Scientist of the Sea* (New Brunswick: Rutgers University Press, 1963), 91-93.

[4] M.F. Maury to T. Butler King, Washington, D.C., February 29, 1848, Records of the Naval Observatory, Record Group 78, Letters Sent, Vol. 3, National Archives and Records Administration, Washington, D.C.

works detailed the tracks of vessels across the sea and the environmental conditions met along the way. It was an important moment for the maritime world, not only in terms of time, measured in days and weeks saved on voyages, but also in the way mariners actively collected data that Maury compiled at the Naval Observatory. No great naval expedition produced these charts. Rather it was largely mariners themselves, directed by Maury and his staff, who observed and then understood.[5]

The charts were graphic spectacles, striking in the sheer volume of information and the visual manner with which Maury conveyed it. He quantified the sea, turning prospective voyages from chance into formulas of probability. In his investigations, Maury found not disorder or mystery, but "the developments of order and the evidences of design."[6] He dismissed the wilderness mythos so deeply rooted in maritime folklore and so central to the way mariners understood the ocean with an alternative based in scientific empiricism. Maury proclaimed the sea to be knowable. It was divinely and benignly created, he argued, and subject to universal rules that could be exploited for the nation's economic benefit. Maury's prose and his charts suggested, confidently, that the mysteries and dangers of the sea might be overcome. Indeed, his work led to faster, safer, and cheaper voyages. But Maury struggled with forces generally out of his control—poor or stubborn navigators, patchy data, flawed conclusions, and, most of all, the dynamic

[5] On Maury and the Naval Observatory, see Williams, *Matthew Fontaine Maury*; Charles Lee Lewis, *Matthew Fontaine Maury: The Pathfinder of the Seas* (Annapolis: Naval Institute Press, 1927); Jan K. Herman, *A Hilltop in Foggy Bottom: Home of the Old Naval Observatory and the Navy Medical Department* (Washington, D.C.: Naval Medical Command, 1984); Steven J. Dick, *Sky and Ocean Joined: The U.S. Naval Observatory, 1830-2000* (New York: Cambridge University Press, 2003), 60-117; Marc I. Pinsel, *150 Years of Service on the Seas: A Pictorial History of the U.S. Naval Oceanographic Office from 1830 to 1980*, vol. 1 (Washington, D.C.: Government Printing Office, 1982), 7-14; Edward L. Towle, "Science, Commerce, and the Navy on the Seafaring Frontier," PhD dissertation, University of Rochester, 1963); Pinsel, "The Wind and Current Chart Series Produced by Matthew Fontaine Maury," *Navigation* 28 (Summer 1981), 123-137.

[6] Maury, *The Physical Geography of the Sea*, 69.

and unpredictable sea itself. These sometimes offset his efforts and suggested, contrary to his own rhetoric, that the sea could neither be perfectly ordered, nor fully controlled.

A scientific democrat and popularizer, Maury stirred the jealousies and intrigues of the capital's scientific community because he believed that his data suggested larger theoretical conclusions about the workings of the sea and the atmosphere above it. His chief critics and rivals pointed rightly to flaws in Maury's theories. He was a naval officer and self-educated scientist at a crucial moment in the professionalization of science. Like Lieutenant Charles Wilkes, Maury interpreted his duty, first and foremost, as one of practical necessity tied to the interests of the Navy and the maritime community. This, perhaps, was enough to damn him in the eyes of scientists. By moving from practical insights to questionable theories, which took book form in 1855 as *The Physical Geography of the Sea*, Maury's legacy as a scientist suffered and continues to do so.[7] Nevertheless, he was a master of ideas and the words with which to frame them. His charts and his writings about science and the sea proved extraordinarily powerful in a cultural sense. Among American mariners, they represented the most expansive nineteenth-century definition of the sea as a commercial space.

Maury's early writing in hydrography and astronomy, which commended him to his future work at the Naval Observatory, established the order and accessibility that became the hallmark of his *Wind and Current Charts*. His voyage around the Horn

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[7] Harold L. Burstyn, "Seafaring and the Emergence of American Science" in Benjamin W. Labaree, ed. *The Atlantic World of Robert G. Albion* (Middletown, CT: Wesleyan University Press, 1975), 107-08; Dick, *Sky and Ocean Joined*, 109-17; John Leighly, "Introduction" in Matthew Fontaine Maury, *The Physical Geography of the Sea*, ed. John Leighly (Cambridge: Harvard University Press, 1963), xxi; Susan Schlee, *The Edge of an Unfamiliar World: A History of Oceanography* (New York: E.P. Dutton and Co., Inc., 1973), 59-63.

aboard *Falmouth* inspired him to write an article published in the *American Journal of Science and Arts* in July 1834. In it, Maury addressed mariners who, like himself, sought guidance at sea. The structure of the article conveys his belief in the power of science to order wilderness. Maury began by conceding Cape Horn's terrors. "The most robust constitutions," he wrote, "overcome by long exposure to it, succumb to its severity; they may bear up against it for days, but the hardiest crew, exhausted at last by incessant toil, are forced in despair to give up the ship, clogged with ice and snow, to the mercies of the contending climates."[8] But Maury did not subscribe to this way of thinking. His mind was more analytical, impressed by the possibilities of scientific empiricism and less governed by fear and uncertainty. "Under the guidance of certain circumstances," he continued, "the navigator may be greatly assisted in conducting his vessel in safety through the tempestuous sea connecting the Pacific with the Atlantic."[9] Based on his limited experience alone, he urged his fellow navigators, contrary to tradition, to sail in close to the land where they might tack more easily against contrary winds. The article was a declaration of confidence, rooted in empiricism. Even in the wildest seas, Maury suggested that the sea could be understood if it were observed and ordered in a systematic way.

In 1836, Maury published a book titled *A New Theoretical and Practical Treatise on Navigation*, which did not break new ground so much as it recast existing navigational science in a graspable way. Before the Navy established its academy at Annapolis in 1845, the education of naval officers resided primarily aboard ship, directed by the

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[8] Matthew Fontaine Maury, "On the Navigation of Cape Horn" *American Journal of Science and Arts* 26 (July 1834), 54.

[9] Ibid., 55.

captain and his lieutenants. Instruction at sea demanded utility, not cumbersome tomes. Maury stated his rationale in the preface to the first edition. "It is not pretended that new theories are set forth . . . but it is believed that those which have already been established, are here embodied in such a form, that the means of becoming a theoretical as well as a practical navigator, are placed within the reach of every student."[10] Maury strove for simplicity and clarity, keeping in mind that his readers, though all young gentlemen, would come to the Navy with various levels of knowledge. Maury wrote that the work should be "an elementary one, adapted to the capacity of all."[11] It was a democratic text, assuming no prior knowledge above basic arithmetic, but promising to teach all. It was also accessible, unencumbered by the jargon that often made science the exclusive to the intellectual.

The book met critical acclaim in and outside of the Navy, and the service soon adopted it for the instruction of its midshipmen. One officer, writing in praise, thought its "explanations of the principles . . . both ample, easy and well-arranged."[12] The Naval Lyceum, an early center of naval intellectualism, also endorsed the work, citing "a simplicity that has heretofore been generally wanting in books on Navigation."[13] But the most revealing review came from the pen of Professor A.G. Pendleton, a naval instructor of mathematics. The book was "best calculated," Pendleton thought, "to induce a love for

[10] M.F. Maury, *A New Theoretical and Practical Treatise on Navigation*, 3rd ed. (Philadelphia: E.C. & J. Biddle, 1845), v.

[11] Ibid.

[12] M.F. Maury, "Opinions of Navigators and Professors," in *Treatise on Navigation*, 1-2.

[13] Ibid., 5.

the prosecution of the study of navigation as a science, and not merely as an art."[14] Maury's *Navigation*, though not the first text to do so, encouraged navigators to think about the sea scientifically. Its accessibility, meanwhile, prefaced the qualities that would win Maury acceptance and respect among mariners.

In June 1842, Maury received orders from the Navy Department for duty as the Superintendent of the Depot of Charts and Instruments, an office that was then more a storehouse than a scientific institution. Maury's scholarship qualified him for the position. He had also suffered a crippled leg, the result of a stagecoach accident in 1839 that all but precluded further sea duty. Since the Navy established the Depot in 1830, it had served as a central storehouse for charts and nautical instruments, which were mostly foreign made. The Depot neither commissioned surveys, nor printed its own charts. The superintendent supervised the exchange of these charts and instruments, incoming or outgoing, to the Navy's warships.[15] The most important work lay in rating the Navy's chronometers. These intricate timepieces for determining longitude at sea often developed errors when jostled by waves and sprayed with salt water. At sea, the least discrepancy could mean the difference between life and death. Rating the error of each chronometer was therefore important, but it did not represent the vanguard of antebellum science. Under three superintendents, including Wilkes, the Depot had skipped around Washington in various locations for twelve years. As superintendent, Maury oversaw yet another relocation in 1844, this time to a permanent home at 23rd Street, overlooking the tidal flats of the Potomac River. There, the Depot became the U.S. Naval Observatory, in

[14] Ibid., 2.

[15] Dick, *Sky and Ocean Joined*, 35-37; Schlee, *The Edge of an Unfamiliar World*, 26.

which the Navy conducted an expanded program of astronomic, hydrographic, and meteorological research. The sight itself was ill-suited for this work. In summer, hanging Potomac mists obscured astronomical observations, humidity damaged instruments, and mosquitoes harassed the staff.[16] But nevertheless, Maury and nearly twenty officers, professors, and civilians now had a permanent home and the means to carry out an original program of scientific research.

Even before the completion of the new observatory, however, Maury had discovered a store of logbooks at the Depot of Charts and Instruments, which almost immediately drew his eyes from the heavens to the sea. Kept daily as a requirement of the service, a ship's log documented navigational and meteorological information, course headings, and any other noteworthy happening that occurred aboard ship during a voyage. At the Depot, these logs sat collecting dust, an untapped archive of environmental information. Maury immediately grasped their import, mindful of his own experience aboard *Falmouth* eleven years earlier.[17] "Such is the rude state of this branch of navigation," Maury wrote, "that if a vessel . . . were now to leave this place for the West Indies, or other parts equally as much frequented, the chances are that she would no where find among the nautical works of the day any directions as to her best route."[18] Here was a pressing problem of maritime navigation, not confined to the bewildering winds off Cape Horn, but pervading even the most frequented seas and sailing routes of the maritime world. So Maury set about "to overhaul the old logbooks," looking entry by

[16] Williams, *Matthew Fontaine Maury*, 159-60.

[17] Ibid., 149.

[18] Lieutenant Maury, "Blank Charts on Board Public Cruisers," *Southern Literary Messenger* 9 (August 1843), 461.

entry for clues to the workings of the sea and the atmosphere.[19] He was curious about winds and currents, forces that could most accelerate or impede voyages under sail. In what directions did they move and with what force or speed, he wondered. Could a better understanding reveal faster, safer, and cheaper commercial routes? “By comparing and discussing these observations,” Maury concluded, “information . . . valuable to the commerce of the country might be elicited.”[20] But the data gleaned from the logs was often crude. It had been collected “without system,” Maury complained, “and with little or no regard to the facts, which I wish to obtain from them.”[21] Without a more systematic approach to data collection, he could not draw firm conclusions of practical value. The logbooks, however, had sparked Maury’s interest, tilting the Naval Observatory’s agenda in favor of hydrography over astronomy.[22] The logs also hinted at the latent potential of the nation’s naval and maritime communities as observers of the marine environment.

By the Civil War, the American merchant marine had become the largest in the world and this proved a powerful impetus for the study of astronomy and hydrography at the Observatory during Maury’s tenure as superintendent. The American whaling fleet reached its height in 1847 and continued to prosper into the next decade while sleek clippers plied waters between America, Europe, California, and Asia. Gold made California a destination more accessible by sea than by the westward trek over land. The route to San Francisco via Cape Horn or over the isthmus became a commercial highway

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[19] Matthew Fontaine Maury, “An Appeal to the Agricultural Interests of Virginia,” Papers of Matthew Fontaine Maury, General Correspondence, Box 5, LOC.

[20] Ibid.

[21] Maury to Robert Walsh, Washington, D.C., January 24, 1848, Records of the Naval Observatory, RG 78, Letters Sent, Vol. 2, NARA.

[22] Dick, *Sky and Ocean Joined*, 109-17.

of ships just as the London, Liverpool, and Le Havre packets between the United States and Europe offered daily communications across vast swaths of ocean. Shipping generated tremendous wealth for the United States and for New England in particular. It hastened the market economy and underwrote industrialization and westward expansion.[23] At mid-century, the United States was a maritime nation, oriented as much to the sea as to the expanding West. Hydrography, then, had an important commercial—and therefore practical—application above the purely scientific potential that the Observatory represented in the eyes of many in the American scientific community.

The larger structure and mission of the antebellum Navy reflected the growth of the nation's maritime community as well. Its officer corps had forged an early institutional identity in victories over Great Britain and the Barbary states of North Africa. By the 1830s, however, the service had transitioned into its traditional nineteenth-century peacetime role as protector and promoter of American maritime interests. By the 1850s, the Navy had established six permanent stations, situated to monitor the centers of American commerce throughout the world. From these stations, small, efficient squadrons carried out the Navy's flag-showing, gun-toting diplomacy.[24] The Navy monitored unrest in regions of American economic influence, set commercial treaties, and, on occasion, used force to protect and expand the nation's maritime interests. Hydrography existed within this larger framework as another arm of the Navy's broad nineteenth-century mission.

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[23] Benjamin W. Labaree, et al., *America and the Sea: A Maritime History* (Mystic, CT: Mystic Seaport, 1998), 7-8.

[24] Kenneth Hagan, *This People's Navy: The Making of American Sea Power* (New York: The Free Press, 1991), 142-46.

Not content with the Depot's logs alone, Maury sought cooperation from the Navy and the American merchant marine, but through much of the 1840s, the response was cool.[25] In December 1842, he issued a circular to commanding officers in the Navy as well as commercial ship owners and masters through his administrative superior in the Bureau of Ordnance and Hydrography. In it, Maury requested "all that valuable information relating to the navigation of distant seas."[26] In particular, he sought observations on winds, currents, tides, weather, compass variation, and *vigias*—a term for rumored, but still unproven hazards to navigation that dotted so many nineteenth-century charts. Maury reached out to the American naval and maritime communities, appealing to the common need for accurate and expanded hydrographic information. In the circular, Maury promised to make the information he obtained "accessible to navigators" and proposed to "open a regular channel of communication" with them.[27] Here, Maury realized, lay the potential for a truly novel and mutually beneficial relationship. His excitement at the thought was palpable. "How pregnant and full of meaning would be the spectacle of a floating Observatory in every man of war," Maury wondered.[28] It is safe to say that he harbored similar thoughts about the American merchant marine. This was at once a statement of his ultimate vision and the difficulties he faced in achieving it. In the mid-1840s, the union between science and the Navy remained an awkward, largely unrealized one. Through the decade, Maury did receive reports from "a number of

[25] Williams, *Matthew Fontaine Maury*, 153, 61n521, 32n532.

[26] William M. Crane, Chief of the Bureau of Ordnance and Hydrography, Circular, December 16, 1842, Records of the Hydrographic Office, RG 37, Miscellaneous Letters Sent, NARA.

[27] Ibid.

[28] Maury to Robert Walsh, Washington, D.C., December 30, 1847, Records of the Naval Observatory, RG 78, Letters Sent, Vol. 2, NARA.

commanders" who had "of their own accord, entered heartily into the subject."[29] But he could not compel their participation and the Navy Department did not order it. Diplomacy, war with Mexico, and the innumerable exigencies of duty on distant stations took precedence over hydrographic science. In order for these observations "to tell well," Maury knew, "every vessel should be an observer and contributor."[30]

The circular, though, had also been directed to the American merchant marine, whose captains, Maury soon began to think, were tradition-bound and suspicious of science penned by a naval officer. Among these seamen, the circular "was not regarded. . . . No response whatever was elicited, and the appeal passed by unnoticed," Maury complained.[31] The basis for this indifference, he surmised, was the traditional belief system of the mariner in which sailing routes were determined and revised by experience, not through methodical investigation. "It is hard to get old sailors out of old notions," Maury groused in a letter to Representative Julius Rockwell.[32] "Two vessels sail together for the same place," he hypothesized, "one arrives two, three, or even twenty days before the other, according to circumstances. This is called 'luck,'" he continued, "and the master who makes short passages is called 'a lucky fellow.'" Of course, Maury placed no credence in luck. He attributed speedy voyages to natural "laws" and the "order of nature."[33] The mariner's intransigence frustrated him. His pen sometimes lashed out at

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[30] M.F. Maury to Dr. [Daniel] Drake, Hydrographical Office, September 30, 1845, Records of the Naval Observatory, RG 78, Letters Sent, Vol. 2, NARA.

[31] Lieut. M.F. Maury, *Explanations and Sailing Directions to Accompany the Wind and Current Charts*, 3rd ed. (Washington, D.C.: C. Alexander, 1851), 23.

[32] Maury to Julius Rockwell, Washington, D.C., January 15, 1849, Records of the Naval Observatory, RG 78, Letters Sent, Vol. 3, NARA.

[33] Maury, "Blank Charts on Board Public Cruisers," *Southern Literary Messenger*, 459.

these “pig-headed” captains who seemed “unwilling to learn, especially from one who has never performed the voyage.”[34] Between outbursts, however, he reflected more deeply on the relationship that he had attempted to forge. In 1847, as he began to construct the first of his *Wind and Current Charts*, he concluded that “the object” had never been “presented in the right way.”[35] In winning the respect of merchant captains, Maury faced two interrelated hurdles—to demonstrate that his charts were, first and foremost, useful and to construct them in a way that made their significance plainly evident.

Maury understood the visual power and the practical value of the nautical chart and so, using his meager sources, he began work on a track chart of the North Atlantic, intending to show a new and faster route from the United States to Rio de Janeiro. Throughout the mid-1840s, he had steadily collected logs, not only from the Navy, but also those gleaned by a few former sea captains and their associates in Boston, Salem, New Bedford, and Nantucket. By 1847, the collected data, showing the tracks of vessels as well as winds and currents in the North Atlantic, pointed to a stunning find. Following their knowledge of wind patterns, mariners had traditionally proceeded eastward from the United States to Madeira or the Cape Verde Islands where the trade winds propelled them west again, but far enough southward to clear Brazil’s Cape St. Roque. This butt of land protruding into the Atlantic presented a fearsome obstacle to early nineteenth-century navigation. Mariners despaired of getting under its lee, or losing the wind in the land’s

[34] Maury to Matthew Maury [cousin], Washington, D.C., July 14, 1848, Papers of Matthew Fontaine Maury, General Correspondence, Box 3, LOC.

[35] Maury to the Owners and Masters of the New Bedford and New London Whaleships, Washington, D.C., January 15, 1849, Records of the National Observatory, RG 78, Letters Sent, Vol. 3, NARA.

shadow, and then drifting into rapid coastal currents that would propel a helpless vessel ashore.[36] Therefore, almost all navigators bound south of the equator followed this circuitous route, a "zig-zag" that, in Maury's words, had them "crossing the Atlantic twice, or nearly twice" just to make Rio. Maury's data, however, suggested a more direct route due south from the United States, crossing the equator precisely between thirty and thirty-four degrees west latitude and negating so many crisscrosses of the sea. A navigator following this course, Maury counseled a Baltimore ship owner, would meet no current "which a tolerable sailor need be afraid." He urged another sea captain following his new route to "stand boldly on."[37] He knew that such a finding could be revelatory. "It is marvelous," he exclaimed, "to see how much time has been thrown away by vessels that pursue this route."[38] In the world of maritime commerce, of course, time was money, and Maury had a chart that could demonstrate the practical value of his first investigations.

The track chart, which Maury named the "Fair Way to Rio," proved a popular triumph that shaved days off the old voyage and gave him the authority to begin a comprehensive investigation of winds and currents. In January 1848, the bark *W.H.D.C. Wright* departed Baltimore with a cargo of grain bound for Rio. It arrived the next month after a passage of thirty-eight days using Maury's chart. The voyage of "the alphabetical barque," as Maury and his staff dubbed the *Wright*, had saved seventeen days over the usual passage and proved, in Maury's words, "the first fruit of the Wind and Current

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[36] Williams, *Matthew Fontaine Maury*, 179.

[37] Maury to H[enry] Mactier Warfield, Washington, D.C., June 1, 1848, Records of the Naval Observatory, RG 78, Letters Sent, Vol. 3, NARA; Maury, *Sailing Directions*, 280.

[38] Maury to Capt. Robert Forbes, Washington, D.C., April 20, 1848, Records of the Naval Observatory, RG 78, Letters Sent, Vol. 3, NARA.

Charts."[39] A powerful endorsement of Maury's efforts, *Wright*'s voyage began to break down the belief system of the mariner, which Maury had previously found so pervasive. "Navigators now appeared for the first time to comprehend clearly what it was I wanted them to do, and why," Maury remarked. "They appreciated the importance of the undertaking, and came forward readily with offers of hearty, zealous, and gratuitous co-operation."[40] Maury had, in a moment, captured the fickle attention of the maritime world by appealing to its purse.

His chart could save money, but it also hinted at the potential for something more profound. "The navigator with that chart before him," Maury proclaimed, "would have before him, *as clear as he has the Sun at midday in a cloudless sky*, the best route to Rio [italics added]."[41] This appeared in *Explanations and Sailing Directions*, a widely-read narrative corollary to Maury's charts that he first published in 1851. It was a calculated allusion intended to speak profoundly to the navigator. The noon sighting with no clouds to obscure it was perhaps the plainest and most powerful allegory of maritime navigation. This chart would be profitable, indeed, but it could also dispel the mysteries and uncertainties of the sea by clearly showing the safest and fastest tracks across the ocean.

Flush with the cooperation he had long sought, Maury supervised a system of research in which mariners themselves collected observations, sent the information to the Observatory for interpretation, and received it back again in the finished charts. To facilitate a more streamlined method, Maury had by 1844 constructed an Abstract Log—

[39] Williams, *Matthew Fontaine Maury*, 180; Maury, *Sailing Directions*, 250-51.

[40] Maury, *Sailing Directions*, 24.

[41] Ibid., 270-71.

a blank table columned with the kinds of observations that he had first requested in the circular of 1842. But where the traditional logbook summarized the events of each day, Maury's Abstract Log required hourly observations so that even subtle changes in the environment could be detected and plotted. The logs quantified the sea—its winds and currents, ocean temperature, and barometric pressure. To express the intangibles of weather, Maury urged the mariner to use abbreviations and symbols—"f" meaning fog, "s" for snow, "g" to indicate gloomy, dark weather, and so on. "By the combination of these letters," Maury remarked, "all the ordinary phenomena of the weather may be recorded with certainty and brevity."[42] Maury extolled the simplicity, ease, and precision of his method. Indeed, the conscientious merchant captain was always taking observations of the sea and sky in an informal way. But this structure formalized and structured the act of observing, forcing the captain to monitor and then record vastly more information about the sea ever before. "The mariner," Maury explained, "has been induced to conduct in every sea and according to prescribed rules a series of observations which aim at a more perfect development of the laws of nature."[43] Informed by these notions of order and progress, Maury had constructed a cyclical system of scientific research in which the Observatory vetted the data submitted by the mariner and returned it to him at no charge provided he continued to submit logs. Such a system was

[42] Maury to R. Kennedy, Washington, D.C., November 11, 1844, Records of the Naval Observatory, RG 78, Letters Sent, Vol. 1, NARA.

[43] Maury to the Owners and Masters of the New Bedford and New London Whaleships, Washington, D.C., January 15, 1849, Records of the National Observatory, RG 78, Letters Sent, Vol. 3, NARA.

unprecedented in scope, if not in kind.[44] It marked a unique relationship between science and the maritime community mediated by the Navy.

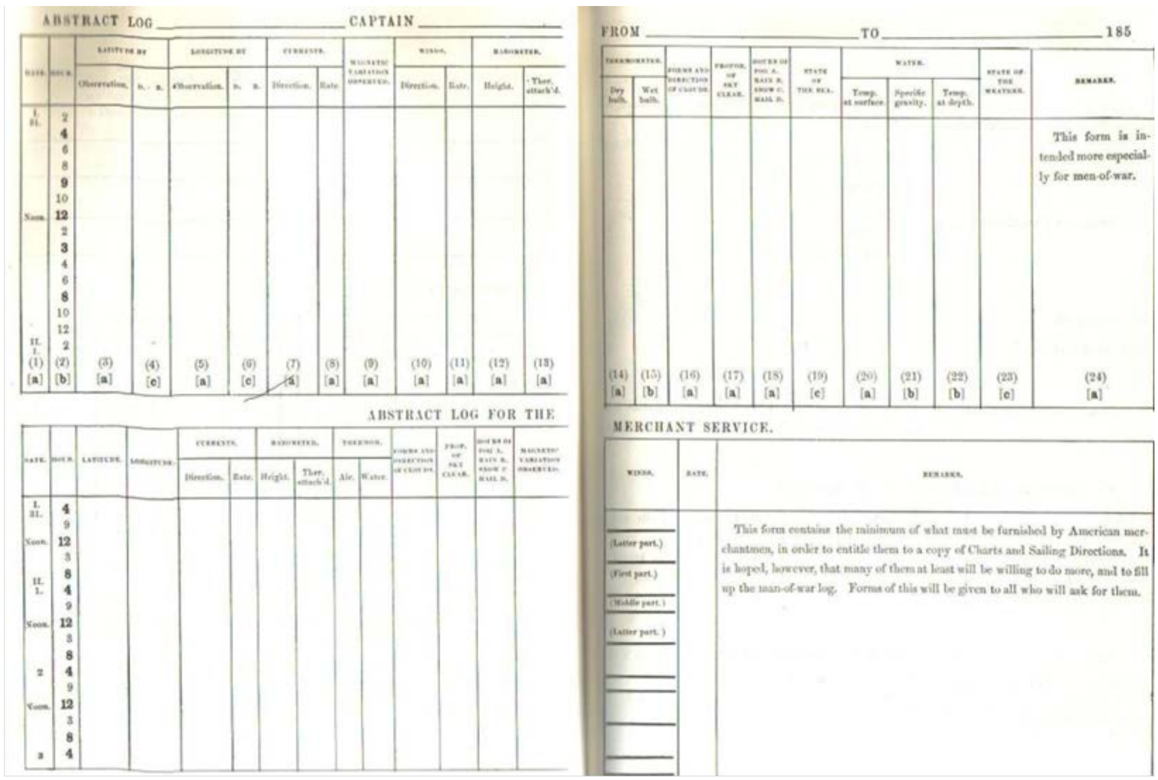

Figure 15: Maury's Abstract Log for the Merchant Service with hours running down the left column and space for notes on all manner of environmental phenomena. Williams, *Matthew Fontaine Maury*,
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Maury, of course, was acutely aware that the value of his system rested on the unschooled eyes of sailors—no urbane naturalists like those accompanying the Ex. Ex.—

[44] The American scientist William Redfield had tracked and studied the paths of hurricanes during the 1820s by examining ship logs.

so he worked to reconstruct the mariner as an amateur philosopher of science. Mariners, Maury admitted, were “a much abused class,” not least in the eyes of the scientific community.[45] Sailors were the dregs of Euro-American society and their masters and mates, though a class above, remained outsiders oriented to the sea and not the intellectual centers of the nation’s colleges and learned societies. Maury’s system seemed to betray the professional impulse then coursing through American science, and, at the very least, it upset proper notions of class in early Victorian America. Scientists and sailors did not commingle. But Maury, who was both a naval officer and a self-taught scientist, viewed things through his own lens. In his private and published writing he began to refer to mariners as a “corps of observers” and his “co-laborers” in science.[46] This was quite a turn from his previous rebukes. “I hold every properly qualified navigator to be a philosopher,” he declared unequivocally in his *Sailing Directions*.[47] In part, this about-face was an affectation. In his private correspondence, he could be utterly dismissive of “the ordinary run of seafaring people.”[48] But Maury was a scientific outsider himself and, as such, shared some affinity with the sailor. The *Wind and Current Charts*, in Maury’s estimation, exhibited the “intelligence and public spirit” of the American mariner. “As a sailor,” he added, “I mention it with proud satisfaction.”[49] Maury understood that no other American knew the sea as well as the mariner. Whether

[45] Maury, *Sailing Directions*, 19.

[46] Maury, *Sailing Directions*, 24; Maury to Robert Walsh, Washington, D.C., January 24, 1848, Records of the Naval Observatory, RG 78, Letters Sent, Vol. 2, NARA.

[47] Maury, *Sailing Directions*, 19.

[48] Maury to George Manning, Washington, D.C., November 13, 1848, Records of the Naval Observatory, RG 78, Letters Sent, Vol. 3, NARA.

[49] Maury, *Sailing Directions*, 24.

Pacific whaleman or captain of a Liverpool packet, life and prosperity at sea demanded a certain store of environmental knowledge that made the mariner a natural observer of the environment.

Yet the scientifically-minded mariner was made, not born, and Maury knew well that experience at sea alone did not immediately turn the sailor into an astute observer. Mariners were the first observers of the marine environment.[50] Just as the field of marine biology began with the amateur beachcomber, the field of oceanography owes something to the mariner. Under Maury's system, the mariner was not a passive observer, but an active participant in a crucial step of the scientific process. "I have determined, during the coming voyage, to keep the 'Abstract Log' of Lt. Maury," wrote John Young, master of the merchant ship *Venice*. By doing so, he intended to "add my mite to the cause of science" that "navigation shall be so simplified, and reduced to 'fixed principles,'" and "that all uncertainty may be removed."[51] Though mariners already knew the sea well, Maury's Abstract Log encouraged them to see it in a different way. Captain Phinney of the ship *Gertrude* wrote to Maury in 1855, praising "your great and glorious task." But in doing so, Phinney referred not only to the *Wind and Current Charts*, but also to the way in which Maury's method had changed his relationship to the sea. This, Phinney explained, was the task "of teaching us sailors to look about us, and see by what wonderful manifestations of the wisdom and goodness of the great God we are continually surrounded." He continued:

> For myself, I am free to confess that for many years I commanded a ship, and, although never insensible to the beauties of nature upon the sea or land, I yet feel that, until I took

[50] Helen M. Rozwadowski, *Fathoming the Ocean: The Discovery and Exploration of the Deep Sea* (Cambridge: Harvard University Press, 2005), 43-44.

[51] Abstract Log of the Ship "Venice" quoted in Maury, *Sailing Directions*, 294.

> up your work, I had been traversing the ocean blindfolded. I feel that . . . you have done me good as a man. You have taught me to look above, around, and beneath me, and recognize God's hand in every element by which I am surrounded.[52]

Aside from the explicit references to natural theology, which will be discussed below, Phinney's letter reveals how Maury's system could change the way that mariners thought about the sea. It is worth mentioning, however, that even Maury's system worked within the rigid class hierarchy of the ship and, therefore, it is likely that only a handful of the ship's crew participated directly in these observations or understood their import. By taking part in Maury's system, however, at least some mariners understood the sea environment in more sophisticated scientific terms. In an era when academically-trained scientists found few opportunities for research on the deep sea, mariners filled the void. They did so imperfectly, perhaps, and with their own motives. But their active participation yielded important results not only of practical value, but of scientific interest as well.

Maury's *Wind and Current Charts* represented a new kind of cartography, designed to be eminently useful by suggesting to the mariner the most practical way to use the environment to his advantage. Maury's "Fair Way to Rio" was the first of these, published in 1847, and he and his staff continued to add, revise, and publish charts through 1860. "Some new discovery, some new fact or law of nature," Maury exclaimed, "is continually starting up before us as we proceed with our investigations."[53] Maury divided the charts into six series, lettered A through F—one series each to document ship tracks, trade winds, winds and currents, water temperature, meteorology, and whales.

[52] Phinney quoted in Maury, *The Physical Geography of the Sea*, 8.

[53] Maury to William Blackford, Washington, D.C., March 12, 1849, Papers of Matthew Fontaine Maury, General Correspondence, Box 3, LOC.

Multiple charts within each series covered the Atlantic, Pacific, and Indian Oceans so that, by 1860, the boundless seas of the world were boxed, lined, quantified, and filled with symbols, each calculated to express certain laws of nature as Maury surmised them. The charts were, first and foremost, practical. Maury's work was based in the understanding that the winds and currents of the sea could "wreck or save the mariner" and "hasten, or delay him on his voyage according to his knowledge of them."[54] By 1855, the Navy Department estimated that the *Wind and Current Charts* saved the American maritime sector "several millions a year" in shorter voyages.[55] Mariners hailed Maury's charts as "one of the most valuable inventions of the age" and "the best guides ever given to the navigator."[56] The charts represented a new cartographic philosophy, mixing the "pictorial conventions" of Western cartographic tradition with new representations.[57] The traditional chart oriented the sea from an omnipotent point of view, faithfully representing the sea on a smaller scale as if the navigator were looking down, god-like, on his diminutive ship from high above. But Maury played with this image. He depicted forces that were invisible, or nearly so, and therefore he was not wedded completely to cartographic tradition. The *Wind and Current Charts* re-conceptualized the sea, breaking it down into new structures, representations, and meaning.

[54] Maury to Robert Walsh, Washington, D.C., July 9, 1847, Records of the Naval Observatory, RG 78, Letters Sent, Vol. 2, NARA.

[55] Maury, "An Appeal to the Agricultural Interests of Virginia," Papers of Matthew Fontaine Maury, General Correspondence, Box 5, LOC.

[56] Captain Leslie Bryson quoted in Maury, *Sailing Directions*, 281; Captain Smyley quoted in Maury, *Sailing Directions*, 287.

[57] D. Graham Burnett, "Hydrographic Discipline Among the Navigators: Charting an 'Empire of Commerce and Science' in the Nineteenth-Century Pacific," in *The Imperial Map: Cartography and the Master of Empire*, ed. James R. Akerman (Chicago: The University of Chicago Press, 2009), 248.

In the track charts of Series A, Maury set down the passages of all the ships for which he had data, exposing the triumphs and follies of individual navigators and infusing the sea with a history. For these charts he sought "1000 tracks for every ocean."[58] Based on this mass of information, he marked the average route between ports so that the mariner could identify the one by which he would have the best chance of favorable winds and currents. Once plotted, Maury remarked, American ships seemed to be "cutting up the ocean in all directions." The busy routes of maritime commerce emerged from the blank space.[59] Some vessels made speedy voyages; others plodded or wandered. But all were revealing. "I find that tracks of vessels at sea are full of meaning," Maury wrote to his cousin Ann Maury. "We have got so that we judge by them the character of Captains," he continued, "a crazy fellow always makes a crooked track."[60] It was a simple axiom and one that was easily graspable by mariners themselves as they scanned the charts to and from their destinations. In some seas, Maury had plotted so many tracks that the charts became a crowded mass of lines, suggesting, in an abstract way, that the mariner was not alone even as he saw no sail on the horizon. Of course, such a multitude of tracks might have sacrificed clarity, but Maury went to pains with his engravers and lithographers to produce each chart in a system of colors and solid, dashed, and dotted lines to differentiate seasons and months.[61] "I must have the 4 colours, and

[58] Maury to R[obert] B. Forbes, Washington, D.C., July 16, 1848, Records of the Naval Observatory, RG 78, Letters Sent, Vol. 2, NARA.

[59] Maury to John Y. Mason, Washington, D.C., September 1848, Records of the Naval Observatory, RG 78, Letters Sent, Vol. 3, NARA.

[60] Maury to Ann Maury, Washington, D.C., April 19, 1848, Papers of Matthew Fontaine Maury, General Correspondence, Box 3, LOC.

[61] Maury to E. and G.W. Blunt, Washington, D.C., October 28, 1846, Records of the Naval Observatory, RG 78, Letters Sent, Vol. 2, NARA.

you must give them to me without offending the eye too much," Maury demanded in a letter to one of his lithographers.[62] The track charts thus appealed in an intensely visual way to the mariner's sense of the past and his shared experience with the rest of the maritime world. "The object," Maury stated, "is to give every Navigator the benefit of the experience of all." With the track chart spread before him, he would know the conditions "his predecessors may have encountered in the same region and at the same season of the year."[63] At sea, the ship's foamy wake soon disappeared, but on the track chart, it remained a testament to the environment and a record of the mariner's encounter with the sea.

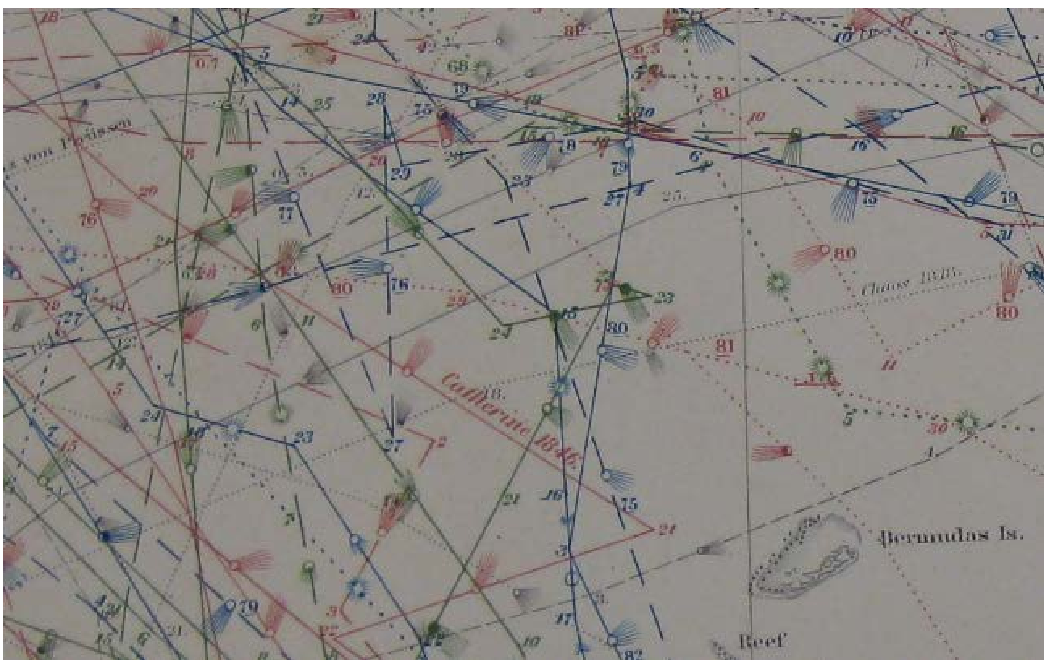


Figure 16: A section from Maury's track chart of the North Atlantic, showing ship tracks colored for seasons and the winds encounter along each route. Geography and Map Division, Library of Congress.

[62] Maury to Sherman and Smith, Washington, D.C., February 3, 1848, Records of the Naval Observatory, RG 78, Letters Sent, Vol. 2, NARA.

[63] Maury to John Y. Mason, Washington, D.C., September 1848, Records of the Naval Observatory, RG 78, Letters Sent, Vol. 3, NARA.

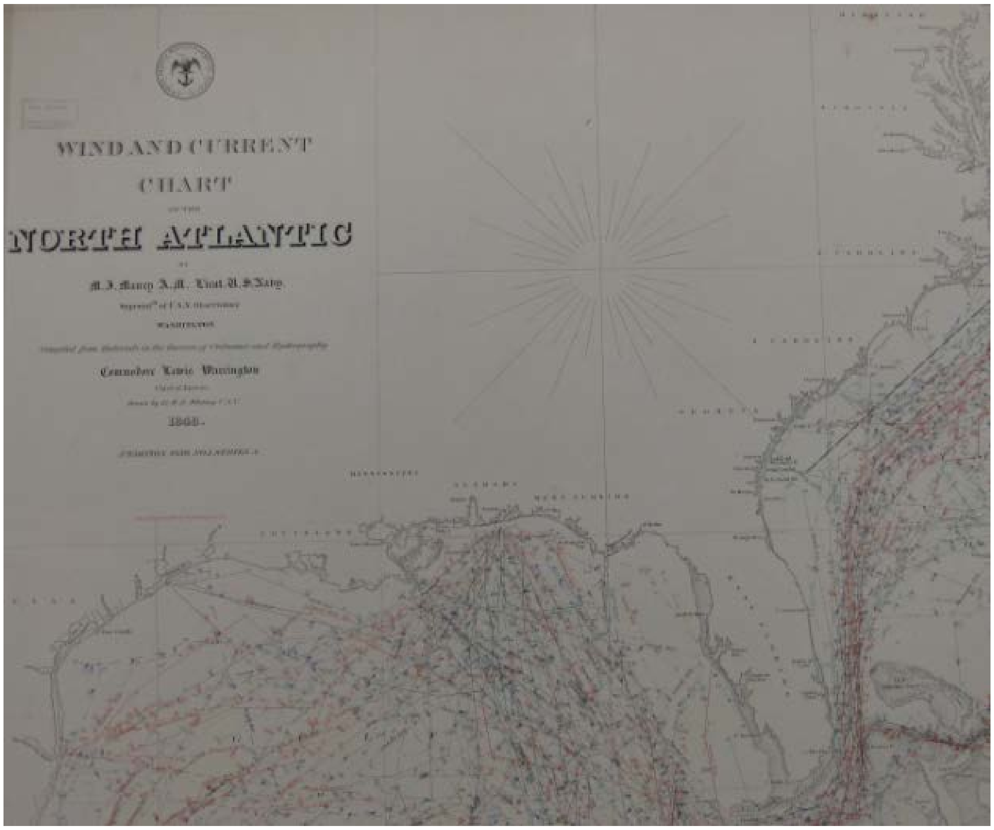


Figure 17: Track Chart of the North Atlantic showing tracks of vessels through the Florida Strait and Gulf of Mexico. Geography and Map Division, Library of Congress.

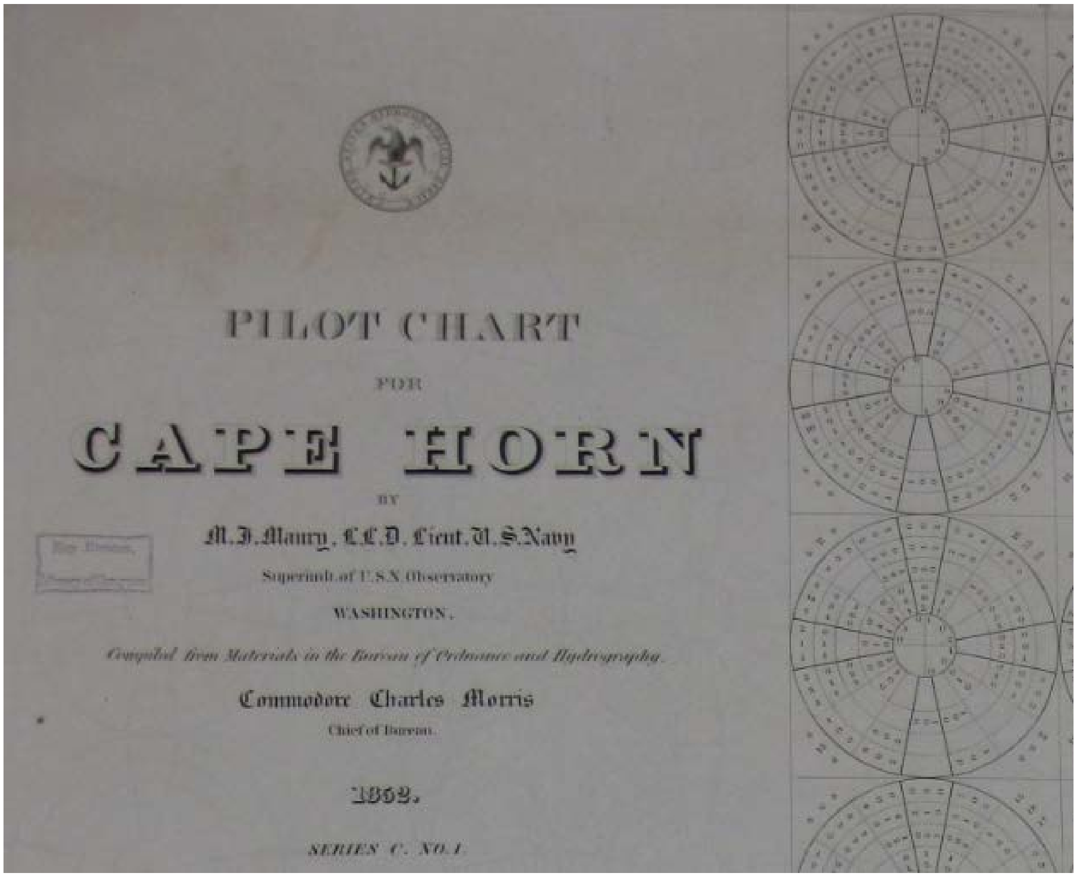
The pilot charts of Series C divided the sea into grids, which Maury filled with numbers according to the frequency with which winds had been recorded on each point of the compass and in every month of the year. Here, Maury reworked the common system of latitude and longitude, creating smaller squares of five degrees in which he quantified the winds. The charts worked on two levels—one visual, the other practical. They were stunning, and perhaps even overwhelming, when viewed as a whole.[64] But when taken grid by grid, Maury's system nevertheless conveyed an extraordinary amount of information in an immediate and straightforward way. The data was both spectacle and

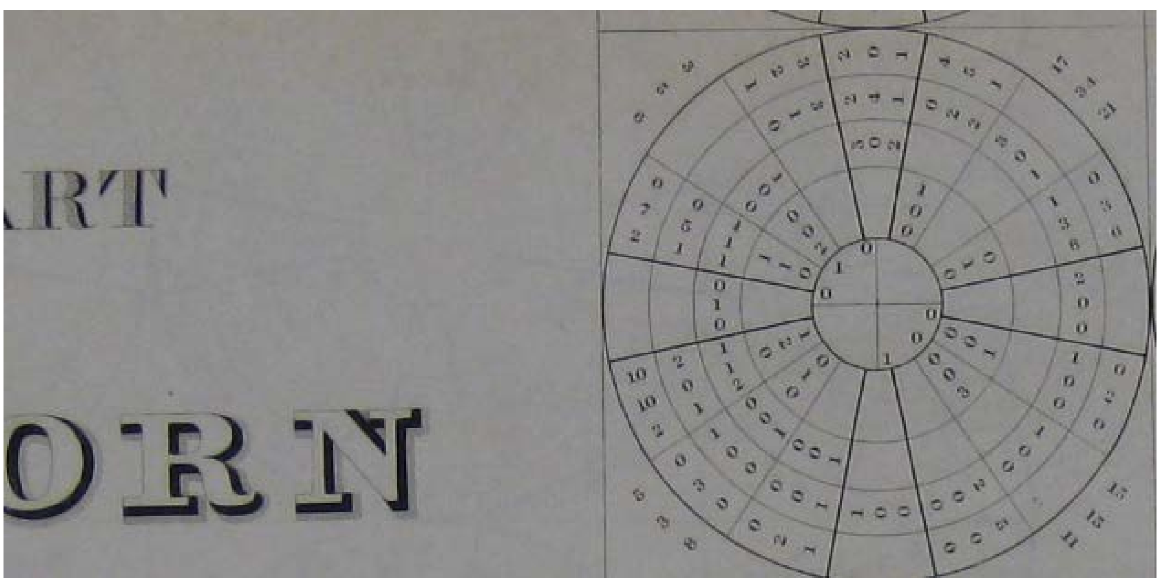
[64] Maury to Captain Thomas Freeman, Washington, D.C., March 29, 1851, Records of the Naval Observatory, RG 78, Letters Sent, Vol. 5, NARA.

practical. Maury "aimed to get at least, on the average, 100 observations for every month in every district," or twelve hundred records for every square on the chart.[65] He did not always achieve this; some seas were busier than others. But the pilot charts represented a significant leap in mariners' understanding of ocean winds. For the first time, Maury bragged, the navigator "may examine his chart, and with such probability tell how the winds are, or at a given time will be in any part of the wide ocean . . . he may bet upon the prediction, and state in definite numbers, the chances for [or] against him."[66] The pilot charts had turned navigation from chance or hard-learned experience into calculations of probability. It was a profound transformation that not only saved money and lives, but also changed the way mariners could imagine the sea.

[65] Maury, *Sailing Directions*, 18.

[66] Maury to John Y. Mason, Washington, D.C., September 1848, Records of the Naval Observatory, RG 78, Letters Sent, Vol. 3, NARA.



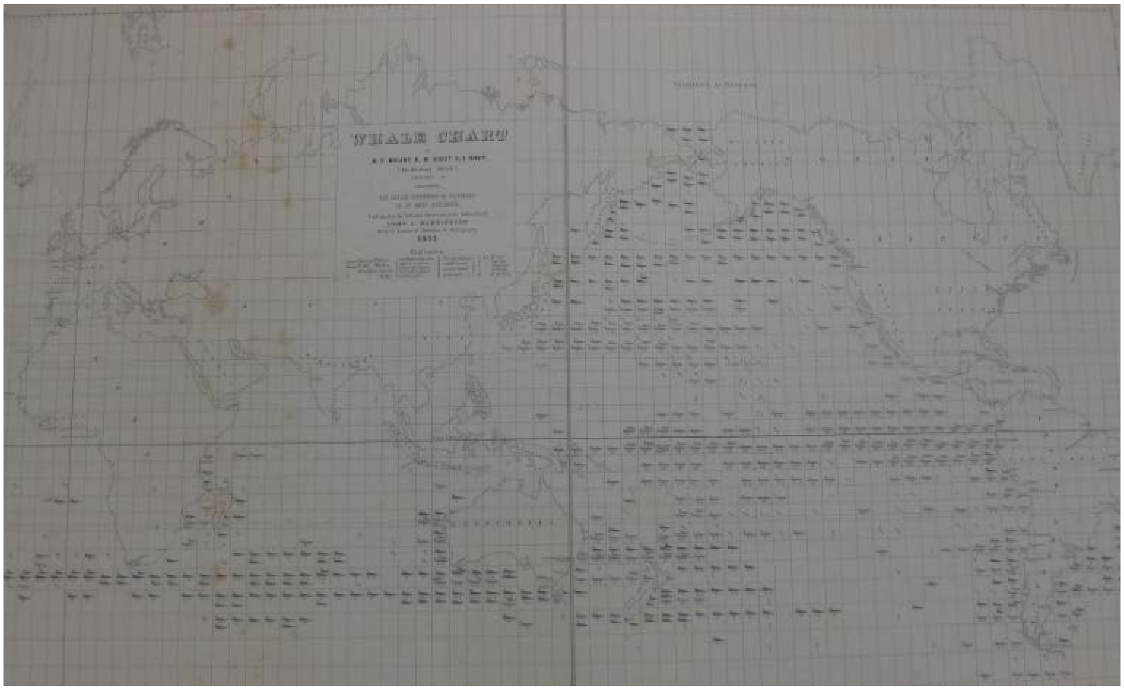


Figures 18 and 19: Section of Maury's Pilot Chart for Cape Horn showing his system for conveying wind direction in each month of the year. Geography and Map Division, Library of Congress.

In the whale chart of Series F, Maury tracked the migrations of sperm and right whales, indicating the richness of certain cruising grounds at particular seasons even as the whale population itself declined. In the whale chart, Maury declared, “we shall be enabled to show whalers exactly when to go and where to go, to get into the midst of [whales] at any time of year.”[67] This was a remarkable proposition. Maury indicated the animals’ prevalence by using breached whales as symbols. The spout, as any whaler easily grasped, identified the type of whale—two spouts for the right whale, one falling forward for the sperm. Maury charted no other species than these two favorites of the whale fishery, suggesting that the value of the chart, at least at first, lay in its practicality. But to the hungry whaling captain, Ahab not least, the whale chart was also a spectacle. Whales seemed to stretch from ocean to ocean and coast to coast, ripe for the taking. This, of course, was more image than reality. Maury labeled each whale with small letters indicating the season in which it would likely be found, so that a whale in any particular sea did not indicate its presence in perpetuity. But this took little away from the sense that the sea seemed full of whales. Here, again, Maury worked on two levels. He shrewdly intended the *Wind and Current Charts* to appeal to the mariner’s senses—to be “a fine show” and to “strike the eye at once.” But he also gave careful consideration to practicality, conveying the data to mariners, as he put it, with “perspicuity.”[68]

[67] Maury to Captain Frank Smith, Washington, D.C., January 1, 1849, Records of the Naval Observatory, RG 78, Letters Sent, Vol. 3, NARA.

[68] Maury to R[obert] B. Forbes, April 27, 1848, Records of the Naval Observatory, RG 78, Letters Sent, Vol. 3, NARA; Maury to John Q. Adams, Washington, D.C., November 17, 1847, Records of the Naval Observatory, RG 78, Letters Sent, Vol. 2, NARA.



Figures 20 and 21: Maury's Whale Chart showing a sea presumably full of whales breached for the taking. A section of the North Pacific, above, showing symbols for right and sperm whales with the Hawaiian Islands at bottom left and the coast of Alta California at right. Geography and Map Division, Library of Congress.

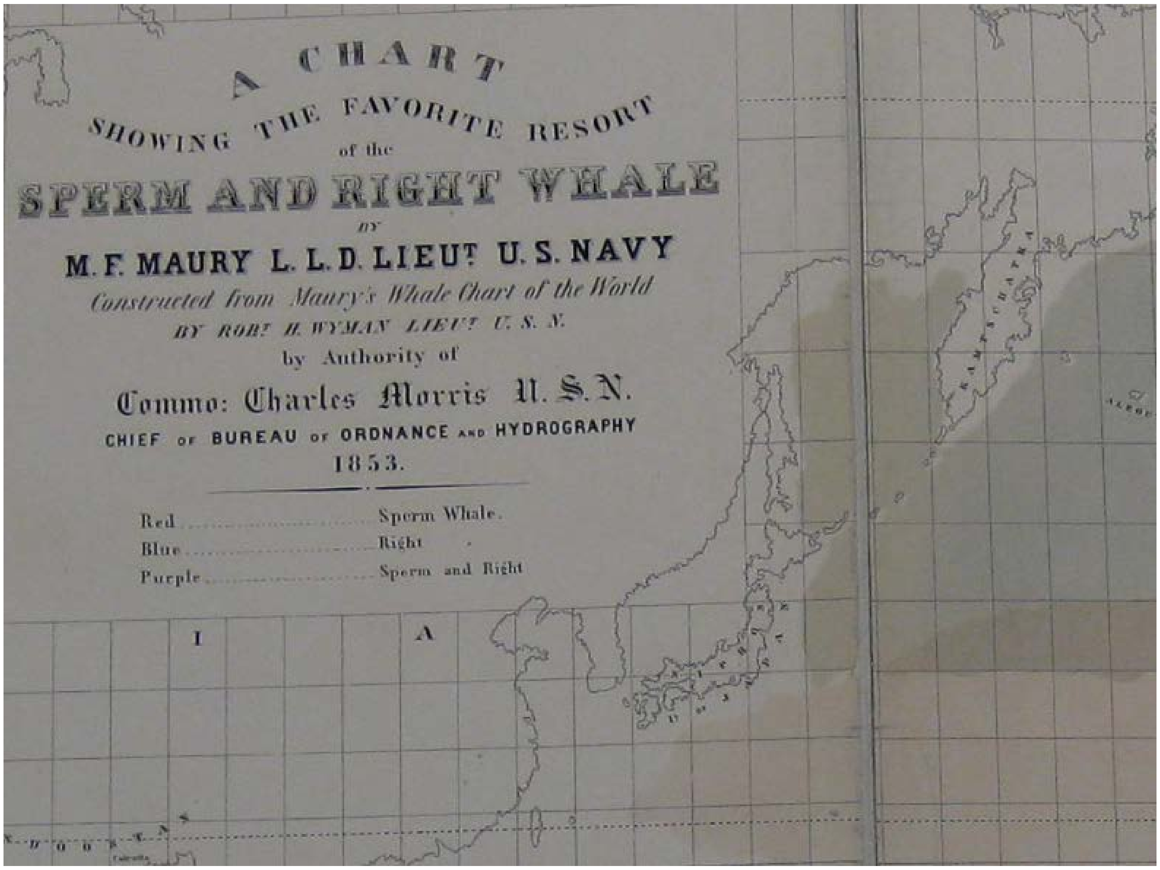


Figure 22: A section of Maury's Whale Chart showing prevalence of sperm and right whales in the Western Pacific by color. Geography and Map Division, Library of Congress.

Wind and Current Charts was a powerful way to represent the sea, suggesting that the environment followed immutable laws and that it obeyed order, not chaos. Maury was certain that his charts had the potential to dispel "all doubt and perplexity."[69] The sea, he wrote, "is never once left to the guidance of chance."[70] This was a powerful message, calculated to directly address the prevalent wilderness mythos that held the sea to be terrifying, disorienting, and unfathomable. "The air and the sea are obedient to law, and subject to order in all their movements," Maury counseled the mariner in his *Sailing*

[69] Maury, *Sailing Directions*, 251.

[70] Ibid., 161.

Directions. "Though unstable and capricious to us they may seem," he continued, they operated "with regularity, and perform their offices with certainty."[71] The *Wind and Current Charts* seemed to prove these statements true and the *Sailing Directions* that accompanied them read as one long sermon on the order of nature.

The sea environment reminded Maury of a giant machine, a metaphor that carried profound meaning and suggested, perhaps, that the sea was a kind of natural mechanism that mariners might harness, not unlike the steam engine, for their own use. "The atmosphere," Maury wrote, was "a vast machine, that is tasked to its utmost, but . . . one that is always in order and never breaks down." Again—"what a powerful machine is the atmosphere . . . as obedient to law as the steam engine to its builder."[72] The data collected for the *Wind and Current Charts* convinced Maury that the workings of the sea were mechanical in nature. Convinced by the order of the whole system, he detected natural balances in these movements that suggested practical as well as purely theoretical clues to the workings of the environment.

Pressing the machine metaphor further, Maury likened the Gulf Stream to a natural furnace system. The tropics, he explained, were the furnace itself, heating water in the "cauldron" of the Caribbean Sea and Gulf of Mexico. The Gulf Stream, in this analogy, was "the conducting pipe," conveying warmed water into the "hot-air chamber" of the North Atlantic.[73] As historian D. Graham Burnett has suggested, there is a parallel between this analogy and the new state-of-the-art furnace system that Maury had installed

[71] Ibid., 57, 133.

[72] Ibid., 42, 47-48.

[73] Maury, *The Physical Geography of the Sea*, 63.

in the Observatory. He was quite clearly and personally informed by notions of progress and efficiency made possible by the burgeoning Industrial Revolution in America.[74] Maury's natural machinery was benign. He thought that it evinced the grand wisdom of the natural order just as the machine had symbolized, to some Americans, the triumph of human ingenuity. In Maury's mind, the machine was not just in the garden, it was the garden.[75]

This "exquisite machinery" pointed to the providence of God who, in Maury's natural theology, created the winds and currents along with the Earth, the sea, the whales, and all other creatures over which humans presided. A devout Christian, Maury saw no contradictions between science and religion. "The right-minded mariner," he counseled, "hears His voice in every wave of the sea . . . and feels His presence in every breeze that blows."[76] He cited Job on gravity and Solomon on atmospheric circulation, finding in these biblical verses general truths that affirmed his own research.[77] He firmly believed that science could, in fact, lead him closer to God. "As our knowledge of Nature and her laws has increased," Maury argued, "so has our understanding of many passages in the Bible been improved."[78] This natural theology so suffused his *Sailing Directions* and *The Physical Geography of the Sea*, published in 1855, that succeeding generations of

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[74] D. Graham Burnett, "Matthew Fontaine Maury's 'Sea of Fire:' Hydrography, Biogeography, and Providence in the Tropics," in *Tropical Visions in the Age of Empire*, ed. Felix Driver and Luciana Martins (Chicago: University of Chicago Press, 2005), 131, 47n243-44.

[75] Leo Marx, *The Machine in the Garden: Technology and the Pastoral Ideal in America* (New York: Oxford University Press, 1964), 160-64, 190-96.

[76] Maury, *Sailing Directions*, 57.

[77] Maury to the Editor of *The New York Evangelist*, Washington, D.C., January 22, 1855, Papers of Matthew Fontaine Maury, General Correspondence, Box 4, LOC; The Bible verses that Maury cited are Job 26:7 and Ecclesiastes 1:7, among others.

[78] Maury, *Sailing Directions*, 45.

scientists and historians of science have dismissed his work as a quaint remnant of amateur science.[79] Yet natural theology had many adherents in nineteenth century science.[80] As Burnett argues, far from condemning Maury and his work, historians of science should reconsider his significance as indicative of an important step in the growth of the field.[81] Divinity was one more way that Maury sensed and expressed the order and beneficence that he found so prevalent in nature. Far from the antagonist of the bewildered mariner, Maury thought, God had made the sea for the mariner to use.[82]

With *Wind and Current Charts*, American mariners and naval officers stretched the bounds of the maritime world during the 1850s, opening the Western and North Pacific as well as the depths of the sea to investigation. It was an important decade in the history of naval hydrography because it represented the apogee of this science as a practical and ideological force for American mariners. With naval support, Maury expanded his research into the deep sea, that most "unfathomable" environment, to explore practical questions, but, increasingly, to attempt to understand more purely scientific ones as well.[83] New sounding technologies made deeper observations possible and the deep sea, therefore, took on new cultural meanings in the 1850s. For all this supposed progress, however, technological issues and human problems of interpretation

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[79] John Leighly, "Introduction" in Maury, *The Physical Geography of the Sea*, xxiv-xxvi.

[80] A. Hunter Dupree, "Christianity and the Scientific Community in the Age of Darwin," in *God and Nature: Historical Essays on the Encounter Between Christianity and Science*, ed. David C. Lindberg and Ronald L. Numbers (Berkeley: University of California Press, 1986), 351-368.

[81] Burnett, "Maury's 'Sea of Fire," *Tropical Visions*, 130.

[82] Religion was, in part at least, also the impetus behind the Lynch Expedition, which surveyed the Sea of Galilee, the River Jordan, and the Dead Sea in 1848 under Maury's direction at the Naval Observatory. See Andrew C. A. Jampoler, *Sailors in the Holy Land: The 1848 American Expedition to the Dead Sea and the Search for Sodom and Gomorrah* (Annapolis: Naval Institute Press, 2005).

[83] Rozwadowski, *Fathoming the Ocean*, 5.

vexed Maury and his staff, while the sea itself remained impossible to fully understand. Meanwhile, whalers and China traders shifted the nation's maritime frontiers from the South Seas to the North and West Pacific. This spurred hydrographic interest in those seas and a North Pacific Exploring Expedition that shared many of the same goals as the Ex. Ex. fifteen years before. The expedition, however, experienced command issues. Its publications were never comprehensively published, and the Civil War soon eclipsed its homecoming so that the expedition attained little of the Ex. Ex.'s cultural power.[84] But during the 1850s, Maury's work on the *Wind and Current Charts* and the North Pacific expedition reoriented American hydrographic interests away from the shallow littoral waters of Pacific islands and atolls, toward a deeper understanding of the sea's vast open spaces.

The deep sea fascinated Maury as it did so many mariners, and in the 1850s naval support and new technologies made surveying it a possibility. The deep sea held tremendous folkloric power. Until mid-century, sailors and scientists could hardly penetrate its surface to what lay beneath. It was the quintessential maritime example of that inability to see and comprehend, which Roderick Nash wrote about in his book *Wilderness and the American Mind*. If winds and waves were little understood before mid-century, the deep sea floor seemed more distant than the moon. "The bottom of the Atlantic Ocean," Maury admitted in 1851, "is, with here and there an exception . . . as unknown to us as in the interior of the other planets of our system."[85] But, as historian

[84] George M. Brooke, Jr., *John M. Brooke: Naval Scientist and Educator* (Charlottesville: The University Press of Virginia, 1980), 136; George M. Brooke, Jr., ed. *John M. Brooke's Pacific Cruise and Japanese Adventure, 1858-1860* (Honolulu: University of Hawaii Press, 1986), 4; Rozwadowski, *Fathoming the Ocean*, 55-56.

[85] Maury, *Sailing Directions*, 70.

Helen Rozwadowski has shown, by mid-century the deep sea had become a destination for scientific research, not merely a highway or barrier to cross.[86] In 1849, Maury had managed to secure the use of three naval vessels to "make observations upon the winds and currents of the sea and to collect other facts in connexion [sic] with the 'Wind and Current Charts.'"[87] The first of these, the unseaworthy schooner *Taney*, had achieved what Maury thought to be a momentous accomplishment. On November 15, 1849, *Taney*'s crew sounded to a depth of 5,700 fathoms, or 34,200 feet, deeper than any previous cast and, indeed, far deeper than Maury thought the ocean floor to be.[88] But soundings by the second of these vessels, the brig *Dolphin*, proved the 1849 cast to be erroneous. The issues were mostly technological and will be discussed below. Beginning with *Dolphin*'s 1852 cruise, however, Maury employed a new deep-sea sounding instrument developed by one of his officers at the Observatory, which promised more accuracy and to bring back a sample of the sea floor.

With more success and greater precision, *Dolphin*'s crew used the new sounding device as it crisscrossed the Atlantic in 1852 and 1853, revealing a new picture of the sea floor that figured significantly in Maury's ideas about a benign sea created for maritime enterprise. The new device was the invention of Lieutenant John Mercer Brooke, whose revolutionary contribution to the history of sounding technology was the detachable weight.[89] Brooke used thirty-two pound shot, and sometimes heavier, to pull his sounding

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[86] Rozwadowski, *Fathoming the Ocean*, 6.

[87] Maury, "Programme of Instructions for the "Taney," drawn by request, for the Secretary of the Navy, October 4, 1849, Records of the Naval Observatory, RG 78, Letters Sent, Vol. 4, NARA.

[88] Maury, *Sailing Directions*, 62.

[89] Brooke, *John M. Brooke*, 58-59.

wire to the bottom where it detached from the weight and, in a tallow-filled cylinder, brought up sediment from the bottom for investigation and testing. With the detachable weight, Brooke had solved the greatest quandary of deep-sea sounding—how to know when the lead actually touched bottom.[90] Previous leads, light enough to be heaved back aboard ship, were subject to the caprice of undercurrents, which carried them horizontally or diagonally instead of at the intended right angle with the sea floor. With Brook's device, *Dolphin*'s crew sounded the Atlantic at intervals of two hundred miles. These measurements gave Maury data for a bathymetric chart, which showed, for the first time, a vague outline of the Atlantic sea floor. With Brooke's lead, Maury exclaimed, "I have been in the depths of the Ocean."[91] To the mariner and the scientist, Maury wrote in his *Sailing Directions* that the bottom was "quite as irregular in its outlines, in elevations and depressions, in its mountains and its valleys, as is the face of our continents."[92] In the North Atlantic, however, Maury stumbled on a stretch of sea floor that, he thought, suggested something providential. At a depth of twelve thousand feet, a nearly flat bed of shells stretched from Newfoundland to Ireland. Maury cleverly designated it the "Telegraph Plateau." Maury's simultaneous correspondence with Cyrus Field, proprietor of the trans-Atlantic telegraph cable, suggested the practical value of hydrographic surveying even as Brooke's deep sea device brought up specimens of special interest to science.

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[90] Rozwadowksi, *Fathoming the Ocean*, 84-86; Schlee, *The Edge of an Unfamiliar World*, 53-54; Brooke, *John M. Brooke*, 57.

[91] Maury to Franklin Minor, Washington, D.C., October 16, 1856, Papers of Matthew Fontaine Maury, General Correspondence, Box 6, LOC.

[92] Maury, *Sailing Directions*, 90.

Laying a telegraph cable across sixteen hundred miles of ocean was a daunting proposition at mid-century, requiring all the ingenuity, knowledge, and publicity available to finance and execute. Maury was a master of all three. As a result of *Dolphin*'s cruise and other deep sea soundings by naval vessels using Brooke's device, Maury had written to Field in 1854 that the cable was, indeed, practicable.[93] But Maury's illustrations and his pen performed, perhaps, an even more important function. Rozwadowski contends that, once publicized by the newspapers and periodicals of the day, Maury's hydrography "presented an attractively benign picture of the depths."[94] As Rozwadowski shows, Maury wrote to Secretary of the Navy James C. Dobbin that the sea floor of the Telegraph Plateau was "quiet . . . as a millpond."[95] Expanding on these words and citing samples from the bottom raised by Brooke's device, print media popularized the venture, declaring that the sea floor was "quiet and undisturbed" and "a sort of bed of down for the cable to rest upon."[96] Here, then, was a new idea about the deep sea. Previously mysterious, dark, and unfathomable, Maury's work and Brooke's sounding device began to recast it as a benign environment that fit quite well within Maury's larger maritime ideology.

The need for a new sounder and the difficulties Field faced in various attempts to lay a working cable, however, suggest that this kind of scientific research was not as simple and as transparent as Maury's pen or even his charts suggested. The problems

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[93] Williams, *Matthew Fontaine Maury*, 231-32.

[94] Rozwadowski, *Fathoming the Ocean*, 90.

[95] Maury quoted in Rozwadowski, *Fathoming the Ocean*, 92.

[96] *New York Herald* and "The Recent Soundings for the Atlantic Telegraph," *The Illustrated London News* (Fall 1857) quoted in Rozwadowski, *Fathoming the Ocean*, 90.

were technological, environmental, and human. Brooke's device solved some festering problems of deep sea sounding technology, but it was far from perfect. Among other things, it required an extended period of calm seas. The line itself, with heavy shot, was prone to part mid-cast as Brooke discovered first-hand on a surveying cruise in the North Pacific.[97] One officer voiced the concern of many when he remarked that "deep sounds will, I think, always be attended with great uncertainty," and, particularly, "if there should be a current."[98] Other methods of investigation also remained primitive. In 1843, Maury had advocated for a general study of ocean currents by suggesting that mariners throw bottles overboard with their position enclosed. When picked up, he hoped, mariners would return them to the Observatory for analysis.[99] Elsewhere, he suggested that sub-surface currents of the Gulf Stream might be identified using a weighted canvas parachute suspended by fishing wire and corks.[100] The sea itself, of course, was a dynamic environment whose processes Maury only vaguely understood despite the mass of data mariners had collected for him. His bathymetric chart of the Atlantic sea floor, for all its cartographic significance, nevertheless relied on a handful of soundings and presented only a very basic representation. Despite all the certainty that suffused Maury's charts and his own pronouncements, the sea remained mostly unknown.

Maury also grappled with problems of interpretation. In his *Wind and Current Charts*, he had striven to present an extraordinary amount of data in a simple,

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[97] Brooke, *John M. Brooke*, 58, 84.

[98] Lieutenant William Rogers Taylor, quoted in Maury, *Sailing Directions*, 80.

[99] Maury, "Blank Charts on Board Public Cruisers," *Southern Literary Messenger*, 459.

[100] Maury, "Suggestions for the Attention of the Home Squadron," October 3, 1843, Records of the Naval Observatory, RG 78, Letters Sent, Vol. 1, NARA.

straightforward way. “Books,” he wrote to John Quincy Adams, “impart information through the ear—these charts through the eye.”[101] But, as Maury discovered, the eye was a subjective lens that did not always see as he intended. In addition to the passages of individual vessels, Maury’s track charts had designated the mean passage from port to port in order to show the navigator the average course of all vessels. Navigators, Maury remarked, “have inferred . . . that [these lines] must be followed as rigidly and as closely as though they marked out a channel-way, on either side of which if a vessel should fall, she would find herself in difficulty.”[102] To Maury’s dismay, some navigators had trusted so wholly in his work, that they followed these lines unequivocally. When contrary winds and currents sprang up unexpectedly, some mariners stuck to this route, beholden to the idea, as Maury put it, that “there is some sort of virtue in the black mark on the chart.”[103] Maury had charted himself into a contradiction. On one hand, his charts and his writing had worked to transform mariners’ ideas about the sea and many embraced its order, its laws, and its design. But Maury knew that the sea did not always follow his rules. “I do not claim for vessels on the new route an exemption either from head winds, baffling airs, or calms,” Maury admitted. “On the contrary, I expressly show that vessels on the new route are liable to all these. Nor do I claim for the new route short passages *invariably*. I only claim that the average of the passages by the new route will be shorter than the average of the passages by the old.”[104] On one level, then, Maury had achieved his

[101] Maury to John Quincy Adams, Washington, D.C., November 17, 1847, Records of the Naval Observatory, RG 78, Letters Sent, Vol. 2, NARA.

[102] Maury, *Sailing Directions*, 232.

[103] Ibid., 271.

[104] Ibid., 240.

expectations, but at the cost of convincing mariners that the sea always worked in certain ways when, in fact, it did not.

Maury, nevertheless, had achieved much of practical value for the Navy and the international maritime community, which won him popular approval as a scientific authority on the sea, but also drew the ire of many in the scientific community. The origins of Maury's rivalry with Joseph Henry of the Smithsonian Institution and Alexander Dallas Bache of the Coast Survey are complex and have been examined thoroughly by other historians.[105] On the surface, there were battles over intellectual rights, about hydrographic jurisdiction, about funding from Congress, and about Maury's preference for hydrography over astronomy. The latter was the most popular scientific field of the day—the gauge of a nation's scientific reputation—and so American scientists bemoaned the lost opportunity of a national observatory put to hydrographic use. But as historian Stephen Dick argues in his institutional history of the Observatory, its professors and officers continued to carry out important and extensive astronomic research even as Maury remained immersed in his logs.[106] For his part, Maury pointed to jealousy, and it was partly this on both sides.[107] In 1850, Maury had written to his chief at the Bureau of Ordnance and Hydrography that the Observatory should usurp the Coast Survey's hydrographic duties, which were confined to the coastlines of the territorial

[105] Burstyn, "Seafaring and the Emergence of American Science," 101; Dick, *Sky and Ocean Joined*, 107-09; Williams, *Matthew Fontaine Maury* , 168-175, 203-05, 235-36; Schlee, *The Edge of an Unfamiliar World*, 39.

[106] Dick, *Sky and Ocean Joined*, 111-12.

[107] Maury to Frank Minor, Washington, D.C., January 11, 1856, Papers of Matthew Fontaine Maury, General Correspondence, Box 5, LOC; Maury to John Minor, Washington, D.C., November 15, 1858, Papers of Matthew Fontaine Maury, General Correspondence, Box 7, LOC.

United States.[108] Then in 1857, he suggested that his method of observation be extended to the land, which was Henry's domain under a Smithsonian led program of meteorological research. At mid-century, Maury was a powerful man. He enjoyed broad popular support for his practical research and relatively little naval oversight in his hydrographic fiefdom at the Observatory. Maury's detractors resented his hold on one of the few advanced centers of astronomical and meteorological research in the world.

These squabbles, however, were symptomatic of broader struggles that attended the professionalization of science in the nineteenth century. The root of these differences arose from competing definitions of the field itself. Maury's method was antithetical to the professionalizing impulse of science because it relied on mariners as collectors of data and naval officers as interpreters of it. Maury's biographer, Frances Leigh Williams, suggested that Bache and Henry were acutely concerned with conventions of class and professional rules of propriety, which set them and their colleagues apart as elite men of science.[109] An anonymous editorial in the February 18, 1857, issue of the *Boston Atlas* reflects this argument. The editorial, which Maury attributed to Henry's pen, railed against Maury's amateurism. "Even half-educated people," the anonymous writer seethed, "should protest against our being held nationally responsible for the character of the essays which are ceaselessly issuing from the 'Hydrographical Office.'" True scientific research, he suggested, relied on "systematic records" from "carefully compared instruments" taken by "learned men" in the nation's "seminaries of learning. I had always supposed," the writer concluded, "that educated men were more likely than

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[108] Maury to Lewis Warrington, Chief of the Bureau of Ordnance and Hydrography, Washington, D.C., May 28, 1850, Records of the Naval Observatory, RG 78, Letters Sent, Vol. 5, NARA.

[109] Williams, *Matthew Fontaine Maury*, 74n527.

ignorant ones to deduce correct results even from data of equal value."[110] Maury was a scientific democrat, eschewing the pretensions of Bache and Henry in favor of science carried out by the common man with conclusions that were accessible and that served the public good.[111] At root, the rivalry between Maury and Bache and Henry emerged from conflicting and irreconcilable definitions of science in nineteenth-century America.

Historians who have adopted Bache and Henry's perspective, with the benefit of hindsight, have failed to fully consider the nature of scientific research at sea in the nineteenth century. While Maury's method flouted convention and sometimes led to flawed conclusions, it is true nonetheless that Maury turned to the maritime community as the only available group of observers capable of taking observations at sea on a large scale. This relationship evinced pragmatism on Maury's part that transcend the critiques of Bache, Henry, and others like them who dismissed the system out of hand. By bridging the social and intellectual gulf between science and the maritime community, Maury had vastly expanded understanding of the sea environment, which otherwise would have gone unrealized. The sea was an environment inhospitable to scientific research. It required unique considerations and not a few concessions. At the most basic level, it remained largely inaccessible to academic scientists at mid-century. While Maury's scientific democratism was perhaps anachronistic, he nevertheless managed to construct a system of research at sea where virtually none had existed before.

Through the 1850s, however, Maury moved from practical results to shaky theoretical deductions, which have led historians of science to largely dismiss his

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[110] Letter to the Editor of *The Boston Atlas*, February 18, 1857, Papers of Matthew Fontaine Maury, General Correspondence, Box 7, LOC.

[111] Williams, *Matthew Fontaine Maury*, 204.

scientific contributions.[112] In 1855, Maury published his sprawling book *The Physical Geography of the Sea*, a general text that combined the theories he had been airing in his *Sailing Directions*. *The Physical Geography of the Sea* was an immediate popular success, running through ten printings in six years. This was all the more dangerous to Henry, Bache, and their associates since it rested on shaky theoretical ground. In it, for example, Maury ascribed the circulation of the atmosphere to magnetism. This was a theory, as geographer John Leighly writes, "which did not convince even his lay critics."[113] Even Maury's work on the Gulf Stream, which had done so much to advance knowledge of that current, exposed his weaknesses as a scientist. Maury showed little regard for competing theories of the current's origin. Rather, he proposed that differences in temperature and salinity, not the trade winds as others surmised, combined to propel warm water northward.[114] *The Physical Geography of the Sea* exposed these flaws. By moving from practical insights toward grand theories about the workings of the environment that he was not qualified to make, Maury undermined his own scientific legacy and justified the claims of his nineteenth century critics.

Moreover, the data on winds and currents led him into questionable matters of policy. In 1848, Maury had proposed a transcontinental railroad terminus at sleepy Monterrey that would tap a natural "commercial highway" across the sea to China.[115]

[112] A Hunter Dupree, *Science in the Federal Government: A History of Policies and Activities to 1940* (Cambridge: Harvard University Press, 1957), 105-09; Leighly, "Introduction," xxix; Nathan Reingold, *Science in Nineteenth Century America: A Documentary History* (Hill and Wang: New York, 1964), 145-46.

[113] Leighly, "Introduction," xx.

[114] Ibid., xvii-xix.

[115] Maury to to T. Butler King, Washington, D.C., February 29, 1848, Records of the Naval Observatory, RG 78, Letters Sent, Vol. 3, NARA.

And in the 1850s, as the sectional crisis erupted, he advocated Southern expansion into the Amazon River Basin, which had not yet outlawed slavery and lay conveniently in the direct path of advantageous winds and currents.[116] Maury had overstepped his bounds as a scientist and as a naval officer. For these reasons he is a paradoxical figure in the history of science—at once a towering founder of oceanography and a threat to the field's legitimacy at its birth.

If Maury's work was not scientific enough for Bache and Henry, it often proved too much so for the Navy, which had not yet reconciled the officer-scientist. Wilkes had similarly drawn the ire of the naval officer corps in taking command of the Ex. Ex. But, ironically, the similarities between Wilkes and Maury—the Navy's two most important hydrographers—end there. Maury despised Wilkes. The animosity began in 1838 in what Maury judged to be Wilkes' inept preparations for the departure of the Ex. Ex and continued in controversies over the publication of the expedition's charts.[117] To Maury, Wilkes was "this favorite of imbecility" and "the only officer in the Navy with whom I would not cooperate."[118] But their differences transcended this petty quarrel.

At root, the two officers practiced two markedly different forms of hydrography. As D. Graham Burnett argues, Wilkes' trigonometric surveys of Pacific islands were predicated on the precision of strict naval discipline. Maury's *Wind and Current Charts*,

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[116] Williams, *Matthew Fontaine Maury*, 197-202.

[117] Ibid., 116-19.

[118] Matthew Fontaine Maury to Thomas A. Dornin, Fredericksburg, April 2, 1839, Papers of Matthew Fontaine Maury, General Correspondence, Box 1, Library of Congress, Washington, D.C. [There is an error in the date of this letter. It should be dated April 2, 1838]; Matthew Fontaine Maury to Ann Maury, Fredericksburg, April 5, 1838, Papers of Matthew Fontaine Maury, Additions, 1834-1960, Box 65, Folder 2, LOC.

however, were the democratic project of the maritime world, evincing all the benefits and faults that attended this method.[119] Wilkes and Maury's work, then, proceeded without reference to the other, the result of personal animosities in a navy still grappling with the place of science in its ranks.

Maury's enemies in the service pointed to his lame leg as grounds for his retirement from the Navy. The Naval Efficiency Board of 1855, comprised of line officers charged with thinning the Navy's aged and feeble ranks, found Maury unable to perform the traditional duties expected of a line officer, science notwithstanding. There was simply no place for scientific achievement within the service's structure of rank and promotion, which extolled command of a warship or a squadron above all else. "I have, without cause, been made to suffer a grievous wrong," Maury pined. He condemned the board as "a monstrous inquisition" made up of officers "not one of whom has the least pretensions to any scientific attainments." Maury petitioned the board, the Secretary of the Navy, and Congress for redress, citing, in histrionic fashion, British Admiral Horatio Nelson who had fought the Battle of Trafalgar in 1805 with one eye and one arm.[120] But here was the crux of the issue. Maury was, in fact, not Nelson. He differed from most of his fellow officers in his preference for the halls of the Observatory over the quarterdeck of a ship of the line. Ultimately, Maury's influence compelled his reinstatement in 1857 with a promotion to the rank of commander retroactive to 1855.[121] Nonetheless, the affair

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[119] Burnett, "Hydrographic Discipline Among the Navigators," *The Imperial Map*, 221.

[120] Maury to Bishop Joseph Harvey Utley, University of Virginia, September 20, 1855, Papers of Matthew Fontaine Maury, General Correspondence, Box 5, LOC.

[121] Williams, *Matthew Fontaine Maury*, 269-308.

suggests Maury's conflicted status within the navy's ranks. The board's findings had, for a time, identified his disability as more significant than his research.

When Maury resigned his naval commission in 1861 to follow his native Virginia in secession, he estranged his only ally—the American merchant marine whose ships had reaped the benefits of his *Wind and Current Charts*. Sent to Great Britain as a Confederate agent, Maury contracted for the construction of commerce raiders in the South's war of guerre de course against Yankee maritime commerce. Rather than saving whalers from wreck or calms, his duty was to build ships that would hunt and burn them. It was a cruel irony. Maury went from hero to the Yankee sailor's reviled enemy. On May 30, 1861, the members of the Salem Marine Society, all sea captains, convened and voted to remove Maury, the society's first honorary member, from its rolls. They cried treason and re-hung his portrait, once prominently displayed, backward and upside down where it still remains. In 2007, however, the Association for the Preservation of Virginia Antiquities, a Fredericksburg-based group with an interest in their state's Civil War heritage, presented the Salem Marine Society with a new Maury portrait.[122] It hangs, upright, next to the old, as a fraught symbol in the contested memory of the nation. Such posturing is a testament to Maury's central place in the antebellum American maritime world. Reviled by science and an iconoclast in the Navy, Maury was a great promoter of the nation's merchant and whaling fleets nonetheless. His continued legacy as a traitor to the North and, in particular, to the maritime interests of New England suggests the heights of his prewar preeminence. Maury was the most important American

[122] Scott C. Boyd, "Matthew Fontaine Maury—He's Being Forgiven at Last," Civil War News (September 2008), http://www.civilwarnews.com/archive/articles/08/sept/murray_sept08_909.htm (accessed March 17, 2011); thanks to Dr. Jan Herman, Historian of the Navy's Bureau of Medicine and Surgery, for bringing this to my attention.

hydrographer of the nineteenth century because he offered, by chart and pen, a compelling alternative to the wilderness mythos that had governed American mariners' relationship with the sea.

There is no more fitting testament to the commercial significance of Maury's *Wind and Current Charts* than the voyage of *John Gilpin* from New York City around Cape Horn to San Francisco in the fall of 1852. The *Gilpin* was a clipper ship—the apotheosis of American ship design and, for a fleeting moment, the marvel of the American maritime world. The 1850s was a watershed moment for the sailing ship as the steam engine gradually replaced it. Romantically-minded Americans, therefore, looked to clippers with awe. On this particular passage, the *Gilpin* departed New York with two other clippers in a race to California using Maury's *Wind and Current Charts*. The *Gilpin* prevailed, making the passage in a record ninety-three days when the average, without the benefit of Maury's charts, stood at 187.5 days.[123] By mid-century, then, the sea had literally and figuratively become a racetrack. While it still remained dangerous and mostly unknown to science, the sea assumed a new character in the maritime imagination. "Indeed," Maury remarked, "the ocean . . . presents . . . a common highway, upon which each society, like every nation, may make its ventures, and return in vessels laden with treasures to enrich the mind and benefit the human race."[124] With a copy of the latest *Wind and Current Charts*, Maury likened the mariner to a "backwoodsman in

[123] Williams, *Matthew Fontaine Maury*, 190-91.

[124] Maury, "Paper on the Currents of the Sea as connected with Geology, read before the Association of American Geologists and Naturalists, May 14, 1844" quoted in Maury, *Sailing Directions*, 121.

the wilderness" who "is enabled literally 'to blaze his way' across the ocean; not, indeed, upon trees, as in the wilderness, but upon the wings of the wind."[125]

Maury's vision of the sea as a commercial highway, expressed so powerfully in his *Wind and Current Charts* and in his system of observation in which mariners themselves began to perceive the sea in new ways, marked the pinnacle of American commercial dominance on the sea in the nineteenth century. The Civil War and an increasingly westward orientation decreased American ocean-going commercial voyages after 1865. Through the 1890s, the idea of the sea as a common highway continued to inform the work of the Hydrographic Office, which broke from the Naval Observatory in 1866. Without a visionary leader like Maury, American naval hydrography largely faded into background of naval and maritime affairs, much as the Navy similarly faded from the national stage between 1865 and 1890. But by the 1890s, the strategic imperatives articulated by Captain Alfred Thayer Mahan in *The Influence of Sea Power upon History*, the strategic studies of the Naval War College, and the Spanish-American War were transforming the nautical chart into a weapon of war, forcing naval officers to think about the marine environment through a strategic lens. As Chapter Four argues, rather than a common highway, the sea became primarily a space to command for the United States Navy at the turn of the twentieth century.

[125] M.F. Maury, *The Physical Geography of the Sea* (New York: Harper and Brothers, 1855), 262.

CHAPTER 5: ’TWIXT THE DEVIL AND THE DEEP BLUE SEA

All nautical pride was cast aside as we ran our ship ashore
On the Caribee Isles, where the poo-poo smiles and the jumble gee chum chees roar.
We sat on the edge of a sandy ledge and shot the whistling bee-ee-ee
While the cinnamon bats wore water proof hats as they soused in the surf of the sea.

-“The Rollicking Window Blind,” U.S.S. *Yosemite*, 1898[1]

On September 23, 1901, four days into a naval court of inquiry to examine Rear Admiral Winfield Scott Schley’s conduct during the Spanish-American War, Schley’s counsel, Isidor Rayner, turned to a “map” to defend his client. “It is a chart, not a map,” the judge-advocate-general, a naval officer, replied. “Chart or map, call it whatever you will,” Rayner was dismissive; he did not care to parse nautical terms. What mattered for Schley’s defense was that this chart purported to be an accurate representation of the Battle of Santiago de Cuba, July 3, 1898, in which the Navy had called into question Schley’s command of his flagship, the cruiser *Brooklyn*, among other errors in judgment. The details were in dispute, but the judge-advocate-general framed his argument this way: At the outset of the battle, Schley had ordered an ill-advised turn to port, nearly colliding with the battleship *Texas* and momentarily impeding both ships’ pursuit of the fleeing Spanish fleet. The court of inquiry was just one episode in the ongoing Sampson-Schley controversy, a long, rancorous feud between Schley and Rear Admiral William T. Sampson, the commander of the North Atlantic Fleet, over who should receive credit for the American victory.[2] Rayner continued, referencing the chart in his cross-examination of *Texas*’ navigator, Commander Lewis C. Heilner. “This is something signed by you and

[1] *Songs of the Yosemite* (Detroit: John F. Eby and Company, 1901), 6. The song is an adaptation of the children’s nonsense poem “The Walloping Window Blind” written by Charles E. Carryl and first published in 1885.

[2] On the Sampson-Schley controversy, see Harold D. Langley, “Winfield S. Schley and Santiago: A New Look at an Old Controversy,” in *Crucible of Empire: The Spanish-American War and Its Aftermath* ed. James C. Bradford (Annapolis: Naval Institute Press, 1993), 69-101.

the other navigators and ordered by Admiral Sampson, and returned by the Secretary of the Navy to the Senate, and the work was done less than three months after the battle."[3] Rayner's point was that an official chart, depicting the movements of American warships during battle, bore the weight of legitimacy—or at least it should. It was on this understanding that Rayner intended to base a key argument in his case to clear Schley's name and to restore credit to the admiral for the American victory. The chart, Rayner argued, was as close as he or anyone else would get to a precise recreation of a battle that made the United States a naval and imperial power.

Rayner and Heilner both knew, however, that the chart was anything but precise, and what followed was partly a hearing in cartographic accuracy that at times digressed to a broader admission of the Navy's hydrographic difficulties in the waters off Cuba. Frustrated at Rayner's apparent faith in the chart, the navigator Heilner retorted, "but we are going over the whole business on a chart that is absolutely worthless—." Rayner had his witness where he wanted. "That is what I want to get at," the attorney replied, "that that chart is worthless—."[4] And so there was agreement, at least for a moment, among Schley's defenders and his detractors that a chart of battle, officially appended to the Secretary of the Navy's annual report of 1898, was almost completely wrong. This was no minor conclusion, occurring in a controversy that split the Navy and captured the popular imagination.

Indeed, for anyone closely following the proceedings at the Washington Navy Yard—spectators packed the room and newspapers offered daily excerpts—it was

[3] U.S. Navy Department, Record of Proceedings of a Court of Inquiry in the Case of Rear-Admiral Winfield S. Schley, U.S. Navy, vol. 1 (Washington, D.C.: Government Printing Office, 1902), 142-43.

[4] Ibid., 140.

apparent that the Navy had won the war despite knowing little about Cuban waters or even exactly what had occurred there. At one point, Captain James Parker, another of Schley's counsels, questioned the use of a chart from the Navy's Hydrographic Office. The judge-advocate-general responded, "this is the chart, I understand, to have been furnished the fleet that was operating in Cuban waters." He was puzzled by Parker's protest. "As a matter of fact," Parker explained, "the positions on that chart are grossly inaccurate. The coast line is put on that chart as 6 miles farther south than it ought to be and 4 miles farther west."[5] Schley's court of inquiry, to which this chapter will return, was hardly an endorsement of the Navy's conduct, hydrographic or otherwise, in what had been a splendid little war for the service in most other respects.

For the naval commanders and navigators who relied on this chart and others like it to blockade Cuba, the sea itself had been a troublesome enemy. Naval operations along the shallow, ill-charted coasts of Cuba, Puerto Rico, and the Philippines evinced the tactical and strategic difficulties of fighting in a mostly unknown and dynamic marine environment. At nearly every turn—bombarding shore targets, engaging enemy gunboats, landing troops and supplies, cutting cable communications, intercepting contraband, and simply steaming in and out of port—naval commanders were frustrated by the sea and by the shortcomings of their charts. Seemingly small discrepancies of a few miles were magnified when a foot or fathom might prove the difference between grounding and safe passage. As Heilner and Parker's objections made clear, these charts could not be relied on in court, to say nothing of their futility in battle. Even in those places where the chart was correct, it could no longer be trusted. A stronger enemy might well have seized on these environmental struggles to defeat the United States or to exact a more arduous

[5] Ibid., 32.

victory. The blockade revealed just how tenuous American command of the sea actually was, regardless of Spain's military weakness.

Knowledge of the sea environment thus became a strategic imperative even as the commercial understandings that had informed naval science continued to animate naval hydrographers' work. Despite hydrographic problems, the American blockade had been a success, affirming the strategic philosophy of Captain Alfred Thayer Mahan, a professor and president of the Naval War College. In *The Influence of Sea Power upon History, 1660-1783,* published in 1890, Mahan had framed the sea as a strategic space that the United States could command through overwhelming naval power. Though Schley had bumbled his way to victory at Santiago and warships had grounded in shoal water, the American naval campaign seemed to play out like some well-rehearsed war game. The blockade cut off Cuba from reinforcement and forced Spain to send a fleet or lose its most valued imperial possession without a fight. Mahan, though, had written in broad strokes about how command of the sea could actually be achieved in the new era of steam and steel navies. In the waters off Cuba and the Philippines, the Americans found out for themselves, forced to turn his principles into strategic reality. For these officers, command of the sea meant reckoning with the environment as well as the enemy and its commerce. Sea power thus demanded new hydrographic meanings. The Spanish-American War represented not simply a victory over Spain despite hydrographic difficulties, but also a larger shift in which the Navy would have to reconsider the purpose of hydrography and the service's relationship to the sea as well.

The American naval and maritime world of 1898, of course, was far different than in 1861 when Matthew Fontaine Maury had resigned his commission to join the Confederacy. After the Civil War, which saw a dramatic change in the size, form, and role of the U.S. Navy, the service once again returned to its traditional peacetime duties with small squadrons patrolling stations around the world and protecting maritime interests. But the American merchant marine was on the decline, decimated by Confederate commerce raiders, high marine insurance rates, and Congressional legislation that denied re-license to shippers who had switched flags during the war. The percentage of waterborne cargo carried by American-licensed vessels decreased steadily from 66 percent in 1861 to less than 10 percent in 1898.[6] While the nation's maritime commerce was not dead, it had turned largely to coastal and inland waters. Indeed, postwar industrialization had reoriented the nation away from the sea toward the American West. Railroads framed an inland empire, transporting passengers and goods over land rather than by circuitous and sometimes unpredictable sea routes.[7] Preoccupied with reunion and oriented westward, war-weary Americans let the Navy decline in fiscal and political neglect through the 1870s and 1880s. Meanwhile, the service itself grappled with social and technological changes.[8] By the 1890s, however, a convergence of political, economic, technological, cultural, and ideological forces revived American

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[6] "Values of U.S. Waterborne Cargo 1790-1994 in Alex Roland, W. Jeffrey Bolster, and Alexander Keyssar, *The Way of the Ship: America's Maritime History Reenvisioned, 1600-2000* (Hoboken, NJ: John Wiley and Sons, 2008), 430-32.

[7] Roland, *The Way of the Ship*, 194-210.

[8] Lance C. Buhl, "Maintaining 'An American Navy,' 1865-1889" in *In Peace and War: Interpretations of American Naval History*, ed. Kenneth Hagan (Westport, CT: Greenwood Press, 1978), 145-173; For the condition of the American merchant marine and its relation to naval policy, see United States Navy, *Annual Report of the Secretary of the Navy for the Year 1878* (Washington, D.C.: Government Printing Office, 1878), 11-16.

Navalism. The nation began building a fleet of steel-hulled, steam-driven warships, embracing a larger peacetime naval establishment increasingly designed to project power rather than defend the American coast.[9] The New Navy, as it was dubbed, was not yet a first-rate force, and at least twenty years would pass before the Navy fully embraced an offensive orientation. Nevertheless, it was becoming increasingly different in form, if not yet in mission. The Spanish-American War only affirmed and added impetus to this continuing transformation.

In the interim, the Navy's hydrographers continued to serve American and foreign mariners as well as the service itself by providing charts, Sailing Directions, and Notices to Mariners that reflected the commercial and practical origins of naval science. In 1866, the Navy had split the hydrographic and astronomic functions of the Naval Observatory, creating a separate Hydrographic Office whose purview was to survey, chart, purchase, and disseminate information about the depths, currents, tides, and meteorology of the sea. The office generally continued in the spirit of the Naval Observatory's antebellum work. It conducted surveys of the deep-sea and extended exploration into the Arctic.[10] Commercial interest in a canal informed several surveying expeditions to Central

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[9] Walter R. Herrick, *The American Naval Revolution* (Baton Rouge: Louisiana State University Press, 1967); Peter Karsten, *The Naval Aristocracy: The Golden Age of Annapolis and the Emergence of Modern American Navalism* (New York: The Free Press, 1972); William M. McBride, *Technological Change and the United States Navy, 1865-1945* (Baltimore: The Johns Hopkins University Press, 2000), 1-63; Robert L. O'Connell, *Sacred Vessels: The Cult of the Battleship and the Rise of the U.S. Navy* (Boulder, CO: Westview Press, 1991), 39-72; Mark R. Shulman, *Navalism and the Emergence of American Sea Power, 1882-1893* (Annapolis: Naval Institute Press, 1995).

[10] For deep sea surveys and changes in technology and method, see Commander Charles E. Belknap, *Deep-Sea Soundings in the North Pacific Ocean, Obtained in the United States Steamer* Tuscarora (Washington, D.C.: Government Printing Office, 1874), 3-18; Charles D. Sigsbee, *Deep-Sea Sounding and Dredging: A Description and Discussion of the Methods and Appliances Used on Board the Coast and Geodetic Survey Steamer, "Blake"* (Washington, D.C.: Government Printing Office, 1880). Sigsbee was a naval officer who worked and devised a deep-sea sounding instrument for the Coast and Geodetic Survey and was later Hydrographer of the Navy from 1893-1897, after which he took command of the ill-fated battleship *Maine*.

America between 1870 and 1886. The office also continued to strengthen its relationship with the American maritime community, establishing branch offices in major ports from New York City to Portland, Oregon. Housed in maritime exchanges and other centers of commerce, the branch offices facilitated the collection and dissemination of hydrographic information. Branches in Duluth, Sault St. Marie, Buffalo, and other inland ports marked the turn of maritime commerce toward the Great Lakes and the nation's rivers. All this was indicative of a continuing commercial role for naval hydography after the Civil War that originated with Wilkes and Maury's work in the antebellum era.

After the Civil War, however, the Navy's hydrographers never regained Maury's stature. It was a testament to the cultural power of his work as much as it reflected the Navy's postwar struggles, new technologies in seafaring, and the nation's dwindling ocean-going merchant fleet. At mid-century, *Wind and Current Charts* had represented a watershed moment in the way the Navy defined the ocean. The nation's maritime standing had been second to none, and its ships still depended largely on winds and currents. After the Civil War, however, the Hydrographic Office could not reconcile Maury's treachery to the Union. It did not publish his *Wind and Current Charts* again until 1883, twenty-two years after his resignation and at a time when the American merchant marine was a shell of its former itself.[11] Meanwhile, technological changes in ship design—steam power, iron, steel, and electricity—dramatically changed life at sea. Maury's charts had led to faster and more efficient voyages, but these technological changes made voyages safer, more pleasant, and less subject to the caprice of nature. Seafaring had become a different experience in many respects. While nautical charts

[11] Frances Leigh Williams, *Matthew Fontaine Maury: Scientist of the Sea* (New Brunswick: Rutgers University Press, 1963), 195.

continued to be fundamental to safe navigation, they never regained their cultural power as symbols of the nation's maritime preeminence and of science's triumph over wilderness.

Indeed, the idea of the sea as a wilderness faded as the industrialization of seafaring and its identification with leisure and science brought new meanings. While wilderness continued to endure, it was no longer as potent a symbol of Americans' encounter with the sea. Traveling among the Fiji Islands in 1895, Mark Twain quipped that "sixty years ago they were sunk in darkness. . . now they have the bicycle."[12] The sea, of course, remained a grueling and dangerous workplace for many. Its mysteries continued to enchant and terrify. Ships were still lost on uncharted reefs. Scientific exploration remained difficult, and its tools and methods primitive. But by the late nineteenth century, the sea had become not just a highway, but a destination in itself—evinced by the voyages of American clippers and the yacht races of the America's Cup.[13] Transatlantic liners competed for the Blue Riband, combining speed with leisure in a class-stratified maritime world quite different from the packet and passenger service of the early nineteenth century.

Among scientists, too, the sea had become a destination for research. During the 1870s, scientists in the United States and Great Britain framed a like-minded community of people who began to identify themselves as oceanographers—that is, their interest in the sea was broader, more theoretical, and more purely scientific. The Challenger

[12] Mark Twain, *Following the Equator: A Journey around the World* (New York: Doubleday & McClure Co., 1897), 94.

[13] On the sea as a destination, see Helen M. Rozwadowski, *Fathoming the Ocean: The Discovery and Exploration of the Deep Sea* (Cambridge: Harvard University Press, 2005).

Expedition, the U.S. Fish Commission, and the Scripps Institution for Biological Research marked this emergent field.[14] It is telling that after the Civil War, naval hydrographers did not generally participate in the growth of this scientific profession. Rather, as this and subsequent chapters will show, the Hydrographic Office generally continued to serve the changing needs of the Navy. Naval and civilian science proceeded largely exclusive of one another until the Second World War forged new bonds of common interest.[15] At the turn of the twentieth century, however, this emergent field of oceanography reflected an interest in the deep sea and, more importantly, an ability to study it with new methods and technologies. Perhaps most telling was a growing concern among scientists for the sea as a finite resource—a marked change from the idea that the ocean was eternal, changeless, and all-powerful.

Euro-American sea literature also fixed these new meanings in the popular imagination. Jules Verne, Jack London, Joseph Conrad, Joshua Slocum, and Rudyard Kipling wrote about the industrialization of seafaring, the futuristic exploration of its depths, and the sea as a destination in itself.[16] Though many of these writers were not themselves Americans, their books were widely-read in the United States at the turn of the century. Kipling set his book *Captains Courageous* in the American fishery, the product of his travels to Gloucester, Massachusetts and elsewhere in New England and the mid-Atlantic. In antebellum America, the sea had swallowed Ahab and the *Pequod*—

[14] Ibid., 97-210.

[15] See Gary E. Weir, *An Ocean in Common: American Naval Officers, Scientists, and the Ocean Environment* (College Station, TX: Texas A&M University Press, 2001).

[16] See Verne, *Twenty Thousand Leagues under the Sea* (1870), London, “The Seed of McCoy” (1909), Conrad, *Typhoon* (1902), Slocum, *Sailing Alone Around the World* (1900), and Kipling, *Captains Courageous* (1897) and “The Destroyers” (1898).

victims of Melville's sublime whale. But in Verne's *Twenty Thousand Leagues under the Sea*, published in 1870, Captain Nemo's submarine had become the whale itself. All this suggested the weaker hold wilderness had on the American maritime imagination, which was no longer altogether so relevant to a nation that relied on foreign vessels to carry much of its trans-oceanic trade and whose focus had shifted inland. At century's end, the American maritime world was full of new, complex, and conflicting ideas that reflected the extraordinary changes of the post-Civil War era.

The sea had new meaning for the Navy as well, part of a larger strategic shift set in motion by Captain Alfred Thayer Mahan, professor and president of the Naval War College at Newport, Rhode Island. Mahan's book, *The Influence of Sea Power upon History, 1660-1783*, appeared in 1890 to naval and popular acclaim both in the United States and internationally.[17] In it, he wrote about a new naval strategy for the United States, which he called "sea power" or "command of the sea." His writing would have profound influence on the American navy during the twentieth century. Looking to the British for historical precedent, Mahan argued that sea power rested on a strong battle fleet supplied by colonies and concentrated in force to sweep the enemy and its commerce from the sea. "It is not the taking of individual ships or convoys, be they few or many, that strikes down the money power of a nation," Mahan wrote, dismissing the Navy's traditional strategy of *guerre de course*. "It is the possession of that overbearing

[17] On Mahan see Robert Seager II, *Alfred Thayer Mahan: The Man and His Letters* (Annapolis: Naval Institute Press, 1977); Seager, "Ten Years Before Mahan: The Unofficial Case for the New Navy, 1880-1890" *Mississippi Valley Historical Review* 40 (December 1953), 491-512; John B. Hattendorf, ed. *The Influence of History on Mahan: The Proceedings of a Conference Marking the Centenary of Alfred Thayer Mahan's* The Influence of Sea Power Upon History, 1660-1783 (Newport: Naval War College Press, 1991); William E. Livezey, *Mahan on Sea Power* (Norman: University of Oklahoma Press, 1947); John Tetsuro Sumida, *Inventing Grand Strategy and Teaching Command: The Classic Works of Alfred Thayer Mahan Reconsidered* (Baltimore: Johns Hopkins University Press, 1997).

power on the sea which drives the enemy's flag from it, or allows it to appear only as a fugitive; and which, by controlling the great common, closes the highways by which commerce moves to and from the enemy's shores."[18] Sea power was expansionist and unabashedly imperialist, a far cry from the Navy's traditional strategy of commerce raiding, commerce protection, and coast defense. Already in the midst of a technological transformation, the New Navy embraced Mahanian sea power though neither it, nor the nation, was yet prepared to carry out such an aggressive policy. Mahan's writing, however, carried cultural power as well as the weight of strategic authority—enamored as it was with power, control, and command. For much of the nineteenth century, the sea had been thought of as a wilderness or a common highway. After 1890, however, the Navy began to frame it as a space to command. In Mahan's words, it was a highway to close. Mahan framed the sea in a new way, which will be fleshed out further in the following chapter. Suffice it to say, the sea thus became a kind of domain in the naval imagination quite different from its previous meanings.

In January 1898, the Navy began to put Mahanian sea power into practice, moving its North Atlantic Squadron to the Caribbean, but the fleet was almost immediately beset by environmental difficulties. Five armored ships of the North Atlantic Squadron arrived at Key West on January 25 to conduct winter maneuvers and to show American concern for the Cuban revolution begun in 1895 against Spanish rule. Key West, however, remained a naval backwater, hardly a base capable of supporting a Mahanian navy in war or peace. Among other shortcomings, its harbor was too shallow for deep draft warships. It was "in no sense a stronghold," wrote French E. Chadwick,

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[18] Captain A.T. Mahan, *The Influence of Sea Power upon History, 1660-1783*, 5th ed. (Boston: Little, Brown, and Company, 1894), 138.

captain of the cruiser *New York*, "except from the fact of the difficulty of navigation from the reef to the town."[19] From a naval perspective, as Chadwick suggested, shoal water could both aid the defender and obstruct offensive operations. Environmental considerations thus compelled the Navy to move sixty miles westward to a deeper anchorage at Dry Tortugas, which had only recently been charted by the U.S. Coast and Geodetic Survey. On January 27, while steaming out to sea from Tortugas' South-East Channel, the battleship *Texas* ran aground and, later that afternoon, the *Iowa* followed.

The groundings did little damage to the ships, but they highlighted the environmental difficulties that the fleet would face during a war in the West Indies. The Navy could ill-afford to lose one of its prized battleships to uncharted reefs or shoals in its own base of operations to say nothing of enemy waters. Two courts of inquiry following the groundings blamed "the imperfection of the survey and the chart," thus absolving both ships' officers and men. Francis J. Higginson, captain of the battleship *Massachusetts* and president of one court, concluded that another survey of Dry Tortugas was "eminently necessary."[20] So he turned to Theodore Roosevelt, Assistant Secretary of the Navy and an ardent Mahanian, as someone who could perhaps get things done.[21] "The channels we were using were improperly surveyed and improperly buoyed," Higginson complained to Roosevelt. "I sincerely hope that while these vessels are in dock under repair, that no foreign complications will arise. Can not you stay the hand of war

[19] F. E. Chadwick, *The Relations of the United States and Spain: The Spanish-American War*, vol. 1 (New York: Charles Scribner's Sons, 1911), 17.

[20] Proceedings of a Court of Inquiry Convened on Board the United States Ship Iowa, Case 4904, Record Group 125, Records of the Office of the Judge Advocate General (Navy), Box 65, National Archives and Records Administration, Washington, D.C.

[21] For Roosevelt's relationship with Mahan, see Richard W. Turk, *The Ambiguous Relationship: Theodore Roosevelt and Alfred Thayer Mahan* (New York: Greenwood Press, 1987).

until we are prepared?" he asked. As it turned out, *Iowa* and *Texas* needed no repairs and Spanish-American relations deteriorated without Roosevelt's meddling, but the groundings had proved the environment to be a strategic issue relevant to the coming war.

Higginson, however, had written Roosevelt about personal matters as well as strategic ones. More than the battleships themselves, the groundings had damaged the naval psyche. Higginson turned from the impending war to the apparent crux of the matter. "We all felt very blue the day of the accidents and it seemed as if it was not only raining but pouring. It created too a nervous distrust of the whole place and even now we are all shy of discolored water whether shoal or sunshine. We are taking no chances," he concluded. Indeed, if Higginson spoke for his fellow captains, the North Atlantic Squadron seemed incapacitated by hydrographic uncertainty. With the channel buoyed, he remarked that the battleships should "enter and depart through it safely, *I think*," he added with emphatic doubt. "We only know, or think we know, this one channel but 'there are others.'" Higginson then traced this paranoia farther up the chain of command to Rear Admiral Montgomery Sicard, commander of the North Atlantic Squadron. By February, Sicard was already an ill man. He had been suffering from malaria and had taken a short leave of absence. But according to Higginson, the groundings of *Iowa* and the *Texas* were too much. "I think it was these accidents and the anxiety about more to come every time he moved his fleet which broke Sicard down," he explained to Roosevelt.[22] The grounding of a battleship, the steel symbol of Mahanian sea power, was

[22] Francis J. Higginson to Theodore Roosevelt, U.S.S. *Massachusetts*, Dry Tortugas, February 11, 1898 in *The Papers of John Davis Long, 1897-1904*, ed. Gardner Weld Allen (Boston: The Massachusetts Historical Society, 1939), 46-47.

perhaps the worst fate for a naval officer who might lose his command or his naval commission, not in battle, but with one uncertain or ill-advised turn.[23] The United States had not yet declared war, but the Navy had already found command of the sea to be a difficult prospect.

As the fleet fretted over shoals real or imagined, the United States declared war on Spain and the Navy prepared for battle. The sinking of the battleship *Maine* off Havana on February 15, for which a naval board of inquiry mistakenly blamed Spain, incited public opinion in the United States.[24] Spain had also balked at the American ultimatum that demanded an end to the brutal reconcentration policy and a commitment to Cuban independence. Together, these factors and a growing clamor for war in the United States, convinced President William McKinley. Congress declared war on April 25.[25] On March 26, Secretary of the Navy John D. Long had promoted William T. Sampson, captain of the grounded battleship *Iowa*, to command the North Atlantic Squadron. The ill and beleaguered Sicard returned to Washington apparently unfit to bear the stresses of war—environmental or otherwise. There he joined Mahan and others on the Naval War Board, an advisory council to Secretary Long as the Navy began operations against Spain.

The Naval War Board's views and Long's subsequent orders to the fleet reflected Mahan's authority in strategic matters. Mahan maintained that a blockade was essential

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[23] See Article 4, Sub-section 10, *Regulations for the Government of the United States Navy, 1896*, 432, RG 80, General Records of the Department of the Navy, Entry 35, PC 31, NARA.

[24] For a revision of the board's initial finding, see Hyman G. Rickover, *How the Battleship* Maine *was Destroyed* (Washington, D.C.: Government Printing Office, 1976).

[25] David Trask, *The War with Spain in 1898* (New York: Macmillan Publishing Co., Inc., 1981), xii-xiv, 30-59.

to American victory; it was the ideal manifestation of sea power. “Whatever the number of ships needed to watch those in an enemy’s port,” Mahan had written in 1895, “they are fewer by far than those that will be required to protect the scattered interests imperiled by the enemy’s escape.”[26] On April 22, three days before the official declaration of war, Long had cabled Sampson at Key West to begin a blockade of Cuba. The Navy intended to cut off the garrison there and to force an engagement with the Spanish fleet. Sampson immediately steamed for Havana and established a blockade of Cuba’s northern ports from Bahia Honda in the west to Cardenas in the east. A day later, the Americans appeared off the southern port of Cienfuegos. Its rail connection northward to Havana made it an ideal port for re-supply and necessitated its closure. The fleet, by then, had been bolstered by the addition of twenty-six other vessels, ships and craft of all kinds desperately needed to patrol two thousand miles of coastline. In all, the Navy Department purchased or chartered one hundred eight vessels from private owners during the war. The blockade, then, largely rested on this motley fleet of yachts, tugboats, revenue-cutters, and transoceanic liners, hastily painted drab gray and armed with whatever guns and smaller arms the navy yards could bolt down. While the sleek, fast liners made effective scouts, the light draft tugs and yachts were ideal for the inshore blockade, working nimbly among the reefs and shoals alongside the Navy’s smaller gun and torpedo boats. The large battleships and cruisers, meanwhile, steamed offshore at distances of four to six miles, supporting the inner blockade and awaiting the advent of the Spanish fleet.

[26] Alfred T. Mahan, “Blockade in Relation to Naval Strategy,” *United States Naval Institute Proceedings* 21 (December 1895), 856.

If Long, Mahan, and others did not quite anticipate the hydrographic difficulties of close blockade, they did recognize its broader challenges and encouraged the junior officers commanding these gunboats, yachts, and tugs to take chances. On March 23, Long had cabled Sampson a message, likely written by Mahan and the Naval War Board, outlining the Navy Department's vision for a blockade of Cuba. It placed particular importance on the inner ring of blockaders—this most unlikely of Mahanian fleets—urging their commanders to take station off the mouths of harbors and to intercept blockade-runners and any Spanish torpedo boats bent on attacking American cruisers and battleships. The Navy was particularly concerned with these torpedo boats, a worry that would prove groundless by war's end. Nevertheless, at the outset, Long encouraged his officers to "run risks and take chances," an admonition that they took to heart in the ill-charted waters off Cuba. Long closed the memorandum with a promise calculated to inspire. "Each man engaged in the work of the inshore squadron," he wrote, "should have in him the stuff out of which to make a possible Cushing; and if the man wins, the recognition given him shall be as great as that given to Cushing."[27] The Secretary was referring to the Civil War naval hero Commander William B. Cushing who had led a clandestine attack that sank the Confederate ironclad ram C.S.S. *Albemarle* in the Roanoke River. Long hoped the blockaders would display the same sort of heroism and therefore encouraged them to take risks that Higginson and his fellow battleship captains simply could not. Battleships, as the war would demonstrate, could not be risked lightly,

[27] John D. Long, Memorandum for the Commander in Chief of the North Atlantic Squadron, Washington, D.C., March 23, 1898 in United States Navy, *Annual Report of the Navy Department for the Year 1898: Appendix to the Report of the Chief of the Bureau of Navigation* (Washington, D.C.: Government Printing Office, 1898), 164-65.

but this ad hoc fleet of blockaders could press the attack even amid heavy enemy fire and dangerous shoals.

The Hydrographic Office supplied each vessel with a stock of charts for operations in the West Indies, some thirty in number, that reflected hydrography's primarily commercial understandings, but that rarely conveyed the kind of strategic information necessary in war. The most well-charted harbors, not surprisingly, were Cuba's busiest commercial ports—Havana, Cienfuegos, and Santiago—whose importance to the maritime world necessitated thorough surveys. Other ports and coastlines had received less hydrographic attention, regardless of their strategic importance to the Navy in 1898. The charts themselves had been constructed with commercial understandings in mind, marked with the safest and deepest channels for merchant and naval vessels alike. This was practical in a peaceful maritime world, but in war the same channels were virtually useless once the Spanish had cleared navigation buoys and left mines in their place. The American blockaders, then, were often forced to enter these harbors by other means, navigating passages that were ill-charted, shallow, or otherwise less than ideal.

Regardless of their commercial or strategic value, these charts remained fundamentally flawed representations of the marine environment. The two-dimensioned chart could hardly capture the dynamism of a sea in constant flux. Tides ebbed and flowed. Sandbars emerged, shifted, and disappeared, combed by currents and the cataclysm of storms. The magnetic field, so essential to compass accuracy, fluctuated across space so that navigators had to account for variations—yet another level of complexity in an infinitely complex undertaking. The chart hardly accounted for all this.

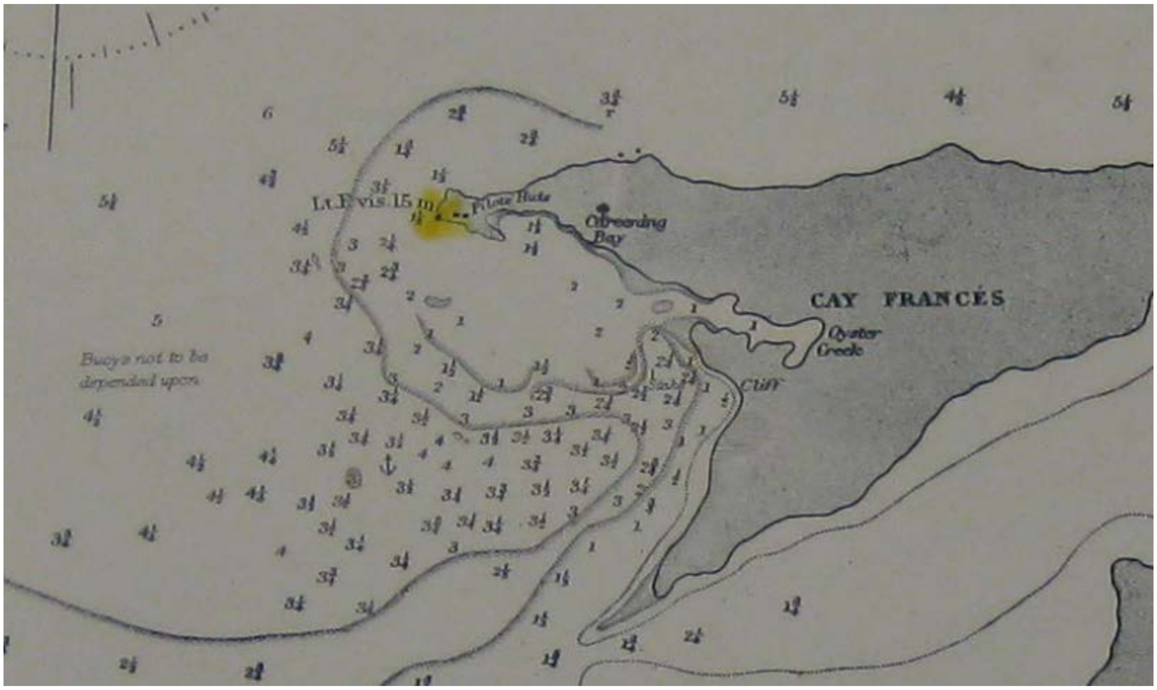
Clues did appear on the charts warning navigators that "there is considerable diurnal inequality" or "the time and height" of the tide is "much affected by the moon's declination." But such information was often ambiguous, inadequate, or downright misleading.

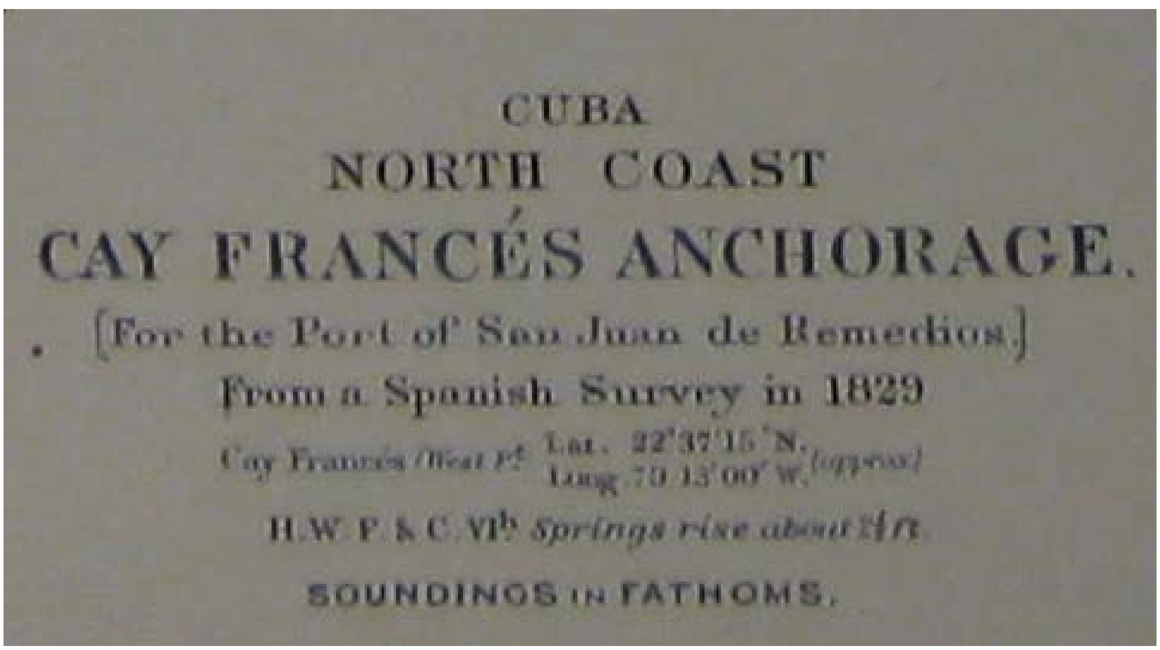
The most glaring inaccuracies, however, resulted from poor, hasty, or dated surveys from which the American navy and the hydrographic bureaus of other nations constructed charts, giving American commanders little sense of what course they should take or, indeed, if they should take it at all. As far as the Navy's Hydrographer, Commander Joseph E. Craig, could surmise, the charts had not been updated in many years. "No surveys have been recently carried on in any [country]," Craig wrote, referring to the United States and to British and Spanish surveys as well, "and there are none now in progress."[28] The Hydrographic Office, then, could do little when commanders wrote requesting better charts "giving the coast of Cuba in more detail." One chart, a captain complained, "lacks many of the details of the coast which would assist materially in inshore work."[29] Others urged that the office augment their collection with one or another privately-made chart that purported to be "particularly good of the coast lines inside of the reefs."[30] Most officers, however, simply made due with the charts in hand, employed a Cuban pilot, or relied on an almost constant use of the sounding lead, a sharp eye, and a steady hand at the helm to navigate unknown waters.

[28] J.E. Craig to George Grantham Bain, Washington, D.C., August, 13, 1898, RG 37, Records of the Hydrographic Office, Entry 32, Letters Sent and Received, February 1885-December 1901, Box 111.

[29] Spencer S. Wood to John D. Long, U.S.S. *Du Pont*, At Sea, May 7, 1898, RG 37, Records of the Hydrographic Office, Entry 32, Letters Sent and Received, February 1885-December 1901, Box 108.

[30] George C. Remey to Royal B. Bradford, Key West, June 29. 1898, RG 37, Records of the Hydrographic Office, Entry 32, Letters Sent and Received, February 1885-December 1901, Box 110.





Figures 23 and 24: Hydrographic Office chart of Cay Frances on the north coast of Cuba, taken from Spanish surveys. This chart is indicative of the kind used by the American navy during the blockade of Cuba. Note the comparatively small number of depths soundings, and the ominous warning, “buoys not to be depended upon.” Geography and Map Division, Library of Congress.

The Hydrographic Office could not immediately remedy these inaccuracies given the already heavy wartime demand for charts among the fleet and the public. To correct cartographic errors or add information where none existed, the Hydrographic Office did not republish new charts or fix old ones. Wartime imperatives did not permit this extensive work. Instead, it issued Notices to Mariners and Sailing Directions as supplements, which contained revisions to be copied by the ship's navigator onto the existing charts. But even this system was mostly lost to the exigencies of war. Craig reported "extraordinary demand" in the office's annual report. In three months of war, his Hydrographic Office distributed 43,910 copies of charts, a nearly seven-fold increase over the normal peacetime work of the office for one year.[31] "The energies of the office," Craig wrote, "were largely diverted from that part of the work . . . that results in the issuing of new publications of charts and of sailing directions covering new ground."[32] The office simply could not outfit all the new vessels of the fleet let alone collect, organize, and disseminate hydrographic revisions. Not all this demand, however, came from the Navy. Americans all over the nation—from the Historical Society of Topeka, Kansas, to the Boys High School of Reading, Pennsylvania, to Johnson and Wood Hardware of Corsicana, Texas—wrote to Craig, requesting charts in order "to know something of the fleet movements."[33] The charts, however inaccurate or obsolete, gave many Americans their first sense of the war's geography and its strategy. They proved an

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[31] John Davis Long, *The New American Navy*, vol. 1 (New York: The Outlook Company, 1903), 155.

[32] Craig to Royal B. Bradford, Washington D.C., September 29, 1898 in U.S. Navy, *Annual Report of the Secretary of the Navy for the Year 1898* (Washington, D.C.: Government Printing Office, 1898), 289.

[33] J.C. Thomas to John D. Long, Corsicana, Texas, May 1898, RG 37, Records of the Hydrographic Office, Entry 32, Letters Sent and Received, February 1885-December 1901, Box 108.

important way for the American public to understand and visualize the movements of the fleet and the progress of the war. For the Navy, however, these charts constituted the only navigational aids available.

Naval commanders, then, quickly learned that their charts represented only a limited vision of the ocean environment into which they pressed the blockade—indeed, these waters often presented as much danger to the Americans as the Spanish themselves. The blockade, as Ensign Henry A. Wiley soon discovered, was monotonous duty, pierced only by a few moments of intense action. Wiley spent the war as executive officer and navigator of the lighthouse tender *Maple*. It was "a glorified tugboat," Wiley recalled, "with an underwater body somewhat like a barrel."[34] His commanding officer, Lieutenant W. Kellogg, resembled his boat. In Wiley's estimation, he "was a very stout man and far from active."[35] Among other eccentricities, Wiley could not wake the captain from sleep. One evening, Kellogg had turned in, leaving orders for Wiley to steam into Cardenas, an ill-charted harbor on the north coast of Cuba. "When I read these instructions I concluded that the captain was ill," Wiley wrote, "that he was mentally fagged by nightfall and something in his mental make-up didn't function." The waters off Cardenas, Wiley knew, "contained no aids to navigation. It was shoal and full of shoaler spots called nigger heads," he continued. "We could not possibly perform any useful service by going in there and might do irreparable damage." But Wiley could not wake the captain to make his protest. As *Maple* steamed into Cardenas, the weather turned, tossing the sea and leaving Wiley little choice but to heave the anchor and ride out the storm. The sudden

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[34] Henry A. Wiley, *An Admiral from Texas* (Garden City, NY: Doubleday, Doran, and Company, Inc., 1934), 81.

[35] Ibid., 83.

stop woke Kellogg in time for Wiley to state his case and save *Maple* from uncertain danger.[36] The maneuver, Wiley discovered, proved useful whenever navigation became precarious.

Maple was once again steaming in uncharted waters, destined for Nipe Bay west of Cardenas, when it ran into shoals, and Wiley turned to the anchor to wake the sleeping Kellogg. "We were sailing merrily along when I suddenly had a feeling that we were getting into shoal water," Wiley recalled. He likened it to "what a poker player would call a hunch," a sort of sixth sense experienced by more than one officer distrustful of the charts and reliant on a keen sense of his surroundings. Soundings reported ten feet. *Maple* drew nine. Wiley's hunch was prescient. "I let go the anchor," Wiley wrote. "Out came the captain." It was a strange sort of maneuver told with a humor that no doubt helped Wiley cope with the monotony of blockade duty in the diminutive *Maple*. "In the meantime," Wiley observed in his wry humor, "history was being made and heroes born."[37] While he was battling shoals and a slumbering captain, others were intercepting contraband and engaging Spanish gunboats among the reefs and cays.

When Commander Chapman C. Todd looked from his chart to the water and then strained to see the Spanish gunboats anchored in the distance, he was aware of the hydrographic challenges that his small force faced in storming Cardenas Harbor. On the afternoon of May 11, *Wilmington*, Todd's third-rate gunboat, in company with the smaller revenue-cutter *Hudson* and the torpedo boat *Winslow*, attacked Cardenas,

[36] Ibid., 85-86.

[37] Ibid., 87.

intending to destroy shipping in the harbor and to sink the gunboats.[38] During the battle, heavy enemy fire damaged *Winslow* and killed five of its crew in one of the most intense actions of the war. Prior to the attack, however, Todd had no doubt consulted his copy of the Hydrographic Office's Sailing Directions *Caribbean Sea and Gulf of Mexico*. The prospect was not encouraging. "The entrance to this bay," the directions read, "is so blocked up by small cays and shoals that it is only navigable for vessels of about 11 feet." *Wilmington* drew almost ten. "Even the most recent charts of this locality are not to be strictly depended on," the directions warned.[39] And so, not trusting his chart, Todd was compelled to send the lighter draft *Hudson* and *Winslow* ahead to sweep for mines and to sound a channel through which *Wilmington*, with its larger guns, could pass.

Safe passage and the ability of the Americans to attack Cardenas at all depended on the convergence of cartographic accuracy and some assistance from the marine environment. The two vessels set out on their hydrographic reconnaissance before noon on the eleventh. The Spanish had mined two of the three entrances to Cardenas, leaving the Americans a third "unexplored" channel. It was, according to Lieutenant John B. Bernadou on *Winslow*, "the shallowest of the three."[40] The chart indicated it to be one and three-quarter fathoms, or just over six feet, at its shallowest. As Todd and Bernadou knew, however, the chart was not to be trusted. With high tide in the Americans' favor, they could perhaps count on an additional one and a half feet to get *Wilmington*

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[38] J.B. Bernadou, "The 'Winslow' at Cardenas," *Century Illustrated Magazine* 57 (March 1899), 701.

[39] No extant copy of Sailing Directions, *Caribbean Sea and Gulf of Mexico*, Vol. 1, No. 86, 1898 seems to exist, but it was reprinted in sections in U.S. War Department, *Military Notes on Cuba* (Washington, D.C.: Government Printing Office, 1898), 310.

[40] Bernadou, "'Winslow' at Cardenas," 301.

through.[41] "If this depth of water actually existed, and if the soundings shown upon our chart were correct, then entrance through this passage for vessels of *Wilmington*'s draft was safe and practical at high tide," wrote Bernadou. He was hopeful, but not necessarily confident that the chart and the tide would work in the Americans' favor. *Winslow* and *Hudson* steamed slowly through the channel, accompanied by a Cuban pilot with knowledge of the local waters while soundings were "constantly taken with the lead."[42] Bernadou had found a channel of ten feet, just enough water to carry *Wilmington*. But as the vessels turned to sweep the channel for mines and report their survey to Todd, *Hudson* grounded and "hung" for some time on a shoal. Shifting weight and adjusting trim, *Hudson*'s crew was able to get the revenue cutter afloat again, but Bernadou reported that the minesweeping "could not be done on account of the grounding."[43]

Wilmington thus entered Cardenas Harbor guaranteed little more than inches under its keel and the possibility of mines ahead, to say nothing of the threat from the Spanish gunboats once safely within the harbor. Running the channel proved as tight as the margin of error. High tide came at 12:30 p.m., and the three vessels steamed for the channel—*Hudson* and *Winslow* on *Wilmington*'s starboard and port bow "to give warning in the event of the discovery of any sudden shoaling of the water." All eyes were on *Wilmington*, which stopped, started, and stopped, then started again, proceeding slowly and cautiously over the shoals. "The stirring up of the coral mud and the resultant whitening of the sea," Bernadou observed, indicated "that there was very little water left

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[41] John B. Bernadou to Long, Key West, May 16, 1898 in *Appendix Bureau of Navigation 1898*, 202.

[42] Bernadou, "'Winslow' at Cardenas," 301.

[43] Bernadou to Long, Key West, May 16, 1898 in *Appendix Bureau of Navigation 1898*, 202.

beneath her keel."[44] But the Americans emerged unscathed for the attack, and the enemy had failed to fire on them as they wove slowly through the hazards. Had the Spanish seized that opportunity, or mined an already dangerous passage, the Americans perhaps would not have broken through. *Winslow*'s hasty survey and the boost from the tide enabled them to breach the harbor and destroy one Spanish gunboat anchored inside.

On the same day that Todd and Bernadou attacked Cardenas, the Americans were scouring the seas off Cienfuegos on the southern coast for underwater telegraph cables, work made more difficult and dangerous by the shortcomings of their charts. No other operation of the war stood so much to gain from hydrography. "Outside of the records of the proprietary cable company and excepting as to some shore ends, the precise location of every cable is unknown," noted Captain Caspar F. Goodrich who had spent much of the war cutting submarine cables around Cuba in the auxiliary cruiser *St. Louis*. "No chart that I was able to obtain, no source of intelligence," he continued, "could tell me the very spot to go to for the purpose of raising the submarine wires I wished to sever."[45] This was the problem the Americans encountered off Cienfuegos. Without charts detailing the cables' routes, they were forced to move into shallow water where the cables could be seen. Operating close to shore, the men were prone to enemy fire—a particularly precarious position while otherwise occupied in spotting, dragging, grappling, and cutting heavy iron cables.

On May 11 off Cienfuegos, as Spanish bullets hissed in the water around the small American boats, Lieutenant Cameron McRae Winslow must have cursed his chart.

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[44] Bernadou, "'Winslow' at Cardenas," 301-02.

[45] Caspar F. Goodrich, "The St. Louis' Cable-Cutting," *United States Naval Institute Proceedings* 26 (March 1900), 158.

“Keeping a good lookout for rocks and reefs, the boats pulled steadily on,” Winslow wrote, “the inaccurate Cuban charts giving us little information as to the distance from the land at which we should find shoal water.”[46] Winslow, in command of the boat party, was looking for two cables that connected points on the southern coast of Cuba with Cienfuegos, Jamaica, and Madrid. By severing these and other cables, the Americans intended to cut communications between Havana and Spain in a kind of communications blockade that was new to the history of naval warfare.[47] Working a few hundred yards offshore and in twenty feet of water without the aid of good charts, Winslow and his men grappled and cut two cables leading to Cienfuegos and dragged the severed ends out to sea where they could not be retrieved or repaired. “To cut the enemy’s lines of communication is always important,” Winslow concluded.[48] It was an old strategic axiom, but one that was given a new, more difficult underwater dimension off Cuba.

For the Americans, cable-cutting proved one of the most important operations of the blockade, turning the sea floor itself into a strategic space. After the war, naval officers and others scrambled to assess the new diplomatic and strategic considerations of submarine telegraph warfare. They debated the rules of war governing the technology, the military nature of private cable companies, and the status of neutral cables “performing the most unneutral kind of service.”[49] The war had posed strategic lessons

[46] Cameron McR. Winslow, “Cable-Cutting at Cienfuegos,” *Century Illustrated Magazine* 57 (March 1899), 714.

[47] This did not happen as a third uncut cable at Cienfuegos allowed communication to Jamaica and thence to Madrid, see Trask, *War with Spain*, 110.

[48] Winslow, “Cable-Cutting at Cienfuegos,” 717.

[49] C.H. Stockton, “Submarine Telegraph Cables in Time of War,” *United States Naval Institute Proceedings* 24 (September 1898), 454.

and considerations as well. In one essay, not coincidentally titled "The Influence of Submarine Cables upon Military and Naval Supremacy," an army Signal Corps captain wrote of "a great sea division," having "no better guides to boundaries than the submarine cable networks." In true Mahanian fashion, he concluded, "the real political boundaries of states are no longer defined and restricted by the land, but involve such portions of the high seas as a nation can, by her commercial and naval vessels, and her submarine cables, reach out and secure."[50] Given the Navy's experience during the war, the author might have added that hydrographic charts were important not only for laying and cutting these cables, but also in delineating them as submarine symbols of sea power. Telegraph cables and command of the sea floor had become strategic issues that, by their nature, were inextricably linked to knowledge of the marine environment.[51]

But poor knowledge hampered American command of the sea from Cienfuegos all along the southern coast of Cuba, a stretch of water notorious for shoals that afforded havens for blockade-runners and frustrated the Americans pursuing them. "The natural conditions existing in these localities," wrote one officer, offered "great advantages" to these blockade-runners.[52] On June 28, President McKinley declared an extension of the blockade on the southern coast of Cuba from Cape Frances in the west to Cape Cruz in the east, a stretch of five hundred miles, encompassing two-thirds of the southern coastline. Particularly challenging to navigation was a gulf of shallows and shoals sheltered by the Isle of Pines and flanked by Cape Frances and the port of Batabano with

[50] George Owen Squier, "The Influence of Submarine Telegraph Cables upon Military and Naval Supremacy," *United States Naval Institute Proceedings* 26 (December 1900), 621-22.

[51] See Paul M. Kennedy, "Imperial Cable Communications and Strategy, 1870-1914," *English Historical Review* 86 (October 1971), 728-52.

[52] W.F. Halsey, "The Last Naval Engagement of the War," *United States Naval Institute Proceedings* 24 (September 1898), 53.

a rail connection northward to Havana. The channels through this gulf carried no more than “12 or 13 feet of water” according to the Navy’s Sailing Directions. It warned of “almost innumerable cays and sand banks, as yet very imperfectly known, and forming intricate and numerous channels. To navigate these channels and to identify the cays used as landmarks,” the directions concluded, “local knowledge is positively necessary.”[53]

Figure 25: Hydrographic chart of Gulf of Batabano, showing the Isle of Pines and port of Batabano, top center. This chart reflects later American surveys that were not at the disposal of American naval forces in 1898. Geography and Map Division, Library of Congress.

The yacht *Eagle* pressed the blockade into this environment on July 12 when it chased the Spanish steamer *Santo Domingo* aground on a shoal and, having little choice,

[53] War Department, *Military Notes on Cuba*, 251.

destroyed it to prevent its recapture. In the late morning, Lieutenant William Henry Hudson Southerland, commanding *Eagle*, spotted the sleek black steamer on the horizon between Cape Frances and the Isle of Pines, running northward toward Batabano at high speed. *Eagle* gave chase, and *Santo Domingo* grounded, unable to outrun the Americans while navigating the shoals. "With an uneven coral bottom of varying depth, and, with boats sounding ahead," Southerland reported, *Eagle* "made slow progress until within about 2,000 yards of the steamer." *Santo Domingo*'s crew had already abandoned the ship by the time a whaleboat from *Eagle* could reach the stranded steamer, which the Americans discovered to be laden with "munitions of war" and an "immense amount of food supplies." With the steamer hard and fast on the reef, the crew doused the ship with kerosene, opened its magazine, and left *Santo Domingo* an inferno that smoked for weeks.[54]

In deciding to destroy the steamer, Southerland had been governed by the dangers of the surrounding waters and the limits of his hydrographic knowledge. As he noted, *Santo Domingo* was a spectacular prize, which, under the rules still governing the capture of these vessels, would have brought a fortune parceled out among *Eagle*'s small crew. "I do not think I am far wrong in stating that if the vessel and cargo could have been saved and brought into port the appraisal value . . . would have fallen but a little short of $1,000,000," Southerland reported. It would have been the kind of payoff that made the drudgery of blockade duty bearable. It was certainly with regret that Southerland cited the hydrographic concerns, which influenced his decision to destroy the prize. In his report, he first pointed to *Eagle*'s inability to pull the much larger steamer off the reef. Then he

[54] W.H.H. Southerland to Long, U.S.S. *Eagle*, Isle of Pines, Cuba, July 19, 1898 in *Appendix Bureau of Navigation 1898*, 247.

went on to state tactical considerations. Among them was "the possibility of an attempt at recapture, which I think *Eagle* could have resisted had it been possible to maneuver a 12-foot [draft] vessel on those unknown coral shoals at night with rapidity and safety."[55] Hydrography, then, had been a tactical consideration foremost in Southerland's mind. The environment and the lack of sound hydrographic information had forced his hand, denying the Navy an important capture and *Eagle*'s crew a valuable prize of war.

Uncharted shoals had also thwarted the Navy's ability to cooperate with and supply Cuban insurgents whose attacks against the Spanish army were the only force ashore until the U.S. Army could muster and transport an expedition in late June. On the evening of May 30, not far from where Southerland would destroy *Santo Domingo* in July, Lieutenant Commander Daniel Delehanty and the crew of the yacht *Suwanee* were preparing to land supplies for the insurgents from the transport *Gussie*. The Cubans, under General Maximo Gomez, controlled much of the territory in western Cuba and, with naval support, might cut off the strategic port of Batabano from supplying the Spanish garrison at Havana. Under cover of darkness, Delehanty steamed slowly inside the cays, "there being no reliable chart of this part of the Cuban coast." The reported presence of Spanish gunboats in the surrounding waters added more danger to an already precarious situation. But Delehanty had reason to think he might succeed. He had two Cuban pilots aboard—one who professed himself to be "a very competent pilot in the waters in which we were to operate." But *Suwanee* grounded anyway, and Delehanty could not free the yacht until high tide finally rescued the hapless vessel at 4:00 a.m. the next morning. *Suwanee* had spent the better part of the night immobile, an easy target had it been discovered and attacked by enemy gunboats. In the morning, Delehanty concluded

[55] Ibid., 248.

that *Gussie*, with its considerably larger draft, would no doubt encounter the same difficulty. He therefore called off the operation, citing “the impossibility of landing the supplies with the means at our disposal.”[56] Delehanty required lighters of almost negligible draft to transport the supplies from ship to shore over shallow water, but this would be a slow and cumbersome operation, exacerbated by the difficulties of the marine environment.

By August 12, the Navy had strengthened the blockade on the southern coast such that it could attempt to take the stronghold of Manzanillo, a port in southeastern Cuba, but once again the operation demonstrated the limits of the Americans’ hydrographic knowledge and the pragmatism needed to overcome it. The Navy had already attempted two raids on the port, one on June 30-July 1 and another on July 17, which had done moderate damage, but ultimately had shown the strength of the Spanish gunboats and the city’s garrison and defenses. After the July 1 raid, one officer had written Secretary Long of his “regret that we could not steam right past the city and endeavor to sink the gunboats as we went along. But we knew nothing about the channels,” he remarked, “and had to return by the one we had found by the use of the lead and the appearance of the water.”[57] This time, the Navy intended to take the city and perhaps force an end to the war, which had not come as expected following the defeat of the Spanish fleet on July 3 and the surrender of Santiago’s garrison to the American army on July 17. On August 8, a

[56] Daniel Delehanty to Long, Navy Yard, Norfolk, September 1, 1898 in *Appendix Bureau of Navigation 1898*, 331-32. For other hydrographic problems associated with aiding Cuban insurgents see W.T. Ryan to Long, U.S.S. *Peoria,* Key West, July 14, 1898 in *Appendix Bureau of Navigation 1898*, 690-91.

[57] A. Marix to Long, U.S.S. *Scorpion*, off Manzanillo, July 1, 1898 in *Appendix Bureau of Navigation 1898*, 233.

force of six vessels under the command of Captain Caspar F. Goodrich in the cruiser *Newark* assembled at Cape Cruz and prepared to take Manzanillo. But this would not be an easy task. "It was . . . evident that to take a vessel the size of the Newark within bombarding distance of the town was an undertaking beset with danger and possible disaster," observed Lieutenant William F. Halsey, Sr., *Newark*'s executive officer and navigator. But Halsey's doubts were well founded. "Risks were to be taken that in time of peace might be deemed inexcusable," he continued, "war conditions demanded them, provided the necessary nerve and ability were combined."[58] Halsey was not referring to the threat of Spanish gunboats or land batteries, but rather to the hazards of the marine environment. All this bravado about danger and disaster, nerve and ability, Halsey thought, would be tested most among the channels, shoals, and reefs, which together constituted Manzanillo's first, and perhaps its best, line of defense.

The hydrography of the approaches to Manzanillo resembled many Cuban harbors—labyrinths of sand, coral, and shallow water for which the chart could not account. The bottom was irregular, Halsey wrote, "and of the currents no man is able to tell." A barrier of keys ran northwest from Cape Cruz, masking Manzanillo behind a kind of inland sea of shoals called Buena Esperanza—"good hope," of course, was what the Americans needed in these waters. "To those not possessing a local knowledge," Halsey remarked, "the keys in this vicinity have a strange similarity in appearance, and as the chart failed to show some that existed, and depicted others that neglected to appear, the difficulties of determining positions by bearings can be realized." The chart itself was no detailed guide, depicting the whole western half of Cuba in wide relief with Manzanillo

[58] W.F. Halsey, "The Last Naval Engagement of the War," 55.

at its eastern edge in small scale. Halsey was suspicious of the “strange variance in soundings” and spoke for many fellow officers when he expressed “doubts upon the reliability of this important aid in navigating.” The Balandras Channel was the shortest and straightest route through Buena Esperanza, but it was only eighteen feet deep, and *Newark*, as Halsey noted, drew twenty-two feet and three inches of water. This left Cuatro Reales Channel as the only alternative, but the Hydrographic Office’s Sailing Directions deemed it impassable. This, Halsey remarked with considerable understatement, “was not reassuring.” But a Cuban pilot had promised five and a half fathoms, or just over thirty feet. Steaming slowly with sounding leads dropping on both sides of the ships, the Americans made a safe, if painstaking, passage, leaving pickle kegs anchored at sharp turns in the channel to mark the return trip.[59]

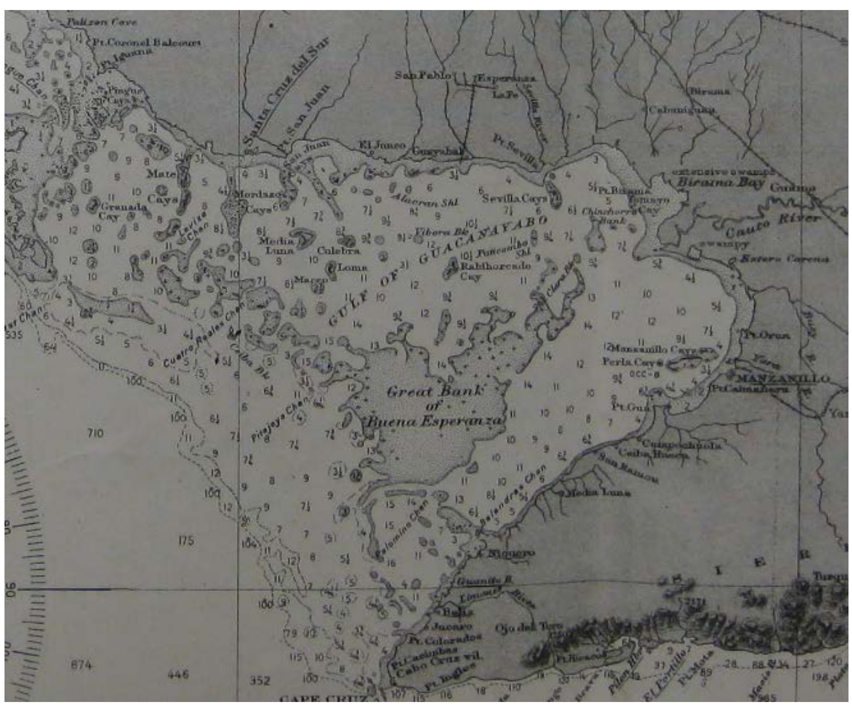

Figure 26: Hydrographic chart of Buena Esperanza, showing the treacherous navigation to the port of Manzanillo, at left. This chart reflects surveys completed after 1898, and was not at the disposal of American naval forces during the war. Geography and Map Division, Library of Congress.

[59] Ibid., 55-57.

The ships sounded general quarters at 1530 the next afternoon and commenced the attack on Manzanillo, but the larger *Newark* was hemmed on all sides by shoals and was forced to stand by in four and a half fathoms of water, letting the small gunboats maneuver among the shallows. The channel rapidly narrowed as *Newark* opened fire with its six-inch gun, forcing the cruiser to maintain course and constricting its arc of fire on the enemy gunboats and the city's defenses. A report from the leadsman of five fathoms was too much for the Cuban pilot who walked to the end of the bridge, Halsey recalled, "indicating that he washed his hands of all further responsibility." Now without a pilot and, for all intents and purposes, without a chart as well, *Newark* pressed on to four and a half fathoms when Captain Goodrich evidently lost his nerve. He ordered the engines reversed, but *Newark* stubbornly continued its forward movement. "The propellers did not have the full effect with the scant water," Halsey wrote. Goodrich then let go the anchors until the ship finally stopped and backed away from the danger. *Newark* could do little but provide fire support as the smaller vessels pressed their attack, laying-to in five fathoms until daybreak, August 13, when the beleaguered Spanish brought word of the armistice and the end of the war.[60] The attack on Manzanillo had demonstrated the concerted power of the blockade, but throughout the entire operation, the ships were slowed by shallows and plagued by uncertainty brought on by charts they could not trust.

The Navy encountered similar problems off Puerto Rico along coasts as poorly charted as those navigated by Goodrich and Halsey at Manzanillo. Rear Admiral Sampson, the commander-in-chief of the American fleet, was himself forced to contend

[60] Ibid., 59-62.

with the Navy's poor charts when, on May 12, he led a bombardment of San Juan with his battleships and cruisers. "The soundings laid down on the chart of the island were . . . doubtful," Sampson wrote, "rendering a near approach to the coast dangerous, except while in the usual track for entering or leaving the port."[61] Worried over the chart and surely hounded by the groundings of *Texas* and his own battleship, *Iowa*, in January, Sampson drew up a plan of battle that would eliminate as much as possible any hydrographic uncertainties left by the navy's charts. He ordered the tug *Wompatuck* to steam ahead and, by leaving a flagged boat, to indicate the point at which the Americans were to execute a change of course across the harbor. With the light draft cruiser *Detroit* leading the column of battleships and cruisers to indicate any shoals, the Americans steamed off San Juan Harbor, firing away at the city's defenses as men on each ship busily took soundings with lead lines on the unengaged side.[62] None of Sampson's battleships grounded in the bombardment, but the juxtaposition of battle and surveying, indeed, dually executed on either side of these ships, suggests just how closely these two activities were associated during the Spanish-American War. To heave the lead with one hand while firing at the Spanish with the other seemed second nature in the waters off Cuba and Puerto Rico.

The Navy returned to Puerto Rico in force at the end of July as part of Major General Nelson A. Miles' invasion of the island, but the Navy was uneasy about providing support for the Army in uncharted waters. The original plan was to land troops at Cape San Juan on the northeast coast of Puerto Rico, but the erratic Miles changed his

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[61] William T. Sampson, "The Atlantic Fleet in the Spanish War," *Century Illustrated Magazine* 57 (April 1899), 890.

[62] Ibid., 890-91.

mind in mid-voyage. Guanica, on the southern coast, he told Captain Francis J. Higginson, would catch the Spanish by surprise, and so he wished to be landed there. Higginson, who before the war had confessed to a fear of discolored water in his letter to Theodore Roosevelt, now faced the prospect of his battleship, *Massachusetts*, running aground off Puerto Rico to fulfill the whims of a general. He protested. “From a naval perspective,” he reported, “I could not so effectually cover his landing or protect his base at Guanica as I could do at San Juan.” Higginson cited a number of environmental problems, not one of which was directly concerned with the Spanish themselves. There was *Massachusetts*’ deep draft, exposure to storms, and finally “that the south coast of Porto Rico was imperfectly surveyed, and lined with reefs.”[63] Miles, the Commanding General of the Army, prevailed over Higginson’s protests and the landing at Guanica proceeded without harm to the Navy’s ships. But, as Higginson wrote Secretary Long, *Massachusetts* had come uncomfortably close to grounding in nineteen feet of water where the chart had indicated a clear sixty-six feet. Higginson, of course, was correct to second-guess his chart, and *Massachusetts*’ near-grounding off Guanica only reaffirmed his conviction. Higginson again requested surveys to be made, writing this time to Secretary Long about his hydrographic troubles. “If the operations on the coast of Porto Rico are to be continued I would recommend that two surveying vessels be sent to that island as soon as possible,” Higginson stated.[64] The Spanish-American War ended on August 12 before the Army could march on San Juan and before the Navy Department could act on Higginson’s request. In once again citing the need for hydrographic surveys,

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[63] Francis J. Higginson to William T. Sampson, At Sea, August 2, 1898 in *Appendix Bureau of Navigation 1898*, 636.

[64] Ibid., 639.

Higginson echoed his plea to Roosevelt six months earlier when *Iowa* and *Texas* had run aground at Dry Tortugas. He knew that if the Navy were to operate effectively in the Caribbean, it required new, comprehensive charts that conveyed the kind of strategic knowledge necessary in war. The hydrography that had framed Wilkes and Maury's nineteenth-century maritime world with commercial understandings was no longer enough. Rather, the Navy required charts for waters that had new meaning.

With Higginson's appeal for surveys, the war closed in much the same way that it had opened—a conflict that had demonstrated American sea power, but only a tenuous command of the sea environment itself. In praise of the American fleet, Sampson wrote about "the admirable navigation of the vessels under unfavorable conditions. They surrounded an island," he concluded, "the harbors and coasts of which were not well surveyed."[65] Assessing the weight of the war's hydrographic experience, Commander Joseph E. Craig, in command of the Hydrographic Office, admitted the shortcomings of the Navy's charts and the natural difficulties of operating in Caribbean waters. The charts were "lacking in details owing to untrustworthy data," he confessed, "and in some features they are no doubt erroneous and the channels amongst the keys for light draft vessels are known only to local pilots."[66] But it is unfair to say that the Hydrographic Office failed the Navy in the war with Spain. It could not have anticipated hydrography's strategic importance in the context of Mahanian sea power, nor could it have foreseen the United States in a two-ocean war. Even had the Navy recognized these new

[65] Sampson, "The Atlantic Fleet in the Spanish War," 887.

[66] Commander J.E. Craig, 6th Endorsement, Bureau of Equipment, Hydrographic Office, July 13, 1898, RG 37, Records of the Hydrographic Office, Entry 32, Letters Sent and Received, February 1885-December 1901, Box 111.

considerations, the hydrographic process of surveying, engraving, and publishing was extremely long, taking years rather than months of preparation. Instead, the conflict proved a watershed moment for the Navy and the Hydrographic Office, exposing the inadequacy of hydrographic understandings based primarily in maritime commerce and the old idea of the sea as a common highway. After 1898, the Navy and the nation looked to the sea as a space to command, and, as the following chapter will show, hydrography changed accordingly.

As the war with Spain ended, a new imperial war emerged amid the remains of Spain's empire in the Philippines, but the operational demands on the Navy were similar, and the environmental problems facing naval commanders were almost precisely the same. The Philippine Islands were not a new theater of operations for the Americans. Commodore George Dewey had opened the Spanish-American War by steaming his Asiatic Squadron into Manila Bay on May 1, 1898, and defeating the Spanish fleet there. But the war in the Philippines had quickly settled into a siege of Manila as Dewey awaited the Army to cross the Pacific and take the city. Following the war, Filipino insurgents under Emilio Aguinaldo took up the fight against the Americans, and the Navy soon established a blockade throughout the archipelago. In many ways, operations in the Philippines were reminiscent of the blockade of Cuba and Puerto Rico, denying supplies, cutting communications, and ferrying and supporting the Army in their operations. "Keeping the cranky engines working, securing sufficient coal, avoiding shoals and reefs, and stalking smugglers and pirates," historian Brian McAllister Linn has written, "was exhilarating work."[67] With no enemy fleet to battle, defeating the insurgency became

[67] Brian McAllister Linn, *The Philippine-American War, 1899-1902* (Lawrence: The University Press of Kansas, 2000), 132.

primarily an Army operation, but the geography of the archipelago and the difficulties of logistics on land made command of the sea key to defeating the insurgency. Like the recent war with Spain, the Philippine-American War required the Navy to work in shallow, ill-charted waters where the marine environment often hindered operations.

The large cruisers and battleships, remnants of Dewey's command bolstered by some veterans of Cuba, began patrolling the coasts of the Philippines almost immediately, but their deep draft was unsuited for operations in dangerous coastal waters. In the early dawn of November 2, 1899, the cruiser *Charleston* was steaming along the northeast coast of Luzon, returning from a hydrographic survey of its own, when it struck an uncharted reef, broke apart, and sank. "We were one of the first ships of our Navy to cruise along this coast," wrote a chief electrician aboard the cruiser. He then went on to reference the inaccuracy of the charts, which, he thought, "were years old and very unreliable. Some of the points were supposed to be taken from the Spaniards," he thought, "and were over a hundred years old."[68]

The crew abandoned *Charleston* without casualties, but the ship itself—one of the largest vessels on the Asiatic Station at nearly four thousand tons displacement—was a total loss. In December 1899, a court of inquiry met to investigate the circumstances surrounding the accident. Not surprisingly, the proceedings focused on the chart, a British Admiralty publication dating to 1867. The best hydrographic information for the north coast of Luzon, in other words, was nearly a half-century old. The court concluded that Captain Charles W. Pigman, *Charleston*'s commanding officer, had done everything by

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[68] R.W. Konter, "Wreck of the U.S.S. Charleston, Camiguin Island, Nov. 2nd, '99, May 1920, *Charleston* Operational File, Ships History Division, Naval History and Heritage Command, Washington, D.C.

the book. He had consulted the chart and sailing directions, corrected the ship's bearings for magnetic variation, and sounded for uncharted shoals. No one and nothing was to blame, the court concluded, but the chart itself.[69] The sinking confirmed what American commanders already knew. The Navy's battle fleet was not fit, or even needed, for counter-insurgency operations in shallow, ill-charted Philippine waters. By 1900, the Navy had largely turned to a fleet of shallow-draft gunboats better suited for these operations. If destroyed by enemy fire or uncharted shoals—which, on occasion, they were—their loss would not be as crippling as one of the Navy's larger armored ships. The loss of *Charleston* was the biggest wartime blow to the American navy in both the Caribbean and the Pacific. The sea environment had claimed what Spanish and Filipino guns could not.

But as Brian Linn has suggested in his history of the Philippine-American War, navigating these waters was hardly easier for the Navy's flotilla of gunboats. Perhaps Commander Craig thought it ironic, or perhaps he was not surprised, when he found himself in Hong Kong facing his own court of inquiry into the grounding of *Albany*, a gunboat of 176 tons. Craig had left his command of the Hydrographic Office in January 1900, hoping to see combat. On December 17, as *Albany* transported Marine reinforcements to Olongapo in Subic Bay on the island of Luzon, the gunboat ran aground on an uncharted shoal. Two days later, after Craig and his men had transferred 227 tons of coal and water, *Albany* finally floated, but it was out of commission for two months as dockyard workers in Hong Kong repaired its hull. Meanwhile, Craig faced the court, forced to reconcile his own faith in the chart with the cartographic limitations that

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[69] Proceedings of a Court of Inquiry Convened to Investigate the Loss of the U.S.S. Charleston, Case 4931, RG 125, Records of the Office of the Judge Advocate General (Navy), Box 65, NARA.

the Spanish-American War had made plainly evident. In his official report, Craig blamed the chart. “The grounding,” he argued, “was due to the incorrect charting of the shoal off Mayanga Island running as it does at least 150 yards farther out than shown on H.O. Chart 1705, the one used in navigating.”[70] Craig’s innocence in the grounding of his ship depended largely on his ability to discredit the chart, which should not have been difficult given the Navy’s wartime experiences.

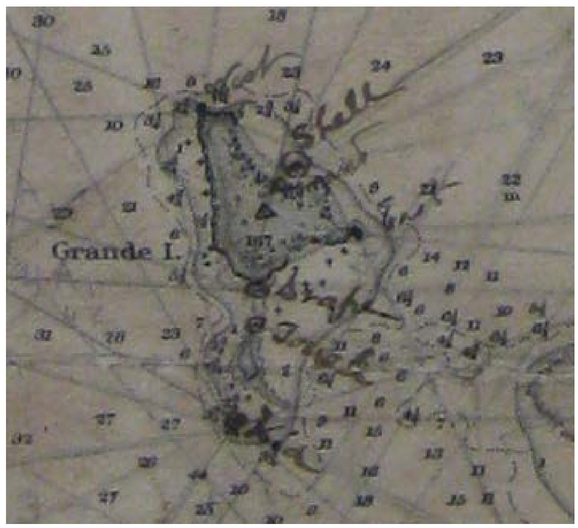

Figure 27: Section of Hydrographic chart of Subic Bay from Spanish surveys, showing Grande Island in the vicinity of *Albany*’s grounding. This is the chart Craig and Winterhalter used to navigate Subic Bay and was an important piece of evidence in the subsequent court of inquiry. Cartographic and Architectural Section, National Archives and Records Administration.

Craig and his executive officer, Lieutenant Commander H.G. Winterhalter, then recounted to the court their misplaced faith in the chart. Asked by his counsel whether he felt confident in the chart’s accuracy based on the frequency with which vessels came in and out of Olongapo, Craig replied affirmatively. “I believed the charts of Manila Bay and of Subig Bay and the coast between these bays were an exception, in point of accuracy, to charts showing other portions of the waters of the Philippine Islands.”

[70] Joseph E. Craig to George C. Remey, U.S.S. *Albany*, Cavite, P.I., December 21, 1900, Case 4941, RG 125, Records of the Office of the Judge Advocate General (Navy), Box 73, NARA.

Perhaps Captain Pigman, *Charleston*'s former commanding officer and member of the court, nodded in agreement at Craig's answer. Asked, "did you know where the ship was when she grounded," Winterhalter replied slyly, "yes, I knew exactly where she was *on the chart* [italics added]." There was, of course, an important differentiation to be made between the sea and the charted sea. Winterhalter and Craig had placed their faith almost wholly in a chart that they supposed to be an accurate representation of Philippine waters. But this was where they had erred.[71]

When the court presented its conclusion on February 11, 1901, it reaffirmed what nearly every commander from Cuba to Luzon already knew—that hydrography was not to be trusted—and this, it seemed, was the crux of the matter. "The cause of the grounding should be attributed to the fact that the shoal off Mayanga Island has extended to the southward and eastward probably more than 150 yards since the survey was made from which H.O. Chart No. 1705 was constructed," the court concluded. Winterhalter, however, had set a course for *Albany* confirmed by Craig that would "allow for less than 250 yards as a margin of safety." This, "we deem . . . a grave error of judgement amounting to a fault," the court concluded.[72] The Navy expected Craig, former Hydrographer of the Navy, to have placed so little faith in the charts of his own office as to assume that they were always wrong. He should have set *Albany*'s course according to what the chart did not indicate, rather than by what it did.

The Navy's charts, then, had been discredited in naval courts from Hong Kong to Key West and in waters from Cuba to the Philippines, but nowhere did a chart so publicly

[71] Proceedings of a Court of Inquiry Convened to Investigate the Grounding of the U.S.S. Albany, Case 4941, RG 125, Records of the Office of the Judge Advocate General (Navy), Box 73, NARA, 23, 63.

[72] Ibid., 76.

reflect the conflicted cartographic lessons of the war than in the case of Rear Admiral Winfield Scott Schley. During the court's proceedings from September to November 1901, the chart of the Battle of Santiago compiled by the fleet's navigators had been maligned for its inaccuracies and celebrated for its authority. Commander Heilner, the *Texas*' navigator, thought the chart "worthless" and Schley's attorney, Isidor Rayner, had heartily agreed. "It appears to me," Rayner concluded, "that every navigator was trying to put his ship in a different position from where his ship really was." But Rayner was not prepared to dismiss the chart so easily. "It is a remarkable document," he told the court. "Here are a half dozen navigators who meet together for the purpose of giving to the country a chart of the battle of Santiago, and after three months . . . they compose a chart which might as well be a chart of the battle of Salamis or the battle of Thermopylae or of the field of Waterloo."[73] In Rayner's mind, the chart was the authoritative representation of the battle—indeed, as Rayner said—a battle that should be ranked among the most important in all of Western History. There was much riding on this chart. Rayner intended it both to clear Schley's name and to associate his name with the likes of Leonidas and Wellington.

[73] Schley Court of Inquiry, 1768.

Figure 28: The Navigator's Chart to which Rayner referred in Schley's Court of Inquiry. Note the distance between the converging *Brooklyn* and *Texas* at bottom left.

And so Rayner returned to the chart and to Commander Heilner's testimony in his closing argument, attempting to reconcile distances put down on it with the navigator's testimony of how close *Texas* and *Brooklyn* had come to collision in battle. Rayner was careful to draw out contradictions in Heilner's story. Heilner had testified to one hundred fifty yards as the distance between the ships. But the chart—the one that Heilner himself had helped to construct—showed the distance between the two ships to be a safe twenty-four hundred feet. “Here is a gentleman who, if it was true, would have liked very much to have placed his ship either right underneath the *Brooklyn* or right on top of her,” Rayner argued, “on this chart he puts his ship 2,400 feet away at the time of the supposed danger of this collision.” The chart may have been worthless, but it had exposed the contradictions in Heilner’s testimony and, Rayner believed, proved the innocence of his client as well. However faulty, it was all that stood between conflicting testimonies and the truth of what happened on the day of the Navy’s great Mahanian victory. As Rayner admitted, the chart “was the only thing that was given to us.”[74]

Much the same, of course, could generally be said about the hydrographic charts used by the Navy in the West Indies and the Philippines between 1898 and 1900. The Navy operated in an ill-charted sea of reefs and shoals, which presented an environmental challenge to Mahanian sea power that is often overlooked. Indeed, in a text adopted at the Naval Academy after the war, the historian Edgar Stanton Maclay had cited “perilous shoals” and charts “so unreliable as to be worse than useless. Well might it have been said,” he surmised, “that our officers, seamen and ships engaged on this service were placed ‘‘twixt the devil and the deep blue sea.’”[75] The marine environment, then, was a natural enemy. In nearly every aspect of the blockade, from the drudgery of patrol to the intensity of battle, naval commanders reported their frustration with natural hazards and the paucity of hydrographic information at their disposal. The examples cited above represent only the most revealing instances in which environmental considerations hindered naval operations. They represent the common experience of many other

[74] Ibid.

[75] Edgar Stanton Maclay, *A History of the United States Navy: From 1775 to 1902*, vol. 3 (New York: D. Appleton and Co., 1902), 239.

commanders who reported similar difficulties as well as those who probably found their charts to be worthless in the humdrum of blockade duty, but perhaps did not note it in their official reports. To be sure, these hydrographic considerations were not new to naval warfare. Sand bars, reefs, and shallows had impeded operations during the Mexican-American War and the American Civil War as well. Indeed, the dangers of the marine environment had always been a factor in naval operations. But by 1898, the strategic context was different. The Spanish-American War marked an important moment in a longer process that saw the American navy turn from a coast defense and commerce raiding force to an offensive battle fleet built to command the sea by defeating the enemy in a decisive fleet engagement. As the war demonstrated, such command would be precarious without new hydrographic understandings. After 1898, naval hydrographers began to chart the sea, not simply as a commercial highway, but as a strategic space as well.

As for Schley, Rayner's deconstruction of the navigators' chart could not save the admiral from censure for his actions off Santiago and for other errors in judgment throughout the war.[76] The Sampson-Schley controversy moved from the courtroom to the presses and history books, blighting the Navy's image and dividing the naval officer corps for years afterward.[77] More importantly for the purposes of this study, the court of inquiry's proceedings had exposed the chart's inherent flaws in the most public of forums. It had shown the chart to be a flawed representation of the sea and the naval operations that occurred there—a larger metaphor for the hydrographic difficulties that the fleet experienced in battle. But, as Rayner suggested, the chart could also be

[76] For the court's opinion, see Schley Court of Inquiry, 1829-30.

[77] Langley, "Winfield S. Schley and Santiago," 96.

construed as something more. Whatever its tactical and strategic limitations, the chart had documented the Battle of Santiago and thus came to represent one of the most important moments in the U.S. Navy's history. The chart was sea power put to paper and made tangible. On its authority, Rayner could assign credit for a naval victory supposedly akin to Salamis and Waterloo. The chart had been a perilous guide indeed, but it remained a powerful way for the Navy to define the sea and to understand its new role. In the new century, as the American navy looked to defend its new empire and to extend command of the sea from the Caribbean to the Western Pacific, hydrography came to occupy a central place in its strategic discourse. In the years 1899 to 1903, hydrography was at the forefront of naval affairs. Perhaps no other factor was as important in determining the geography of the American empire, which is taken up in Chapter Five.

CHAPTER 6: THE HYDROGRAPHY OF SEA POWER

Strategy is the art of making war upon the map.

-Antoine-Henri, Baron de Jomini, *The Art of War*[1]

The District of Columbia's Sons of the American Revolution met in Washington on December 28, 1898. It had been four months since the United States won its war with Spain. A contentious debate over ratification of the peace treaty, annexation of the Philippines, and, indeed, the whole question of American empire was set to begin in the Senate. About two hundred Sons and their guests attended the flag-draped dinner. Toasts were made and speeches given. The evening's most anticipated speaker then stepped to the rostrum with a toast, "In ye time of peace prepare for war." He was Commander Royal B. Bradford, a naval officer and advisor to the Paris Peace Commission.[2] He had played an important role in the commission's deliberations and, in particular, the commissioners' intent to claim the entire Philippine archipelago for the United States. Now, returned from Paris and speaking before the SAR, Bradford enjoined his audience to the cause. "I am an expansionist," he declared, and he was in good company.

Bradford sought coaling stations for the Navy's bituminous-burning fleet. As chief of the Bureau of Equipment, he oversaw the coaling of the Navy in 1898, and, perhaps more than anyone, grasped just how precarious this logistical war had been. His duties at the bureau also put him in command of the Hydrographic Office, and so Bradford grasped the convergence of charts, naval strategy, and the logistics of empire. "We have already the most important station in the Pacific," Bradford told the SAR, referring to the Philippines. "Let us keep it. As long as we don't own it, it will be a

[1] Baron de Jomini, *The Art of War* (Philadelphia: J.B. Lippincott & Co., 1862), 69.

[2] Bradford was a member of the Sons of the American Revolution and also, as a descendant of William Bradford, the Society of Mayflower Descendants.

menace to us." He cited so many fine harbors, ideal, he thought, for coaling stations and followed this with numbers about the hopelessly short range of the battle fleet without stations to top its coal bunkers. "It is impossible for this nation to become an important naval strength without coaling stations all over the Pacific," he urged. When he had finished, the crowd roundly applauded and joined together in singing, "Columbia, the Gem of the Ocean."[3] *The Army and Navy forever, Three cheers for the red, white, and blue.*

Bradford knew, however, that beneath the heady rhetoric of empire was hydrography, which the Navy pursued with more urgency after the war and as naval officers began to remake the nautical chart in strategic terms. As Chief of the Bureau of Equipment, Bradford largely presided over this transformation. He had travelled to Paris in October 1898 to advise the Paris Peace Commission, couching his arguments for Philippine annexation using charts and his knowledge of the strategic features of the marine environment. He had also largely directed the extensive hydrographic surveys of the Caribbean and the Pacific during this period along with Hydrographers Commander Joseph E. Craig and Commander Chapman C. Todd. In 1901, Bradford joined the General Board of the Navy and, in that capacity, brought his hydrographic knowledge to the highest levels of strategic discourse. Every summer since Secretary Long established the General Board in 1900, it retreated to Newport where its members joined the staff and students of the Naval War College. The War College had itself been reinventing charts for strategic purposes since the early 1890s, constructing charts to be used in the college's early system of war planning and war gaming. All these elements came together at Newport during the first years of the twentieth century—Bradford, his surveyors, and

[3] "At the Banquet Board," *The Times*, December 29, 1898.

their charts, the war games and war plans of the college, and the General Board. Together, these officers summoned hydrography and environmental arguments about the strategic advantages of the marine environment to bolster their vision of American sea power. Indeed, it might well be said that, by 1903, naval hydrography was among the most important factors in shaping the geography of the new empire.

Among the most pressing issues to arise out of the war with Spain was the need for overseas coaling stations. This was a problem the Navy felt acutely during the war and one that Bradford, in particular, was determined to address as the nation acquired new territories in the Caribbean and the Pacific. "It is almost as difficult in the present day to exaggerate the importance of coal as it is that of air or water," remarked Captain French E. Chadwick, a veteran of the Cuba blockade, naval historian, and incoming president of the Naval War College.[4] A fleet of modern, steam-powered warships, operating far from American shores required bases and coaling stations, which the United States did not have. "The subject was forced upon the attention of the [Navy] Department by the Spanish war," Bradford had written, referring to the logistical and, indeed, the larger strategic frustrations the Navy had experienced in 1898.[5] As Chief of the Bureau of Equipment charged with coaling the fleet, Bradford was forced to pull ships from an already-thin blockade to coal at Key West, by collier at sea, or at Guantánamo Bay, which the Marine Corps and the Navy had seized precisely for that reason. After the war,

[4] Captain F.E. Chadwick, Coal, Lecture Delivered 1901, Record Group 14, Faculty and Staff Presentations, 1901-1914, Box 2, Naval Historical Collection, Naval War College, Newport, Rhode Island.

[5] Navy Department, *Annual Report of the Secretary of the Navy for the Year 1902* (Washington, D.C.: Government Printing Office, 1902), 351.

Secretary of the Navy John D. Long concluded that the service "found itself greatly hampered by the lack of coaling stations both at home and abroad."[6] In their postwar assessments, Bradford and others raised unsettling prospects. What if the main theater of war had been more than a few day's steaming from the coast of the United States? To where could Commodore George Dewey's Asiatic Squadron have retreated had it been defeated at the Battle of Manila Bay?[7] These were new and important questions, particularly for a navy faced with defending a vast oceanic empire.[8] Thus, when Bradford proclaimed to the Sons of the American Revolution that he was an expansionist, he did so based primarily on logistical and strategic considerations made evident during the war and more urgent as the nation acquired far-off territories. To defend the new empire, the Navy needed to expand it, and so Bradford traveled to Paris in October 1898 to advise the American peace commission about the service's new strategic needs.

Bradford based his briefing to the commission in hydrography, which perhaps grew out of his bureau's command of the Hydrographic Office, but also from the understanding that the marine environment offered certain strategic advantages and disadvantages for the Navy. In meeting with the five American commissioners, Bradford drew heavily on charts, which served as a powerful visualization of his arguments as he evoked the great expanses of water over which the Navy would need to steam and the

[6] Navy Department, *Annual Report of the Secretary of the Navy for the Year 1899* (Washington, D.C.: Government Printing Office, 1899), 25.

[7] See Statement of Commander R.B. Bradford, U.S.N., October 14, 1898, 5, Record Group 43, Records of International Conferences, Commissions, and Expositions, Entry 800, Box 2, National Archives and Records Administration, Washington, D.C; R.B. Bradford, "Coaling-Stations for the Navy" *Forum* 26 (February 1899), 734-35. *Annual Report of the Secretary of the Navy*, 1899, 305.

[8] On the logistical and strategic considerations of coal, see John H. Maurer, "Fuel and the Battle Fleet: Coal, Oil, and American Naval Strategy, 1898-1925," *Naval War College Review* 34 (November-December 1981), 60-74; also Lamar J.R. Cecil, "Coal for the Fleet that Had to Die" *The American Historical Review* 69 (July 1964), 990-1005.

strategic geography of the waters that, he argued, the Navy must control. Bradford reported to the commission on October 24 "fairly filling my room up with the multitude of charts he had brought on from the Navy Department for use in his examination," wrote Whitelaw Reid, Republican expansionist editor of the New York *Tribune* and member of the Paris Peace Commission.[9] Discussion focused on the Philippines as the most important question still remaining to be settled. It was a contentious debate, occurring within many contexts—diplomatic, economic, racial, gendered, and moral as well as naval and strategic.[10] On this day, however, Bradford unveiled his charts to support a primarily strategic argument for territorial expansion.

The commissioners began by considering the Pacific broadly, urging Bradford to orient the discussion with his charts. "Where are the Philippines?" asked William R. Day, former Secretary of State and president of the commission. "Have you a map showing the American and Asiatic shores, both?" Thumbing through his charts, Bradford replied, "yes, here it is. There are the Ladrones [Marianas]; here are the Carolines; there are the Marshalls; here are the Hawaiian Islands; and there are the Philippines," pointing to the various island groups in the North Pacific on the line from California to China. "Here are the Pelews [Palaus]," Bradford continued, "about 600 miles from the Philippines. I am firmly convinced," he told the commissioners, "that the Pelews, Carolines and Ladrones

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[9] H. Wayne Morgan, ed. *Making Peace with Spain: The Diary of Whitelaw Reid, September-December, 1898* (Austin: University of Texas Press, 1965), 73.

[10] See, for example, Kristin L. Hoganson, *Fighting for American Manhood: How Gender Politics Provoked the Spanish-American and Philippine-American Wars* (New Haven: Yale University Press, 1998); Walter LeFeber, *The New Empire: An Interpretation of American Expansion, 1860-1898* (Ithaca: Cornell University Press, 1963); Rubin Francis Weston, *Racism in U.S. Imperialism: The Influence of Racial Assumptions on American Foreign Policy, 1893-1946* (Columbia: University of South Carolina Press, 1972).

should all be acquired."[11] And so Bradford, speaking as a naval officer and one particularly concerned with the logistics of coal, expanded the scope of the commission's discussion. Annexation of the Philippines, he testified, required stations that spanned the Pacific. It was an argument made plainly evident to anyone who understood the logistical limits of the reciprocating steam engine and then glanced at Bradford's charts.[12] Empire begot further expansion until no island group went unconsidered for its strategic importance to the United States.

The charts were useful enough to give the commissioners a sense of the Pacific's strategic geography, but the commission soon turned to a more detailed consideration of particular islands and harbors, informed by Bradford's hydrographic estimation of their value to the Navy. On Ponapi, one of the Caroline Islands that Bradford identified as particularly important, Reid inquired, "it is the largest, is it not?" No, Bradford replied, "but it has some very good harbors." Referring to the Aleutian Islands of the North Pacific, Commissioner William P. Frye, expansionist senator from Maine, interrupted to ask, "any harbor there?" to which Bradford responded, "Dutch Harbor, a fairly good one."[13] The exchange continued in this manner as Bradford and the commission considered one island group after another. While perhaps not apparent to the diplomats, Bradford's rather basic line of answers was rooted in an exhaustive study of Pacific hydrography as it then existed, however imprecise, in the Navy's charts and Sailing Directions. For Bradford, as we will see, a good harbor meant deep, sheltered waters,

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[11] Statement of Commander R.B. Bradford, October 14, 1898, 7.

[12] See also William M. McBride, *Technological Change in the United States Navy, 1865-1945* (Baltimore: Johns Hopkins University Press, 2000), 90.

[13] Statement of Commander R.B. Bradford, October 14, 1898, 9-10.

defensible from attack with good holding ground—usually mud—easy and deep approaches to the shore, room for access and egress, and located near seas of strategic importance that the Navy could control. At Paris in the fall of 1898, Bradford presaged the more thorough study taken up by the Hydrographic Office, the Naval War College, the General Board, and, of course, Bradford himself in the following years.

The depth of Bradford's hydrographic knowledge and its centrality to the imperial discourse becomes apparent as the commission turned to the Philippines themselves. Bradford contended that Palawan, a string bean-shaped island running from Mindoro to Borneo with a commanding position on the South China Sea, was perhaps the best position in the Philippines. It was his choice for a naval station in the islands. "There are five bays with good anchorages at any time or with any wind," he stated. The island was "sufficiently valuable to excite the cupidity of any nation."[14] But Bradford's cupidity had been excited as well. Referring to Palawan's Malampaya Sound, Bradford launched into the hydrography of the matter:

> It is 19 miles deep, with a width of from 2 to 4 miles. The entrance is six-tenths of a mile wide and between bold and high headlands. It has been aptly named 'blockade strait.' The sound is divided into two parts of about equal depth. The channel to the inner section passes between islands, commanding the approaches and affording the most perfect means of defense. Within is a broad sheet of water, from six to ten fathoms deep, affording excellent anchorage and good holding ground. The entire sound is surrounded by high lands, is well wooded, and affords an abundance of good water.[15]

Bradford couched his arguments in the language of hydrography—that is, he articulated his larger vision of American empire to the commission using environmental arguments about the advantages and disadvantages of particular bodies of water. The charts had thus

[14] Ibid., 14.

[15] Ibid., 14-15.

taken on a strategic meaning different from the commercial understandings that had informed the voyage of the United States Exploring Expedition and Maury's *Wind and Current Charts* in the antebellum era. Maritime commerce and its ships, of course, required similar environments, but Bradford was drawn to consider defensibility, position with regard to strategic waters, and depth of water enough to accommodate the Navy's deep-draft battleships. A commercial harbor such as Manila offered many, but not all of these conditions. Bradford hoped to seize as many positions as possible. He was not content with Luzon alone, and so he threw his influence behind Palawan and Malampaya Sound as his choice for the best naval position in the Western Pacific.

Figure 29: Hydrographic Office chart of Malampaya Sound, with surveys taken after 1900, showing Blockade Strait. The chart gives a sense of Bradford's hydrographic considerations, though this chart was a significant improvement over the Spanish charts at Bradford's disposal in October 1898. Geography and Map Division, Library of Congress.

The meeting then turned to the central question facing the American commission—how much of the archipelago should the United States demand from Spain? Even in October 1898, McKinley was not yet committed to full annexation and had saved the question for the diplomats to debate at Paris as he began a tour of the American Midwest to gauge public opinion.[16] The Philippines became the focus of the commission's work with Bradford its most important adviser.[17] On his chart of the islands, Bradford had drawn a line that roughly bisected the archipelago from northeast to southwest, indicating that the islands west of the line—Luzon, with its commercial center of Manila, Mindoro, and Palawan—should be taken by the United States at all costs. "The division," he told the commissioners, "was made with a view to taking as little as possible in addition to Luzon, and at the same time maintaining control of a fairly good strategic line of outposts."[18] But for Bradford, the lined chart represented a dangerous compromise, which he had delineated only to placate the moderate imperialists.

Bradford argued that from a naval perspective, taking only a part of the archipelago would leave the remaining islands to another power, endangering any American position there. He then raised the specter of Germany whose imperial ambitions in the Pacific were well-known.[19] Germany was the American navy's most

[16] David Trask, *The War with Spain in 1898* (New York: Macmillan Publishing Co., Inc., 1981), 452-54.

[17] William Reynolds Braisted, *The United States Navy in the Pacific, 1897-1909* (Austin: University of Texas Press, 1958), 53-54; Richard D. Challener, *Admirals, Generals, and American Foreign Policy, 1898-1914* (Princeton: Princeton University Press, 1973), 77.

[18] Statement of Commander R.B. Bradford, October 14, 1898, 17.

[19] Braisted, *The United States Navy in the Pacific*, 50-63; Challener, *Admirals, Generals, and American Foreign Policy*, 29, 103.

likely enemy in the immediate aftermath of the Spanish-American War.[20] "If we should adopt your line of demarcation," Senator Frye asked, "what do you think Spain would do with the balance of them?" to which Bradford replied without hesitation, "Sell them to Germany."[21] Cutting to the crux of the matter, Frye then wondered "What, in your opinion, ought to be done relative to these positions in the East and in the Pacific?" Bradford answered by saying that he thought "the entire Philippine group of islands, the Carolines, including the Pelews, and the Ladrones should be annexed to the United States. If we are going to be a commercial or naval people," he concluded, "it is absolutely necessary to have coaling stations and colonies the world over."[22] Bradford's unqualified expansionism struck some of the commissioners as more than even the imperialists among them were willing to sanction. It seemed to Frye, in particular, that annexing so much territory would leave the United States less secure, not more, and would require a larger navy to defend. Bradford, of course, did not oppose naval expansion as a natural consequence of the nation's imperial obligations, and he remained adamant that full annexation would be safer than not. He firmly believed that the American empire should be pushed to its fullest extent.

Ultimately, Bradford's counsel only confirmed McKinley's new directive, on October 26, that the commissioners demand all of the Philippine Islands and Guam from Spain in addition to Puerto Rico and the initial war aim of Cuban independence. In his decision, the president was swayed by issues much broader than the naval perspective

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[20] See Ronald H. Spector, *Admiral of the New Empire: The Life and Career of George Dewey* (Baton Rouge: Louisiana State University Press, 1974), 137-153; Holger Herwig, *The Politics of Frustration: The United States in German Naval Planning, 1889-1941* (Boston: Little, Brown, 1976).

[21] Ibid., 27.

[22] Ibid., 23, 18.

expressed by Bradford and his charts. Nevertheless, naval considerations had figured prominently in the commission's debate in late October 1898. The Navy had sent Bradford to speak for its interests, and he had done so, couching his arguments in a hydrographic understanding of naval strategy. The Treaty of Paris, of course, did not go so far as Bradford advocated. The United States did not take territory in the Palaus or Carolines and only Guam in the Marianas. It nevertheless annexed a large empire made larger still by the acquisition of the Hawaiian Islands in June 1898. That hydrography had played such a significant role in Bradford's arguments to the commission—indeed, that he had martialed so many charts to make his points—presaged the new role hydrography would play in the discourse of American empire.

But claims made by reference to the Navy's charts, as Bradford knew, were based on flawed or incomplete hydrographic knowledge. The war with Spain exposed hydrography as a strategic weakness that had hindered American command of the sea. At Paris, in the course of the Philippines debate, Senator George Gray, the only Democrat and anti-expansionist on the commission, asked Bradford about the approaches to Palawan. Bradford admitted that his choice for a naval base was "more or less fringed with shoals, rocks and islets, making navigation dangerous with the present charts in places. The Philippine Islands are not well surveyed," he confessed, "and it is unknown dangers that are most feared."[23] It was much the same throughout the new American empire. "From personal experience," reported Commander Chapman C. Todd, the Navy's new Hydrographer and a veteran of the Cuba blockade, "I am well aware that the same condition exists as to the published charts of the waters around the island of Cuba.

[23] Ibid., 16.

What has been said relative to the Philippines applies equally to . . . Cuba."[24] Hydrography, Todd now believed, had become both "a matter of commercial supremacy and national security."[25] The Navy's charts were too inaccurate to secure command of the sea, and they were inadequate to inform the debate over where to establish naval bases and stations. It was primarily in the context of these new strategic needs that the Navy began to survey the waters of the American empire after the Spanish-American War.

The strategic geography of the new empire owed much to Captain Alfred Thayer Mahan, whose work not only ushered the New Navy, but also would frame the postwar naval base debate.[26] In *The Influence of Sea Power upon History, 1660-1775*, Mahan had cited colonies as essential to national greatness. They were, he wrote, one of the fundamental elements of a nation's sea power.[27] Through the 1890s, in several articles that appeared in the wake of *Influence*, Mahan elaborated on the prospect of an American empire and the appropriate course of strategy at sea. Mahan's sea was very much a martial place. The Caribbean, he wrote, represented "the very domain of sea power." Cuba and the West Indies were "fortresses" that guarded important sea lanes from the

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[24] *Annual Report of the Secretary of the Navy, 1900*, 359.

[25] Navy Department, *Annual Report of the Secretary of the Navy for the Year 1901* (Washington, D.C.: Government Printing Office), 432.

[26] On Mahan see Robert Seager II, *Alfred Thayer Mahan: The Man and His Letters* (Annapolis: Naval Institute Press, 1977); Seager, "Ten Years Before Mahan: The Unofficial Case for the New Navy, 1880-1890" *Mississippi Valley Historical Review* 40 (December 1953), 491-512; John B. Hattendorf, ed. *The Influence of History on Mahan: The Proceedings of a Conference Marking the Centenary of Alfred Thayer Mahan's* The Influence of Sea Power Upon History, 1660-1783 (Newport: Naval War College Press, 1991); William E. Livezey, *Mahan on Sea Power* (Norman: University of Oklahoma Press, 1947); John Tetsuro Sumida, *Inventing Grand Strategy and Teaching Command: The Classic Works of Alfred Thayer Mahan Reconsidered* (Baltimore: Johns Hopkins University Press, 1997).

[27] Captain A.T. Mahan, *The Influence of Sea Power upon History, 1660-1783* (Boston: Little, Brown, and Company, 1896), 28.

United States and Europe to an isthmian canal.[28] In the Pacific, Mahan wrote that Hawaii's value lay in its position as an "outpost of the canal."[29] This canal, which was not yet built, became the focus of Mahan's thinking.[30] It would close the distance by water between the American coasts, connect the nation's growing interests in the Far East with its traditional influence in the Caribbean and Latin America, and allow the Navy to concentrate its fleet as one unit—the quintessential Mahanian maxim. For Mahan, American empire and sea power were inextricably linked to the canal. In his prose, islands became fortresses, coastal waters became "sea frontiers," and the sea itself, the "great common" that the Navy must control.[31] The war with Spain had turned much of this from prospect to reality, and so when the Navy and the American public, having read Mahan's work, began to think about empire, they did so with the understanding that the sea was a strategic space.

Between 1898 and 1903, as naval officers considered establishing the bases that Mahan had written about for more than a decade, they looked to the sea as an environment that needed to be understood in strategic terms. As Bradford and a succession of officers at the Hydrographic Office already knew, the marine environment in large measure would be the determinative factor in the geography of American empire. Mahan, it seems, first grasped this in the fall of 1898 when, as a member of the Naval War Board that advised Secretary John D. Long, he called for surveys to inform the base

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[28] A.T. Mahan, "A Twentieth-Century Outlook" *Harper's Monthly Magazine* 95 (September 1897), 531-32.

[29] A.T. Mahan, "Hawaii and our Future Sea-Power" *The Forum* (March 1893), 4.

[30] A.T. Mahan, "The Isthmus and Sea Power," *The Atlantic Monthly* 72 (October 1893): 459-72.

[31] Mahan, "Hawaii and our Future Sea-Power," 8; Mahan, *The Influence of Sea Power upon History*, 138.

debate. "Before any harbors that may be selected as naval stations are permanently acquired," the Board wrote in a report to Long, "each should be visited, carefully examined and reported upon fully by competent naval officers sent for this purpose in one of our cruisers."[32] If Mahan, in proposing a lone cruiser, did not quite grasp the scope of the work, the General Board did. Established by Long in 1900 as a permanent advisory council to the Secretary, the General Board spent the better part of its first three years considering the hydrographic depths of naval strategy. George Dewey, hero of Manila Bay and now Admiral of the Navy, was its president. In 1901, Dewey wrote to Long that "as complete a knowledge as possible should be possessed by the Board, concerning the hydrography of such points as may be utilized for naval bases or are of strategic value to our naval forces in the event of hostilities with a foreign naval power."[33] As Dewey put it in one General Board report, "without knowing the bottom thoroughly we lose the benefit of it."[34] At the same time, officers at the Naval War College were also grasping hydrography's strategic significance. "There is an enormous amount of hydrographic surveying to be done in our new possessions, owing to their multitudinous insular character and the meager and imperfect hydrographic work already done in them," declared Captain Charles H. Stockton, President of the Naval War College, when he

[32] M. Sicard, A.T. Mahan, and A.S. Crowninshield to John D. Long, Office of the Naval War Board, Washington, D.C., 1898, RG 80, General Records of the Department of the Navy, General Board, Box 40, Folder 414-1, NARA.

[33] George Dewey to John D. Long, General Board, Newport, R.I., August 23, 1901, RG 80, General Records of the Department of the Navy, General Board, Box 43, Folder 415, NARA.

[34] George Dewey, "Relative to BLAKE surveying the locality of Dry Tortugas, 2nd Endorsement, General Board, Washington, D.C., February 8, 1901, RG 80, General Records of the Department of the Navy, General Board, Box 43, Folder 415, NARA.

appeared before the United States Senate in 1899.[35] Hydrography, charts, and the need for further surveys had thus entered the highest levels of naval discourse in the years after the Spanish-American War.

With hydrographic considerations at the fore, Bradford at the Bureau of Equipment and Commander Joseph E. Craig at the Hydrographic Office, planned a comprehensive survey of Cuba, the key to Mahan's domain of sea power. Bradford considered this among his most important work at the bureau. He did so primarily because of hydrography's military significance, rather than its commercial value. "There is no more important and necessary work with a view of being prepared for war," he reported to the Secretary of the Navy in 1903.[36] "In the opinion of the Bureau it is quite as necessary for this Government to be able to supply to its ships of war all the charts necessary for purposes of navigation anywhere in the world, as it is to supply them with armor, ordnance, coal, and other articles of equipment."[37] To Bradford, charts ranked with steel and shot in the arsenal of naval war. That he equated their importance with coal—his great passion as bureau chief—says a good deal about the new role hydrography played in naval affairs. Cuba, of course, had been the site of the Navy's greatest hydrographic difficulties during the war. The island's position astride the Windward Passage—a stretch of water separating the island from Santo Domingo and commanding the main sea lane to the isthmus—assured its strategic importance to a canal

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[35] C.H. Stockton to Members of the United States Senate, in "Hydrographic Office," *United States Army and Navy Journal, and Gazette of the Regular and Volunteer Forces* 37 (1899-1900), 879.

[36] *Annual Report of the Secretary of the Navy, 1903*, 365.

[37] *Annual Report of the Secretary of the Navy, 1900,* 309.

and therefore to the Navy. Any major American naval base in the Caribbean would almost certainly be located in Cuba, the only question remained where.

In January 1899, the yachts *Eagle* and *Yankton* began hydrographic surveys to answer that question. With the addition of the yacht *Vixen* late in 1899, the three survey vessels worked in Cuban waters for the next four years. With the exception of the U.S. Exploring Expedition, this was an American hydrographic effort unprecedented in size, duration, and scope. The three had been veterans of the Cuba blockade, acquired by the Navy from private owners in the first weeks of the war. They were steel-hulled, both sail and steam-powered, and they were small—less than two hundred feet long and about twelve feet in draft—making them ideal for surveying in coastal waters. The hydrographic work of *Eagle* and *Yankton*, in particular, was perhaps the most important factor in setting the geography of the American empire in the Caribbean.

Though there were some differences, hydrographic surveying in the new century remained much the same as it had when the United States Exploring Expedition charted the Fijis in 1840. The differences were largely technological. Instead of sail and oar, the launches that set out from *Eagle*, *Yankton*, and *Vixen* were steam-powered, making the intricate maneuvering demanded by triangulation much faster and easier. In addition, the entire survey could be plotted more accurately since longitude, long the most complex and inaccurate of navigational measures, could now be determined more precisely by its relation to telegraph stations whose coordinates were known by signals sent from Cuba to the Prime Meridian at Greenwich. But the method of the trigonometric survey remained the same as it had in the 1840s, and the whole exercise was subject to the vagaries of nature. The surveying schedule itself was interrupted by a four-month break during the rainy season when hurricanes and lesser storms battered the Cuban coast. The island's shallows were so vast and complex that the surveyors often had to work almost out of sight of land. Even close-in, the mangrove swamps that surrounded many harbors made the erection of signals difficult. The tropical sun continued to do its worst, glancing off the exposed coral heads in a blinding panorama of light that had been as familiar to Wilkes and Passed Midshipman William Reynolds in the Old Navy as it was in the new. "I am sure that none of the cadets would be able to use a sextant after a continuous week of this sort of sounding," Commander Carlos G. Calkins, *Vixen*'s commanding officer, reported to Bradford.[38] "Already we have many complaints of damaged vision."[39] Much of the work was "done in water rough enough to make Midshipmen seasick," remarked Lieutenant Commander M.L. Wood in *Eagle*.[40] With higher rank, it seems, came sturdier constitutions, but the fact remained that this work, like no other in the Navy, immersed officers and men in the marine environment.

Bradford intended first to locate a suitable site for naval use, and so he directed *Eagle* and *Yankton* to proceed to Guantánamo and Santiago bays, respectively. Geography had placed these harbors favorably, commanding Cuba's southeast coast and guarding the vital Windward Passage. Other harbors like Havana and Nipe Bay on the north side of the island and Cienfuegos on the south were also good harbors, but, for the Navy's needs, they were not close enough to this most strategic stretch of water. "Opinions are divided as to which is the most desirable port, Santiago or Guantánamo,

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[38] In this era, midshipmen were sometimes referred to as "naval cadets."

[39] C.G. Calkins to Bradford, U.S.S. *Vixen*, Havana, Cuba, April 26, 1902, RG 19, Bureau of Equipment, General Correspondence, 1899-1910, Box 100, NARA.

[40] M.L. Wood to Bradford, U.S.S. *Eagle*, Port San Antonio, Jamaica, February 10, 1903, RG 19, Bureau of Equipment, General Correspondence, 1899-1910, Box 101, NARA.

for deposits of coal for naval purposes," observed Bradford.[41] The choice would primarily be a hydrographic one. By the time both vessels returned north to spend the rainy season of 1899 in cooler waters, they had accurately charted both bays. At Santiago, whose prominence as a commercial port meant that it had been better surveyed, *Yankton*'s attention focused on charting the narrow, circuitous channel that was Santiago's dominant strategic feature. At Guantánamo, forty miles to the east, *Eagle* surveyed the bay's more than one hundred miles of coastline and twenty-five square miles of water. Its crew erected more than two hundred signals and took over twenty-five thousand soundings. The survey found a new deep-water channel not on the old chart, which had been unknown to the local pilots. With little dredging, the channel would allow battleships to coal closer to shore, a tremendous tactical advantage in wartime that surely pleased Bradford. Otherwise, he summarized, "important shoals were more correctly located and developed and the hydrography was corrected in many places."[42] By the summer of 1899, Guantánamo and Santiago were as well charted as any harbor of the continental United States.

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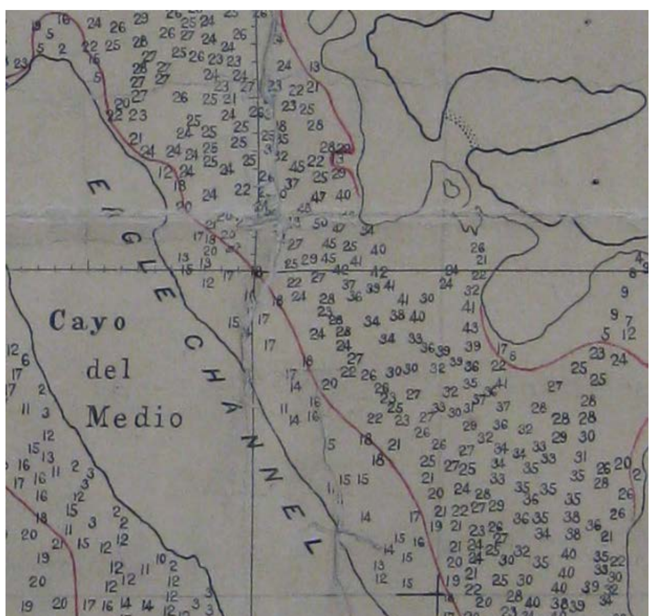
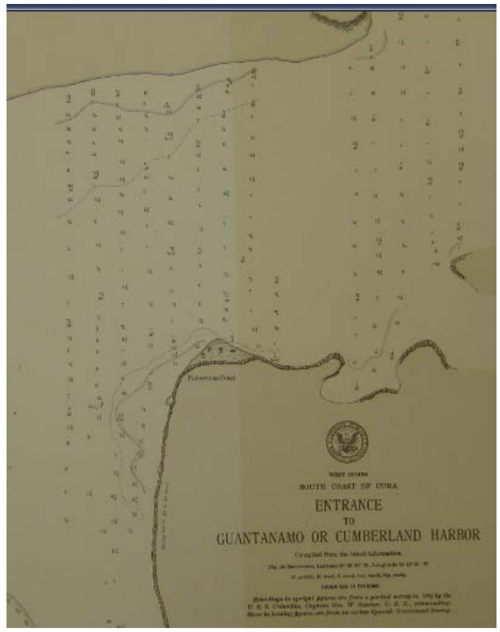
[41] *Annual Report of the Secretary of the Navy*, 1899, 318.

[42] Ibid., 316.

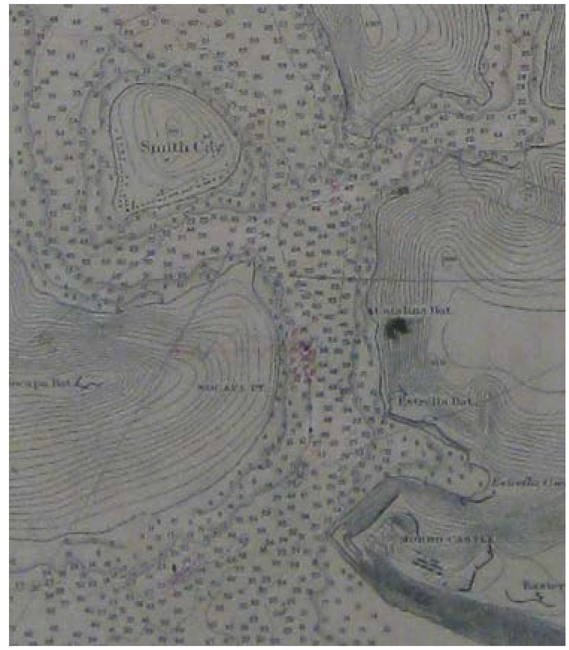


Figures 30 and 31: Sections of draft chart from *Eagle*'s survey of Guantanamo Bay, 1899. Cartographic and Architectural Section, National Archives and Records Administration.

Between 1899 and 1903, the three yachts encircled Cuba with new charts that served both commercial and military purposes. Though primarily interested in the island's strategic characteristics, the Navy and its Hydrographic Office still provided nautical charts to the nation's mariners. After the war, Americans who were now drawn to invest in Cuba demanded better charts, and so the Hydrographic Office remained beholden to commercial interests. Lieutenant-Commander Frank Friday Fletcher, who commanded *Eagle* in 1900, informed Leonard Wood, governor-general of the island, that "considerable capital is being invested along the N.E. coast by Americans and I have reason to believe that other capital is being held back owing to the lack of more definite information relative to the coast." Fletcher hoped to enlist Wood's influence to have the Navy's hydrographic surveys continued on the north coast of the island. Fletcher told Wood that New York's Munson Steamship Company, which sought to develop the harbors of Nuevitas and Gibara, was "unwilling to invest their money in those wharves and improvements until more definite information is obtained as to depth of water, character of bottom, shore line and other facts embodied in a modern plan and hydrographic survey." Thus, while the sea had become a strategic space, the Navy by no means ignored continuing commercial needs. Indeed, the two were often interrelated.



Figures 12 and 33: Chart of entrance to Guantanamo Bay from Spanish surveys at left and from *Eagle*'s survey at right. Note the difference in depth soundings. Geography and Map Division. Library of Congress.



Figures 34 and 35: Section of chart of Santiago Bay showing channel from Spanish surveys at left and from *Yankton*'s survey at right. Geography and Map Division. Library of Congress.

Military considerations, however, largely informed the Cuba survey, and a succession of officers commanding these yachts viewed the marine environment through a strategic lens. Commander Austin M. Knight, who had been a student at the Naval War College and would ultimately become its president, is a case in point. In command of *Yankton* during the survey of 1902-03, Knight wrote to Bradford at the Bureau of Equipment and Dewey at the General Board regarding Buena Esperanza, an inland sea on Cuba's southern coast that had bewildered the Navy in its assault on Manzanillo at the close of the war. After his survey, Knight found the waters no longer treacherous, but in fact ideal as an anchorage for the American battle fleet. "I know of no sheet of water in the world which is in any degree comparable to it," he observed, "nor am I able to think of any possible advantage in which it is lacking for the use of our Navy whether for drills in time of peace or for a rendezvous and shelter in time of war." As for the hydrography, "I find that six fathoms may be carried through here and that the channel is perfectly feasible for battle ships. It could be closed with great ease and at short notice." In another report, he even went so far as to compare these waters to Nantucket and Vineyard sounds, which the Naval War College had studied in detail as a strategic exercise. It seemed "to hold the same relation to the Caribbean Sea that is held by the above mentioned Sounds to the waters of our North Atlantic coast," Knight observed.[43] This was precisely the kind of report that Bradford and Dewey wanted. It demonstrates how hydrography and strategy mixed in the mind of a naval officer taught to think in this way by his training at the War College. "The General Board is impressed with the report of Lt. Cmdr. Knight," Dewey wrote to Bradford after the Board reviewed it in June 1902, "and concurs in his estimate of the strategic value of the region in question."[44] The Board also recommended that Knight remain in command of *Yankton* for another surveying season as its strategic eyes on the water.

If the Cuba survey had made one thing unquestionably clear, however, it was the utter uselessness of the old charts, which the Navy had used during the war. The battle reports, of course, had attested to this, but the surveys revealed the true measure of hydrographic ignorance. Responding to one solicitor who hoped to interest the Navy in purchasing land in Cuba for a coaling station, Bradford responded that "with the exception of a number of ports surveyed by this Department since the Spanish war, the charts, generally speaking, of Cuban waters are so inaccurate that it is impossible at

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[43] Commander A.M. Knight to Bradford, U.S.S. *Yankton*, Santa Cruz del Sur, Cuba, February 6, 1903, RG 80, General Records of the Department of the Navy, General Board, Box 28, Folder 404-2, NARA; Knight to Bradford, U.S.S. *Yankton*, Cienfuegos, Cuba, June 6, 1902, RG 19, Bureau of Equipment, General Correspondence, 1899-1910, Box 100, NARA.

[44] George Dewey, 3rd Endorsement, June 20, 1902, RG 80, General Records of the Department of the Navy, General Board, Box 28, Folder 404-2, NARA.

present to judge of the strategic value of the harbor mentioned by you."[45] In the course of his survey, Knight found his H.O. Chart 1523 "seriously in error." It had been constructed, he discovered, from a survey by the Spanish navy "apparently made by running a few lines of soundings and then sketching in the coast and cays by eye."[46] Distances erred by as much as five and a half miles. Aboard *Eagle*, Fletcher found that Guantánamo's position diverged from the chart by more than one mile of latitude and one of longitude.[47] Bradford went so far as to suggest that the stodginess of Spanish charts had perhaps itself been a strategic act—that "the former government . . . preferred that the coasts of Cuba should remain a danger . . . rather than that accurate surveys should facilitate approach in time of war."[48] Hydrography, as Bradford surely knew, was the least of Spain's military concerns, but such was the ease with which he now found it to be a strategic asset that he could entertain the idea.

Still, the Spanish had done an extraordinarily poor job of surveying their empire, something that the American navy hoped to rectify not only in the Caribbean, but in the Philippines as well where the search for a suitable naval base was constrained by a whirlwind of political and strategic complications. In his first annual report as Hydrographer in 1900, Commander Chapman C. Todd referenced the "inaccurate charts

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[45] Bradford to J. Aymer, Bureau of Equipment, Washington, D.C., December 28, 1901, RG 19, Bureau of Equipment, General Correspondence, 1899-1910, Box 100, NARA.

[46] Knight to Bradford, U.S.S. *Yankton*, Santo Cruz del Sur, Cuba, February 6, 1903, RG 80, General Records of the Department of the Navy, General Board, Box 28, Folder 404-2, NARA.

[47] *Annual Report of the Secretary of the Navy, 1899*, 317.

[48] R.B. Bradford, 2nd Endorsement, January 20, 1903, RG 19, Bureau of Equipment, Correspondence, 1899-1910, Box 101, NARA.

of the Philippine group."[49] Indeed, the cruiser *Charleston* and several other ships and gunboats on the Asiatic Station had been lost or laid up due to groundings. Todd intended to construct a new set, which, he promised a fellow officer would be "carefully thought out from the strategic as well as the navigational standpoint." At any rate, with regard to a naval base, Todd wrote that "until there has been a thorough examination of the more important points . . . I do not think anyone ought to express a final point on this matter."[50] But the American position in the Pacific and the Far East was far from clear, making surveys comparable in scope and comprehensiveness to those off Cuba out of the question. Early in 1899, a Philippine independence movement took up arms against the new American colonizer. True to Bradford's word at Paris, Germany had purchased territory from Spain in the Mariana Islands, adding to their outposts at Samoa and at Kiaochow on the coast of China. Then, in 1900, an anti-colonial Chinese uprising besieged the foreign legations at Peking. The Navy's Asiatic Squadron had its hands full. Hydrographic surveys were necessarily a secondary concern. Still, the Navy took up the question of a naval base in the Philippines, aware that Asia was an ever-growing sphere of economic and strategic interest and that the Philippines, as American territory, would require defense.

In 1900, the Asiatic Squadron was perhaps the most demanding command in the Navy, but it nevertheless fell to Commodore George C. Remey to lead a reconnaissance of Philippine harbors amid his other duties as a wartime commander. At the behest of Congress and Secretary Long, the Remey Board met for the first time aboard the

[49] *Annual Report of the Secretary of the Navy, 1900*, 358.

[50] Todd to J.M. Ellicott, Hydrographic Office, Washington, D.C., November 24, 1900, RG 8, Intelligence and Technical Files, Box 36, Folder 1, Naval Historical Collection, NWC.

commodore’s flagship, the cruiser *Brooklyn*, on December 10, 1900. Its work was limited by the exigencies of war, the urgency of time, and the vastness of the archipelago, which consists of some seven thousand islands. Nevertheless, this board of four naval officers and a civil engineer completed a rough hydrographic reconnaissance in thirty days. In its report to Long, the board dismissed Malampaya Sound on the island of Palawan, which Bradford had pushed when he appeared before the Paris Peace Commission. “From the indications on the charts and from other information,” it concluded, “though there are good anchorages . . . it is not the most suitable location for the principal naval station in the islands.” The board, continuing on, found channels “practicable . . . for vessels of the deepest draft” at Iloilo in the central Philippines—another site favored by many naval officers.[51] But it unanimously selected the port of Olongapo in Subic Bay on the island of Luzon, thirty miles from Manila. On January 8, 1901, Remey cabled Long, citing Subic’s “good channel, ample anchorage” and its “inner basin well sheltered from storm waves,” which, he added, “requires some dredging.”[52] The official report followed. In its main points, the Remey Board echoed the arguments that were at that same time being made in favor of Guantanamo.[53] So the Navy, which would ultimately choose both Guantánamo and Subic to establish American sea power in the Caribbean and the Pacific, cited common hydrographic features among its most important considerations.

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[51] House of Representatives, 57th Congress, 1st Session, Doc. No. 140, Establishment of Naval Stations in the Philippine Islands, 2-3.

[52] Ibid., 22.

[53] On Remey’s service in command of the Asiatic Squadron and, quite superficially, as president of the Remey Board, see George C. Remey, *Life and Letters of Rear Admiral George Collier Remey, United States Navy, 1841-1928*, vol. 9, ed. Charles Mason Remey (Washington, D.C., 1939), 859-918.

Hydrographic reports from the Philippines arrived pell-mell, spurred by the ongoing strategic work of the Naval War College and the General Board's intent to glean as many opinions as possible before making its final decision on the location of a base. At the War College, President Stockton hoped to have some homecoming officers assigned to the staff. Lieutenant John M. Ellicott had been a student at the college in 1896 and returned to Newport once again from the Philippines to lecture on the strategic features of the Pacific. Before the class of 1900, Ellicott unequivocally dismissed Manila. "From its topographic and hydographic environment," he declared, it was "absolutely indefensible." Among other weaknesses, its entrance was too wide to be protected and too deep to be mined. Contrary to the Remey Board, whose findings appeared only a few months later, Ellicott favored Iloilo. Its bluffs, he told the college's students, "drop back into a semi-circular bight where thirty battleships could lie absolutely concealed from the outside." He continued, conjuring a strategic environment sprawling with dry docks, repair shops, a coal station and a supply depot—a naval base, in his words, "preeminently the strongest to be found in the Philippines."[54] But the next year, Rear Admiral Frederick Rodgers, who succeeded Remey in command of the Asiatic Squadron, threw his influence once again behind Subic, whose "natural features" and harbor he too thought "magnificent." It was "without a question the most desirable in the Philippine Islands for a naval station."[55] Subic, Iloilo, Palawan, Manila—Philippine harbors were tossed around the board rooms, class rooms, and ward rooms of the Navy in these years with little

[54] Lieutenant J.M. Ellicott, "The Strategic Features of the Philippine Islands, Hawaii, and Guam," 1900, RG 8, Intelligence and Technical Files, Box 104, Folder 6, Naval Historical Collection, NWC.

[55] Rodgers to Long, U.S.S. *New York*, Olongapo, P.I., June 12, 1901, RG 45, Office of Naval Records and Library, Subject File PS, Philippine Islands, Box 563, NARA.

consensus. This was certainly the result of the hastiness of wartime surveys in which Filipinos sometimes took shots at the surveyors themselves.[56] But disagreement also stemmed from the fact that no harbor was perfectly suited in an environmental sense, rather each afforded a mix of strategic advantages and disadvantages.

The scope of environmental knowledge that the Navy collected and then debated between 1899 and 1903 was staggering. As Mahan and Bradford knew, defense of the Philippines required not only a base in the islands, but a string of stations across the Pacific to support it. These, Ellicott had told the War College in Mahanian fashion, "must be considered like strongholds along a military highway," after which he delved into the hydrographic and strategic qualities of each.[57] Indeed, this was a highway built on hydrographic charts. A few, like the new charts of Cuba, were precise to the thousandth sounding; in 1903 alone, *Yankton* made a remarkable one hundred eighty thousand such measurements.[58] Other surveys, as in the Philippines, were less thorough, and many more, from the coasts of China to Puerto Rico, lay somewhere in between as the Navy made due with shortages in personnel and vessels to carry out its vastly expanded duties. After 1900, the Navy moved from Cuba to consider the hydrography of Puerto Rico, Santo Domingo, Mexico, and both coasts of the isthmus. In the fall of 1899, the collier *Nero* charted a course across the Pacific for a submarine telegraph cable that would link communications between San Francisco, Hawaii, Midway Island, Guam, and Manila and, in the process, recorded the deepest depth sounding ever made up to that time in the

[56] See *Annual Report of the Secretary of the Navy, 1901*, 370-71.

[57] Ellicott, "The Strategic Features of the Philippine Islands, Hawaii, and Guam," Naval Historical Collection, NWC.

[58] Knight to Bradford, U.S.S. *Yankton*, Portsmouth, N.H., July 8, 1903, RG 19, Bureau of Equipment, General Correspondence, 1899-1910, Box 101, NARA.

Mariana Trench, southeast of Guam. In November 1900, the auxiliary cruiser *Yosemite* completed its survey of the harbor of San Luis d'Apra, Guam before a powerful hurricane hit the island, driving the ship from the harbor out to sea where it sank with a loss of five men.[59] "It appears that a breakwater is not considered advisable," a survey board concluded in 1901, "on account of its great cost and the uncertainty of its resistance against storms."[60] In the same year, a pair of gunboats under the command of Lieutenant Albert P. Niblack, who himself had been a lecturer at the War College, completed a survey of Subic Bay.[61] By 1903, despite ongoing war and, indeed, the sea itself, the Navy had amassed a considerable hydrographic knowledge. Though much of the American empire still remained poorly charted, officers from the Naval War College and the General Board drew on the charts that did exist and the opinions of the surveyors themselves as they debated naval bases and planned for future wars.

[59] *Annual Report of the Secretary of the Navy, 1901*, 75.

[60] Ibid., 18.

[61] Ibid., 371.

Figure 36: Hydrographic chart of Subic Bay, circa 1899, from Spanish surveys. Cartographic and Architectural Section. National Archives and Records Administration.

Charts, in fact, had informed the course of study at the Naval War College since before the Spanish-American War. In 1893, Captain Henry C. Taylor became president of the college, beginning a tenure that naval historians consider one of the young institution's most critical moments.[62] Established at Newport in 1884 by Rear Admiral Stephen B. Luce, the college trained officers in naval history, tactics, strategy, and international relations, attempting to apply the scientific principles of the day to the study

[62] John B. Hattendorf, B. Mitchell Simpson, III, and John R. Wadleigh, *Sailors and Scholars: The Centennial History of the U.S. Naval War College* (Newport, RI: Naval War College Press, 1984), 38-45; Ronald Spector, *Professors of War: The Naval War College and the Development of the Naval Profession* (Newport, RI: Naval War College Press, 1977), 64-100.

of naval warfare. It was as lecturer and president of the college that Alfred Thayer Mahan had revised his lectures into *The Influence of Sea Power upon History*. Mahan, his book, and his thinking were thus deeply ingrained in the college's culture. Bradford himself had been a graduate of the inaugural class of 1885, and many of the bright young officers in command of the Hydrographic Office, or making surveys in the Caribbean and the Far East had since studied there. During Taylor's presidency, however, the classroom moved to the waters of Narragansett Bay and the New England coast to study the strategic elements of the marine environment firsthand. Typically, Taylor and his staff assigned small groups of student-officers to spend several days, with chart in hand, studying the hydrography and topography of localities that figured prominently in each year's problem—a broader strategic question around which each summer's course was organized.

These forays produced what Taylor called war charts, which forced officers to think about the strategic qualities of the marine environment and became the basis for the college's system of war planning. Despite the Navy's increasingly offensive orientation, it nevertheless remained concerned, both before and after 1898, with coast defense. For the War College, the harbors and coasts of the United States were as strategic as the waters of Cuba or the Philippines. During the summer of 1896, for example, in the course of studying a problem whose parameters were the defense of New York City and Long Island Sound, Lieutenant Commander J.R. Selfridge and Lieutenant Ellicott chartered a small steamer for a reconnaissance of Fisher's Island Sound off the coast of eastern Connecticut. "During this trip," the officers reported, "the chart was frequently consulted and the various inlets, rivers, and harbors specially examined as places of refuge for torpedo boats and mosquito fleets, together with the necessary docking facilities, while the Sound itself was studied for defense."[63] The waters off Fisher's Island, the two officers concluded, would make an ideal base for small vessels to harass any enemy intent on attacking New York City from Long Island Sound.

This was precisely the kind of thinking that Taylor and others hoped to promote with these studies, which considered the American coast as a strategic environment and turned the chart itself from a navigational aid into a weapon of war. The war chart, President Charles H. Stockton told his class in 1899, "should be based or made upon a hydrographic chart of the area under discussion" and should include "all the features that will enter into the attack and defense of an anchorage, harbor, bay or water area."[64] Taylor intended it to be both "an exercise of the mind in the study of war," and "of inestimable value to our fleet in a moment of crisis." Thus, Taylor told his students, "the commander-in-chief has only to hand the chart to the officer he selects as the commandant of the fleet base and direct him to carry out the details."[65] The war chart, then, was a kind of military cartography, studded with symbols detailing fortifications, land batteries, anchorages, channels, and shallows where mines and torpedo boats might impede an attacking fleet, or as a place of rendezvous for the battle fleet to sortie against the enemy. As a visual representation, these charts were designed to be read and

[63] Lieut-Cmdr Selfridge and Lieut Ellicott, "Reconnaissance of Fisher's Island Sound, Gardiner's and Peconic Bays, Shinnecock Canal, etc.," August 27, 1896, RG 8, Intelligence and Technical Files, Box 36, Folder 13, Naval Historical Collection, NWC.

[64] Commander C.H. Stockton, "The Formation of Maps or Charts for War or Coast Defense Purposes," 1899, Manuscript Collection 56, Papers of Charles H. Stockton, Box 3, Naval Historical Collection, NWC.

[65] Captain H.C. Taylor, Closing Address, Session of 1895, Record Group 28, President's File, Henry Clay Taylor, Naval Historical Collection, NWC; Naval War College, *Abstract of Course, 1895* (Washington, D.C.: Government Printing Office, 1895), 27-28.

understood at a glance, when decision at sea could turn on a moment. Indeed, they were not unlike Maury's *Wind and Current Charts* in their visual power to convey complex information in a way that was immediately graspable. But where Maury's charts had led the mariner to favorable winds and currents, or fertile whaling grounds, Taylor's war charts intended to lead the naval commander to victory in battle.

The chart also figured importantly in another exercise at the Naval War College—the war game. Lieutenant William McCarty Little, a permanent member of the staff, introduced the game into the college's course in 1894, influenced by the works for the Royal Navy by John Clerk and Sir Philip Colomb, but also by the German army's *kriegspiel*, which had proved its worth in the Franco-Prussian War of 1870-71. The war game, like Mahan's histories and Luce's founding philosophy, intended to apply scientific principles to the study of war so that, given certain parameters, ship duels, fleet battles, and naval strategy could be played out, tested, and retested, and principles of naval warfare then extrapolated. The game board, of course, was the chart itself. Assigned a particular scenario, the student-officers divided into two forces, under two commanders, to play out the game over a series of hours or days in separate rooms with nothing to govern their movements but the chart and directions from an umpire. This umpire kept abreast of the action and ultimately judged its outcome according to his own omnipotent chart. The hydrographic details mattered little here, but in matters of coast defense and attack, or, in the broad sweep of the strategic game, the environmental features of land and sea became inextricably part of this mock war.[66]

[66] See Hattendorf, et. al., *Sailors and Scholars*, 40-41, 56; Spector, *Professors of War*, 74-87; Captain W. McCarty Little, "The Strategic Naval War Game or Chart Maneuver," *United States Naval Institute Proceedings* 38 (December 1912), 1213-1233.

Figure 37. War gaming at the Naval War College in 1895 from an illustration in *Harper's Weekly*, Spector, *Professors of War*, 79.

But the real cultural significance of these war games is evident in McCarty Little's own estimation of its value. He actually preferred to call the exercise a chart maneuver rather than a war game. War game, he said, "had much the same depreciating effect as the term Sham Fight has had with regard to field maneuvers." Chart maneuver, he told the students, "accentuates the fact that the strategist's real field of operations is the chart, just as the architect's real field is the drawing board." For McCarty Little, the war game or chart maneuver was meant to reflect reality, as close as it could be achieved on the chart. He then went on to reference Jomini's well-known maxim, from his military treatise *The Art of War,* that strategy is "the art of making war upon the map." To McCarty Little, naval strategy was similarly making war upon the chart. Again, in the naval officer's mind, the line between chart and sea blurred. Representation and reality merged. In fact, he thought, the chart was perhaps a better representation than reality itself. "A little consideration will show that ordinary navigation is merely sailing on the chart," McCarty Little argued. "A walk on deck gives no idea where the ship is, but a glance at the chart in the cabin does. In like manner it is on the chart that the admiral plans and conducts his cruise." McCarty Little had made the imaginary leap from representation to reality and then took the metaphor further. The chart was not simply a classroom stand-in for command on the bridge of a warship, rather in battle it actually afforded the commander a much broader vantage of strategic vision. In real war, then, the naval commander need hardly view the action so much as plot and then direct it on the chart just as he had done in the classroom. The war game was not altogether different from the battle itself. "Even on the tactical field with the enemy in sight, the picture on the retina is a distorted representation, which in the mind must be reduced to a proper diagram," he told his students. "Even the actual witnesses to a battle do not have a clear idea of what has taken place until it has been reduced to a diagram." McCarty Little demonstrated a remarkably sophisticated understanding of cultural geography. In the officer's mind, the war game should become the war itself. With it, the chart became the sea—the very field of tactical and strategic decision.[67]

[67] McCarty Little, "The Strategic Naval War Game," 1213, 1219.

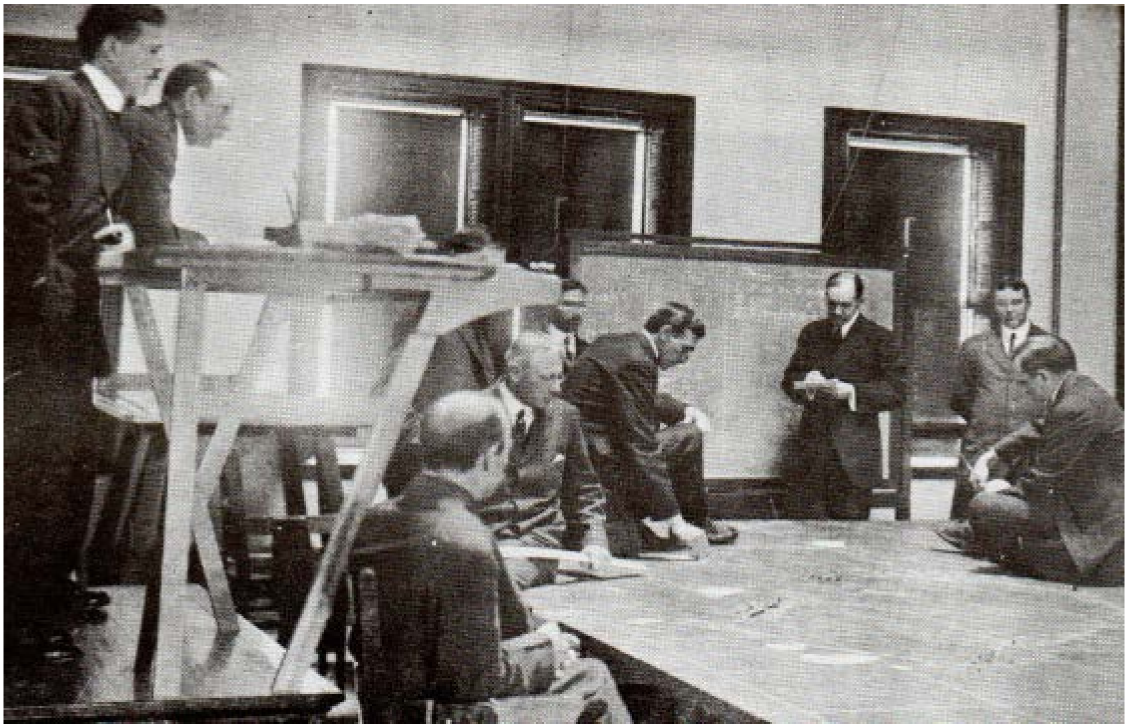

Figure 38: Making war upon the chart, circa 1914, Spector, *Professors of War*, 80.

Summers at Newport became the center of naval strategic discourse as the Naval War College played out war games, constructed war charts, and heard lectures, while the General Board retreated there from the sweltering capital to take in the high social scene and discuss the most pressing matters facing the Navy and the nation. Established in 1900 to advise the Secretary of the Navy, the General Board consisted of nine members from the various bureaus, the Office of Naval Intelligence, and the Naval War College. Admiral Dewey, the highest ranking officer in the Navy, presided. Between 1900 and 1903, the General Board's agenda largely revolved around naval bases and their location in the Caribbean and the Pacific.[68] Bradford at the Bureau of Equipment had so

[68] See Ronald H. Spector, *Admiral of the New Empire: The Life and Career of George Dewey* (Baton Rouge: Louisiana State University Press, 1974), 154-78; Challener, *Admirals, Generals, and American Foreign Policy*, 36.

interposed himself in these discussions before the General Board that he became a member himself in August 1901 and stayed for more than two years. Almost from the start, then, the work of the General Board represented the confluence of these different, but interrelated forces within the Navy —Bradford at the Bureau of Equipment, the surveyors and the Hydrographer Todd under him, Captain Stockton and Rear Admiral French E. Chadwick as successive presidents of the Naval War College, and Dewey himself as the most influential officer in the Navy. They all converged and mingled at Newport. Officers at the college tested the principles gleaned from their games in Narragansett Bay or sometimes with the North Atlantic Fleet itself, while, between meetings, members of the General Board served as observers, umpires, and adjudicators. It should be no surprise that hydrography and the chart were foremost on their minds and, perhaps more than any other factor, determined the geography of the American empire.

In November 1901, Dewey reported to Secretary Long that Guantánamo Bay, due to its natural advantages, was the board's unanimous decision for an American naval base in the West Indies. From the beginning, the Board had heard a string of arguments. Bradford had forwarded letters from Commander George L. Dyer and from Fletcher, each commanding yachts on the Cuba survey. He had also solicited and sent along opinions from commanders of the North Atlantic Fleet's battleships as well as from Captain Bowman H. McCalla who had led the attack on Guantánamo during the war. Guantánamo, Fletcher had reported, was "favorably situated" and "has a fine anchorage for a large fleet of vessels," while Dyer added that "Santiago is more easily defended than Guantánamo, but it is not so easy to enter."[69] For his part, McCalla cited Guantánamo's

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[69] G.L. Dyer to Bradford, U.S.S. *Yankton*, Santiago de Cuba, May 17, 1899, RG 80, General Records of the Department of the Navy, General Board, Box 28, Folder 404-2; Fletcher to Bradford, U.S.S.

defensibility and its spacious channel. “From a military point of view,” and he perhaps understood this view more than anyone, “Guantanamo Bay would seem to be greatly superior to Santiago, for it is as easily defended, except as to mines, and its entrance is broad enough for four battleships to steam out in line.”[70] In August 1901, meanwhile, the Board had reviewed the results of several strategic games at the war college, which, its members agreed, had “a bearing upon the solution of the Caribbean situation.”[71] Each game had pointed to the importance of Guantánamo as a base nearest the vital Windward Passage. On November 25, after considering all these points, the General Board went on record, choosing Guantánamo. “By reason of its position inside and adjacent to the Windward Passage, its commodious and well protected harbor and its easily defended entrance,” Guantánamo, “commends itself strongly to the General Board as of the first importance for a naval base in Cuba,” wrote Captain Robley D. Evans, summing up the Board’s opinion a few months later.[72] Guantánamo thus became the Navy’s strategic outpost in the Caribbean, made official by a lease from the Cuban government to the United States in February 1903.

The decision in favor of Subic Bay followed much the same course. Through the fall of 1901, a succession of officers had appeared before the General Board. There was Ellicott, who, in June 1900, presented the same lecture that he had given at the Naval

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Eagle, Caimanera, Cuba, May 25, 1899, RG 80, General Records of the Department of the Navy, General Board, Box 28, Folder 404-2.

[70] McCalla, 12th Endorsement, Navy Yard, Norfolk, Virginia, June 29, 1899, RG 80, General Records of the Department of the Navy, General Board, Box 28, Folder 404-2.

[71] General Board, Newport, Rhode Island, August 21, 1901, M1493, Proceedings and Hearings of the General Board of the U.S. Navy, 1900-1950, Roll 1, NARA.

[72] R.D. Evans to Long, March 25, 1902, RG 80, General Records of the Department of the Navy, General Board, Box 28, Folder 404-2.

War College on the importance of Iloilo and other points in the Philippines and the Pacific. Niblack, who had been a member of the Remey Board and had just made a survey of Subic, reported to the Board in September 1901. Through the fall, the Board discussed Remey's report, and the admiral himself appeared to answer questions in the spring of 1902. Perhaps more than anything, the weight of Admiral Dewey's opinion held sway. Any base in the Philippines had to be deep enough to accommodate the floating dry dock *Dewey*, named, of course, for the man who had done perhaps more than anyone to secure the Philippine Islands for the United States. So it was with intense personal interest that Dewey presided over and directed this debate. As for himself, Dewey was convinced that Subic was the superior position. "I may state from my own experience," he later wrote, referring to his victory in 1898, "I fully expected to find the Spanish fleet at Subig as from my strategical study of the situation that is where they should have been."[73] By September 1901, the General Board had made up its mind. Subic, Dewey later reported in recapping the Board's opinion, "possesses a capacious anchorage with sufficient depth of water for the largest ships, is capable of being excellently defended by fortifications and submarine mines," and "has good protection from the prevailing storms of the locality."[74] The Board, in its recommendation to Long, wrote that it was "impressed with the advantages possessed by Olongapo, in Subig Bay," and pressed him that "steps be taken toward the establishment of a strong naval base . . . with as little delay as possible."[75] By the end of 1901, though many surveys and much work remained

[73] Dewey to William H. Moody, June 16, 1903, RG 80, General Records of the Department of the Navy, General Board, Box 28, Folder 405, NARA.

[74] Ibid., June 8, 1903.

[75] H.C. Taylor to Long, General Board, Washington, D.C., September 26, 1901, RG 80, General Records of the Department of the Navy, General Board, Box 28, Folder 405, NARA; on Subig in the larger

to be done across the empire, the Navy had come to a conclusion regarding its positions in the Caribbean and the Far East. It had done so primarily based on hydrographic arguments and with reference to the charts and presentations of those who had completed the surveys themselves.

But, in a curious turn, Bradford had dissented in both decisions. By 1901, for reasons that are not entirely clear, he had come to favor Havana in Cuba and Manila in the Philippines and thus disagreed with his fellow officers on the General Board.[76] Perhaps Bradford grasped earlier than anyone the larger economic realities of building the empire. After the Navy had finally concluded in favor of Guantanamo and Subic Bay, Congressional appropriations tightened and, at least in the Pacific, new logistical and strategic realities changed the direction of naval strategy, which will be taken up more fully in the dissertation's epilogue.[77] Suffice it to say, Subic never became the principal American naval base in the Pacific. By 1906, a series of debates within the Navy and with the Army had determined Subic too distant from the United States and indefensible from the growing naval power of Japan, which had won a dramatic victory in the Russo-Japanese War in 1904-05.[78] Manila, with its preexisting, albeit inadequate, military

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strategic context of naval planning in the twentieth century, see Edward S. Miller, *War Plan Orange: The U.S. Strategy to Defeat Japan, 1897-1945* (Annapolis: Naval Institute Press, 1991), 65-76.

[76] See General Board, Washington, D.C., November 25, 1901, M1493, Proceedings and Hearings of the General Board of the U.S. Navy, 1900-1950, Roll 1, NARA; Ibid., April 25, 1902; General Board, Newport, Rhode Island, August 27, 1902, , M1493, Proceedings and Hearings of the General Board of the U.S. Navy, 1900-1950, Roll 1, NARA.

[77] See Challener, *Admirals, Generals, and American Foreign Policy*, 39-40, 193, 228; Seward W. Livermore, "American Naval-Base Policy in the Far East" *The Pacific Historical Review* 13 (June 1944), 130-32; Braisted, "The United States Navy's Dilemma in the Pacific, 1906-1909" *The Pacific Historical Review* 26 (August 1957), 235-44; Rear-Admiral George W. Melville, "The Important Elements in Naval Conflicts" *Annals of the American Academy of Political and Social Science* 26 (July 1905), 130-31.

[78] Braisted, *The United States Navy in the Pacific*, 121-24; Challener, *Admirals, Generals, and American Foreign Policy*, 47-50, 233-41.

infrastructure ultimately served as the Navy's base in the Philippines, while Pearl Harbor, five thousand miles to the east, became its fleet base in the Pacific. Perhaps Bradford foresaw all this. More likely, he had trouble grasping the larger strategic realities of the American empire. Havana and Manila were the commercial centers of their respective islands, but most officers had dismissed them on hydrographic and strategic grounds and by arguing that they could be better defended from American positions in the Florida Keys, Guantánamo, and Subic Bay. Moreover, in his quest for coaling stations, Bradford had consistently demonstrated little reservation. Indeed, he grasped at any possible site with seemingly little regard to location, or the increasingly complex political, diplomatic, and strategic considerations of the new century. It seems likely that Bradford understood the logistics of coal—which, of course, was his great professional passion and his duty as Chief of the Bureau of Equipment—but little more.

Indeed, hydrography proceeded within larger contexts that both furthered and limited its role in naval affairs. Its new importance to the New Navy, of course, was tied to the service's growing commitments around the world and Mahan's philosophy of sea power. But foreign countries, equating hydrography with strategic advantage, sometimes protested Americans charting their coastal waters. This was less an issue with nations like Haiti than it was with, for example, the new Republic of Cuba, which even during its occupation by an American military government, protested the presence of the Navy's surveying ships. Diplomatic complications were perhaps most marked in the Navy's attempt to secure a base in the Chusan Islands. The Boxer Rebellion had proved that a base in the Philippines was not enough to support operations on the coast of China. Favorable in its hydrographic, strategic, and geographic features, the Navy considered the

Chusan Archipelago off the China coast as a possible advanced base. But China could not sell the islands to the United States under a preexisting agreement with Great Britain.[79] Indeed, the State Department worked closely with Dewey, Long, and Bradford in all matters related to prospective coaling stations in foreign territories. Military and commercial considerations also informed the surveys, but perhaps no other factor both advanced and impeded hydrography more than the marine environment itself. Keeping pace with an ever-changing environment and charting a vast oceanic empire continued to challenge hydrographers even as the strategic advantages of the marine environment made hydrography central to naval discourse in this period.

Nevertheless, by the turn of the twentieth century, as they considered the merits of particular harbors and islands for military use, naval officers came to believe that nature itself had imparted these places with strategic value. Officers were consciously differentiating between commercial ports and those they termed military, naval, or "man-of-war" ports"—as when Captain Charles D. Sigsbee, a member of the General Board, wrote, "no harbor can now be considered a good man-of-war harbor that will not admit a battleship fleet."[80] For its part, the Navy needed only to survey, apprehend, and improve waters that seemed ready-made for its battleships and the increasing logistical sprawl required to service, repair, and protect them. Thus, Mahan could write that Subic Bay was

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[79] Braisted, *The United States Navy in the Pacific*, 124-36; Livermore, "American Naval-Base Policy in the Far East," 122-25.

[80] Charles D. Sigsbee to Charles H. Allen, Office of Naval Intelligence, Washington D.C., March 20, 1901, RG 80, General Records of the Department of the Navy, General Board, Box 28, Folder 404-3, NARA.

"an impregnable fortress," which "lends itself most readily to defense."[81] At the Naval War College, Taylor and his students concluded that Long Island was "endowed" by nature with "admirable strategic qualities."[82] Still other naval officers conducting surveys or reconnaissance reported to the Department, citing the "magnificent natural advantages" of one harbor or another, or the particular "facilities afforded by nature."[83] In 1901, a General Board report on Samana Bay, Santo Domingo, which the Board deemed a sure flashpoint in a possible war with Germany, cited an environment "fitted by nature for defense."[84] Environmental questions thus became inseparable from strategic considerations. The sea had military value.

The study of the marine environment, the charts themselves, and the language of hydrography thus came to play a central role in the discourse of empire. It was not only important in determining coaling stations and naval bases, but also in the imagination of the naval officer who, after playing war games and constructing war charts at the Naval War College, came to equate representation with reality. If American naval officers were not literally making war on the map, as Jomini had put it, they were certainly preparing for war on it. And so this hydrography of sea power emerged out of new strategic needs as the Navy looked to establish and defend its empire in the years after the Spanish-American War. The Navy considered hydrography and the waters of the empire to be its

[81] A.T. Mahan, "The Advantages of Subig Bay Over Manila as a Base in the Philippine Islands," in *Letters and Papers of Alfred Thayer Mahan*, vol. 3, Robert Seager II and Doris D. Maguire, eds (Annapolis: Naval Institute Press, 1975), 659.

[82] Captain H.C. Taylor, "Address Delivered Before the First Naval Battalion, N.Y., Wednesday, January 9, 1895, Record Group 28, Henry Clay Taylor President's File, Naval Historical Collection, NWC.

[83] Frederick Rodgers to John D. Long, Olongapo, P.I., June 12, 1901, RG 45, Office of Naval Records and Library, Subject File PS, Philippine Islands, Box 563, NARA; Captain Asa Walker, "Notes on Cuban Ports," RG 8, Intelligence and Technical Files, Box 70, Folder 1, Naval Historical Collection, NWC.

[84] George Dewey to John D. Long, General Board, Washington, D.C., April 23, 1901, RG 80, General Records of the Department of the Navy, General Board, Box 38, Folder coz, NARA.

domain. But in 1900, when the U.S. Coast and Geodetic Survey began to press Congress to make the waters off the new American territories the Coast Survey's own hydrographic jurisdiction, Bradford, the Hydrographic Office, and the Navy became embroiled in a political fight, which will be taken up in Chapter Six. This rivalry—which had existed since Maury's time—now questioned the structure of science in the federal government and revealed how the Navy, the Coast Survey, and the nation were redefining the sea in the new century.

CHAPTER 7: TERRITORIAL WATERS

Our government was admitting, perhaps unconsciously, that the Pacific coast of the United States had advanced to the China Sea.

-Lieutenant John M. Ellicott, 1900[1]

The United States House of Representatives debated the Naval Appropriation Bill of 1901 for nearly the entire day on Thursday, April 19, 1900. At one point, about midway through, Joseph G. Cannon, Republican from Illinois, Chairman of the Appropriations Committee, and would-be Speaker of the House, stood up to explain his reasons for seeking to amend that bill. He was in favor of cutting the Navy's annual appropriation for "Ocean and Lake Surveys" from one hundred thousand dollars to ten thousand dollars. "I would like to see you run the battleship *Indiana* or the battleship *Oregon* into 6, 8, 10, or 12 feet of water to survey these coasts," he told the House. Battleships, he believed, were better suited for war than survey duty. The members of the House Naval Affairs Committee jumped on Cannon's premise. "Have you ever heard a battleship being used for that purpose?" asked George E. Foss, Cannon's fellow Republican from Illinois and chairman of the Naval Affairs Committee. "Do you understand that the survey is made from the deck of a battleship?" echoed Charles E. Littlefield, Republican from Maine. "No, sir, I do not," Cannon quickly recovered. "Somebody has said that a child can ask more questions in a minute than a wise man can answer in a lifetime." Littlefield then responded, "A man can be childish in not undertaking to answer." Cannon's own acerbic propriety had been offended and, at least

[1] Lieutenant John M. Ellicott, "The Strategic Features of the Philippine Islands, Hawaii, and Guam," Record Group 8, Intelligence and Technical Files, Box 104, Folder 6, Naval Historical Collection, Naval War College, Newport, R.I.

for the moment, he was on the defensive.[2] "Oh, if the gentleman will rise and address the Chair, he will find that he will always be treated with courtesy by me," Cannon snapped, and Littlefield rose to recognize the challenge.[3]

These exchanges set off a lively debate that continued through the day, alternating between humorous jabs at the Navy's expense and tense words between Cannon, Foss, and their respective supporters—all for an appropriation bill whose most controversial point was not a battleship building program or the establishment of another coaling station, but hydrographic surveys of America's territorial waters. Yet this debate proved significant and revealing. "Very rarely a provision in an appropriation bill contains a proposition of as much importance as the one under discussion," declared William H. Moody, Republican from Massachusetts. "It is very easy," he observed, "to conceal great changes which are enveloped in the language of an appropriation bill."[4] Moody was right. In debating the bill, Congress was, in fact, legislating hydrographic jurisdictions, deciding whether the Navy's Hydrographic Office or the U.S. Coast and Geodetic Survey, a civilian agency in the Treasury Department, should survey the territorial waters of the nation's new imperial possessions. At stake was nothing less than the political and legal definition of marine territoriality and, thus, the meaning of the sea itself.

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[2] On Cannon, though dealing mainly with his tenure as Speaker of the House, see Blair Bolles, *Tyrant from Illinois: Uncle Joe Cannon's Experiment with Personal Power* (New York: W.W. Norton & Company, Inc., 1951); Booth Mooney, "Uncle Joe: Joseph G. Cannon," in *Mr. Speaker: Four Men Who Shaped the United States House of Representatives* (Chicago: Follett Publishing Company, 1964), 89-127; Scott William Rager, "Uncle Joe Cannon: The Brakeman of the House of Representatives, 1903-1911," in *Masters of the House: Congressional Leadership over Two Centuries*, Roger H. Davidson, Susan Webb Hammond, and Raymond W. Smock, eds. (Boulder: Westview Press, 1998), 63-89.

[3] *Congressional Record*, 56th Congress, 1st Session, April 19, 1900, 4435-36.

[4] Ibid., 4427.

The sea, then, had entered the halls of Congress in the form of the Naval Appropriation Bill of 1901, and, more specifically, in a renewed rivalry between the Hydrographic Office and the Coast Survey for money to survey the sea. Many of the arguments made by Cannon, Foss, and others in the course of the debate drew on issues that had punctuated the history of American hydrography since the time of Charles Wilkes and Matthew Fontaine Maury. Congress had stoked the old antipathies of civilian and military science, which originated in Maury's feud with Alexander Dallas Bache and Joseph Henry during the 1850s. Related to this, Moody and others foresaw a dangerous imbalance in civil-military relations, citing encroachments by both the Navy and Treasury departments on the other's domain. They alternately decried the amateurism of naval science and the inefficiencies and poor administration of the Coast Survey. They differed on which institution better served the mariner and the nation's new strategic needs. Finally and fundamentally, they acknowledged the vastness and dynamism of the sea itself, which challenged hydrographers—naval and civilian—throughout the nineteenth century and continued to do so as the Hydrographic Office and the Coast Survey expanded their work into the waters of the new territories after 1900.

These issues had reemerged in the context of empire, which created uncertainties about the political and legal standing of the territorial waters of the United States. Since Thomas Jefferson established the Coast Survey in 1807, it had charted the American coast and twenty leagues to sea, while the Navy, by law, surveyed and charted the deep sea and foreign coastal waters. This distinction, though not always strictly obeyed, nevertheless established exclusive spheres of hydrographic work. But the acquisition of the Philippines, Guam, Samoa, Hawaii, Puerto Rico, and, for a time, Cuba, created new meanings for seas that were suddenly outside the historical understandings of what constituted territorial waters. The congressional debate of 1900, in which the House, in particular, grappled with expanded appropriations and jurisdictions for both the Hydrographic Office and the Coast Survey, provides insight into how the United States and its Navy struggled to define the sea in the new century. That Congress ultimately continued to fully fund both institutions despite overlapping work and the interests of economy speaks to the scope and the importance of the work. But, more importantly, it suggests that there were significant ambiguities in the way the United States defined the sea as it wrestled with its new imperial obligations and with the question of who, if anyone, really controlled the great common.

The relationship between naval and civilian science, particularly within the federal government, had always been fraught with difficulties only exacerbated by the commonalities that the Hydrographic Office and the Coast Survey shared. Since the fracture in Maury's time, when he quarreled with Bache and Henry over professional and intellectual questions, the Hydrographic Office and the Coast Survey had carved out relatively distinct spheres for their work. Congress, however, eliminated, re-established, and transferred the Coast Survey to the Navy Department three times prior the Civil War, a consequence of political fickleness and uncertainty over the survey's appropriate place within the structure of government. The Survey nevertheless continued to intermittently chart the American coast, expanding to Alaska after the Civil War in addition to its work in terrestrial geodesy and magnetism. With the exception of brief periods during the American Civil War and since 1898, naval officers assigned to the survey conducted most of its hydrographic work. Indeed, such was the Navy's involvement in the operations of the Coast Survey that Congress again considered the survey's amalgamation into the Navy twice between the Civil War and the turn of the twentieth century. In both instances, Congress and commissions of military officers and civilians validated the Survey's independence, but it nevertheless carried this precarious existence into the new century.[5]

The political and legal definitions of American territorial waters only exacerbated this rivalry. By 1900, national claims to coastal waters were firmly set in international maritime law and in the political and legal framework of the United States. In 1609, when the Dutch jurist Hugo Grotius wrote *Mare Liberum*, establishing the principle of freedom of the seas, he also recognized the right of maritime nations to claim coastal waters. By 1793, Secretary of State Thomas Jefferson had adopted the so-called "cannon shot rule," claiming that American territorial waters extended three miles to sea, or the range of a cannon fired from shore. By 1807, Congress had established the Coast Survey's jurisdiction to twenty leagues from the coast, and, in some cases, farther when the president deemed such surveys in the interest of American commerce.[6] Thus, American waters, broadly defined, ranged anywhere from three to sixty or more miles from the

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[5] On the Coast and Geodetic Survey, see Henry S. Pritchett and the Great Reorganization of the Coast and Geodetic Survey, 1897-1900," in John Cloud, *Science on the Edge: The Story of the U.S. Coast and Geodetic Survey, Its Transition into ESSA and NOAA, and the American Triumph of the Earth Sciences in the 20th Century*. National Oceanic and Atmospheric Administration, http://www.lib.noaa.gov/noaainfo/heritage/ coastandgeodeticsurvey/Pritchettchapter.pdf, (accessed February 10, 2012); A. Hunter Dupree, *Science in the Federal Government: A History of Policies and Activities* (Baltimore: Johns Hopkins University Press, 1986); Thomas G. Manning, *U.S. Coast Survey vs. Naval Hydrographic Office: A 19th-Century Rivalry in Science and Politics* (Tuscaloosa: The University of Alabama Press, 1988).

[6] Albert E. Theberge, *The Coast Survey, 1807-1867*, vol. 1 (Silver Spring, MD: National Oceanic and Atmospheric Administration, 1998), http://www.lib.noaa.gov/noaainfo/heritage/coastsurveyvol1/ CONTENTS.html (accessed April 13, 2012); Office of Coast Survey, "Law of the Sea," http://www.nauticalcharts.noaa.gov /staff/law_of_sea.html (accessed April 13, 2012).

coast. As in all other attempts to delineate the sea within constructed frameworks, the concept of territoriality proved more ambiguous on the water, occasionally leading to rivalries, misunderstandings, and overlapping jurisdictions between the Coast Survey and Hydrographic Office.

The war with Spain, however, opened new waters for the Coast Survey, which, under the direction of its superintendent, Henry S. Pritchett, expanded its work to the waters of the empire. In the Sundry Civil Appropriation Act for 1900, Pritchett proposed the usual funds "for every expenditure requisite for and incident to the survey of the coasts of the United States." But he followed this with a vague and broadly-construed clause that read, "and of coasts under the jurisdiction of the United States."[7] The meaning of this addition seemed straightforward enough, and it was in keeping with the premise that waters of the American territories should be considered an extension of the American coast itself. But Congress had nevertheless sanctioned the Coast Survey to chart seas outside its historic domain, a tremendous expansion of the survey's work that raised little concern at the time. Thus, in 1900, the Coast Survey's steamers and sailing vessels began surveying Puerto Rican waters and preparing for surveys of Hawaii and other coasts newly under "the jurisdiction of the United States." It was a seemingly minor change to the usual appropriation that nevertheless held the implicit recognition that American territorial waters had dramatically expanded over the ocean. This was a new—as yet unacknowledged—understanding of the sea that the Navy would soon contest and that Congress would take up extensively in the debate over appropriations in the spring of 1900.

[7] Hearing before the Subcommittee of House Committee on Appropriations, Sundry Civil Appropriations Bill for 1900, 55th Congress (Washington, Government Printing Office, 1899), 91-99.

Meanwhile, the Navy began its own expanded program of hydrographic surveys in these same waters, assuming that these seas had historically been the purview of its Hydrographic Office. For the Navy, the dramatic need for surveys raised by the late war and by the ongoing naval base debate demanded immediate, thorough surveys by naval officers trained to think about the sea, not only as a commercial space, but also as a space likely to be strategically valuable to the nation. In the naval appropriation for 1899, the Bureau of Equipment had, like the Coast Survey, extended its work under "Ocean and Lake Surveys" to include surveys in the Philippines, Cuba, and Puerto Rico, which Congress once again passed without much debate. From the Navy's perspective, this move also seemed appropriate. The nation had always considered these seas to be foreign waters. Moreover, the islands that now became, formally or informally, a part of the American empire were in various states of incorporation, a consequence of the confused and hasty process of imperial expansion after 1898. By the Treaty of Paris and by other means as well, the United States had inherited a vast overseas empire, which it was ill-equipped and unready to manage. The United States established a civilian government in Hawaii while the Navy and Army administered Guam and Puerto Rico, respectively. The declaration of war had guaranteed independence to Cuba under the Teller Amendment, but, for the moment, the island remained under a temporary American military government. Filipinos, meanwhile, contested American annexation, and the islands remained war-torn—a territory of the United States in name, but hardly in kind. In 1900 the islands of the new empire were thus in various and messy stages of incorporation as American territory, and so the Navy continued to survey waters that, though formally American, still seemed quite foreign.[8]

[8] *Annual Report of the Secretary of the Navy for the Year 1898* (Washington: Government Printing

In the House of Representatives, Cannon became aware of these overlapping hydrographic jurisdictions in 1900 as the Appropriations Committee vetted the various government bureaus, and it immediately struck him and his colleagues as an example of wasted spending. By 1900, Cannon had become one of the most powerful men in the House of Representatives, loathed, feared, and respected for his combativeness and his commitment to the tenets of old line Republicanism—that is, the interests of big business and fiscal conservatism. It was the latter that incited his passion as the House took up the Naval Appropriation Bill. Cannon, wrote historian Scott William Rager, "could not abide waste of the public's money." To the House, he was known as "Cerberus of the Money-box" and "Watchdog of the Treasury."[9] It was from his influential post as Chairman of the Appropriations Committee that the House voted him Speaker in 1903, beginning a tenure marked by unrivalled influence in the Speakership and by the House's eclipse of the Senate as the preeminent legislative body. The debate over the Naval Appropriation Bill revealed Cannon, known affectionately as "Uncle Joe," in all his colorful form as a staunch defender of government economy. In itself, Cannon's performance on the House floor during the spring of 1900 is illustrative of his burgeoning influence. And in the bill's denouement, Cannon perhaps revealed some of the overreaching power that ultimately deposed him as Speaker and that informs his legacy.

In the House on April 19, Cannon won the first bout, inciting his fellow congressman by a vote of 111 to 41 to amend the Naval Appropriation Bill of 1901, cutting funding for the Hydrographic Office's "Ocean and Lake Surveys" from one

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Office, 1898), 313.

[9] Rager, "Uncle Joe Cannon," in *Masters of the House*, 66, 71; Mooney, *Mr. Speaker*, 95.

hundred thousand dollars to ten thousand. This was a significant blow for those officers in the Navy, such as Rear Admiral Royal B. Bradford, Chief of the Bureau of Equipment, and the Hydrographer, Commander Chapman C. Todd, who understood hydrography's new strategic significance. Such cuts put the entire hydrographic work of the Navy in jeopardy. Bradford and Todd argued that the amendment would almost certainly mean closing the sixteen branch hydrographic offices around the nation that were such a boon to the Navy's relationship with American mariners.[10] For their part, Bradford and Todd confessed to being blindsided by Cannon's amendment. They blamed a cabal in the Coast Survey as well as Cannon and his colleagues on the Appropriations Committee for favoring a civilian institution over which they had some appointment power. But, true to form, Cannon's argument on the House floor was primarily economic, decrying the use of government funds for an unnecessary duplication of hydrographic work. "Cost," he told the House, "is the essential matter in the discussion of this proposition." He then explained that naval officers cost more than civilian engineers and that the Coast Survey's work that year in Puerto Rico had been much less expensive, per sounding, than the Navy's simultaneous surveys of Santiago and Guantánamo bays.[11] As Cannon's antagonists on the Naval Affairs Committee pointed out, this was a problematic way to compare economies since it did not take into consideration the myriad other factors that informed surveying work. Nevertheless, Cannon's argument proved compelling, and it

[10] C.C. Todd to Officer in Charge, Branch Hydrographic Office, New York, NY, Hydrographic Office, Washington, D.C., March 1, 1900, Record Group 37, Records of the Hydrographic Office, Entry 32, Correspondence, 1885-1924, Letters Sent and Received, Feb. 1885-Dec. 1901, Box 127, National Archives and Records Administration, Washington, D.C.

[11] *Congressional Record*, 56th Congress, 1st Session, April 19, 1900, 4437.

ultimately carried the debate in which both sides manipulated numbers and facts in their favor.

While Cannon's intentions were primarily economic, the House debate on the nineteenth quickly degenerated, under the five minute rule, into a mud-slinging contest, in which proponents of both the Hydrographic Office and the Coast Survey sought to promote their cause while undermining the other. Members of the Appropriations Committee, seeking to bolster Cannon, cited the encroachment of the Navy on civil authority, declaring the issue to be one of militarism. For William H. Moody, Republican from Massachusetts and member of the Appropriations Committee, the issue seemed clear. The Coast Survey had always charted American coastal waters and the Navy everything else. "We do not want one coast survey for the coast of the continental United States and another coast survey for our insular possessions. It would be expensive; it would be unwise in every respect," he declared. At issue, he believed, was the establishment of another coast survey in the Navy's Hydrographic Office "under military rule." And then he took the argument further. "When you extend the dead hand of militarism over the sphere that is appropriate to civilian action," he proclaimed, "then you begin to incur the dangers of militarism, which have been dreaded from the beginning of the Republic."[12] To Moody, at least in this early stage of the debate, the distinction between hydrographic jurisdictions seemed unequivocal. The waters of the new possessions were a civil space—American territory—not a foreign one that the Navy should survey. And, as he said, any advance on the part of the Navy to survey these waters held dangerous and profound consequences for civil-military relations.

[12] Ibid., 4427.

But Moody and Cannon's stand against the naval appropriation should not be construed as anti-imperialist sentiment on their part. When Moody invoked the specter of militarism, he was not also condemning the Navalism and imperialism of this era. Cannon and Moody, in fact, were staunch imperialists. In March 1898, Cannon had played an important role in passing the "Fifty-Million-Dollar-Bill," after President McKinley asked for his support in the House to provide emergency funds to bolster the American military as the United States moved toward war with Spain.[13] Cannon was an advocate of empire, though, not surprisingly, he often had reservations about its expense. Moody was also a central figure in the imperialist discourse. He had served on the Insular Affairs Committee and was close with the imperialist Senator Henry Cabot Lodge. In 1902, President Theodore Roosevelt would tap Moody to be Secretary of the Navy, a position that he held for two years. As Secretary, he proved to be an ardent proponent of the Navy, supporting, among other things, the General Board's aggressive battleship-building proposal of 1903, which called for the construction of forty-eight battleships by 1920.[14] Meanwhile, the supporters of the appropriation bill, consisting largely of members of the Naval Affairs Committee including Chairman Foss and Alston G. Dayton, Republican from West Virginia, were sympathetic to the Navy's agenda. The debate over the Naval Appropriation Bill was therefore not another round in the Congressional battle between imperialists and anti-imperialists. Rather, with both sides sympathetic to empire, it would be a debate over the extent of American imperialism. In

[13] David F. Trask, *The War with Spain in 1898* (New York: Macmillan Publishing Co., Inc., 1981), 33-34.

[14] Paul V. Heffron, "William H. Moody, 1 May 1902-30 June 1904," in *American Secretaries of the Navy*, vol. 1, ed. Paolo E. Coletta (Annapolis: Naval Institute Press, 1980), 461-65.

short, what did empire mean politically and legally, and how far did its meanings extend to the surrounding waters?

Foss, Dayton, and others countered Cannon and Moody's charges by arguing that the Navy had been surveying for much of the nineteenth century. To them, the contested appropriation was not really about creating another Coast Survey so much as continuing to fund work that the Navy had always done. It was work appropriate to the Navy as the nation's sea service. Foss offered a rejoinder. "Ever since the American Navy was established they have always made the ocean surveys," he reminded Moody. "Ever since the days of Old Jack Barry and Esek Hopkins and John Paul Jones, the American Navy, charged with the responsibility of conducting these ships over the ocean, have claimed the right to make the ocean surveys and of the isles in the ocean."[15] Here, Foss perhaps rewrote history. The American Navy, as it existed under law, did not go back to the Revolutionary days of Barry, Hopkins, and Jones, but his point stood nevertheless. Foss, like his opponent Moody, saw these hydrographic jurisdictions in quite definite terms. "We are not seeking to abolish the Coast and Geodetic Survey," he admitted, "all we are seeking to do is to hold the Coast and Geodetic Survey to the original jurisdiction which was given it under the revised Statutes at Large. What we are contending for," he concluded, "is the coast surveys of the islands of Cuba, Porto Rico, and the Philippine Islands—not for the coast survey of our own country. This is the Navy's jurisdiction."[16] Ocean surveys had been the Navy's domain from its beginning, and, in Foss' mind, it

[15] *Congressional Record*, 56th Congress, 1st Session, April 19, 1900, 4428.

[16] Ibid.

should remain so. As he had pointed out, the new empire consisted of “isles in the ocean.” It was difficult for him to imagine these waters as an American coast.

This discussion led naturally to questions about the efficiency of these two institutions with each side pointing to its favored institution’s long history in science and its distinguished record within its traditional hydrographic domain, while citing the other’s shortcomings. Foss and the Naval Affairs Committee went on the offensive, referring to the Coast Survey’s still unfinished survey of the American coast, to say nothing, they declared, of adding Alaska’s long coastline to its work. “I say to you,” Foss professed, “that with the present rate of rapidity of that Bureau a century after you and I are dead and gone they will still be working on Alaska.”[17] Dayton echoed Foss. “It has taken the Bureau ninety-three years to furnish us—what?” he asked.[18] Not only was the Coast Survey unfinished with its present work, but it wanted to expand, and so Foss and his colleagues leveled counter-charges of civilian encroachment on a purely military function. Congressman Albert S. Berry, Democrat from Kentucky, went so far as to invoke Alexander Hamilton’s leadership of the Treasury Department as the historical precedent for this most recent—and, in his mind, most insidious—expansion of civilian power.[19] As Foss and Dayton surely knew from their experience on Naval Affairs, the Navy needed surveys immediately for strategic purposes, and its ships were already operating in these waters. The Coast Survey, on the other hand, seemed ill-equipped to

[17] Ibid., 4430.

[18] Ibid., 4439.

[19] Ibid., 4432.

handle such an expansion of its duties, which these men interpreted as a dangerous expansion of civilian power.

But the Navy was not immune to similar charges of inefficiency. Congressmen could rightly question the Hydrographic Office on the basis of its own uneven record. Testifying before the Naval Affairs Committee in March as the debate opened on the House floor, Superintendent Pritchett questioned the Navy's commitment to original hydrographic research. The Navy simply had not surveyed or produced many charts of its own. Of the more than one thousand charts that the Hydrographic Office published at that time, Pritchett told the congressmen, nine hundred and fifty of them were reprints of foreign charts taken from the British Admiralty or the hydrographic bureaus of other nations. He charged that all the Navy's surveys since the Civil War had only produced 155 original charts. "That is," he stated dismissively, "most of their work has been reprinting."[20] It was a powerful indictment later echoed by Cannon and others on the House floor. Naval hydrography, punctuated here and there by extraordinarily productive and culturally powerful periods of research in hydrography and physical science, nevertheless had not been a prolific maker of original charts. Indeed, this was evident in the Navy's statutes themselves, which, prior to the Spanish-American War, had only sanctioned "special ocean surveys." Thus, there was some truth to the claim that the Coast Survey had been surveying more continuously and with more resolve than the Navy.

The old rivalries that had long split federal science thus resurfaced, calling into question the scientific expertise of naval officers, the practical experience of the Coast

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[20] "Statement of Mr. Henry S. Pritchett, Superintendent Coast and Geodetic Survey," Hearings before the Naval Affairs Committee, March 19, 1900.

Survey scientists, and the very methods used to represent the marine environment on the chart. Again, Moody leveled the initial charge. "Why, gentlemen, we must not expect these naval officers to devote their hours of retirement from active duty to work in which they have no interest and work for which they have no special fitness, but only the fitness that is possessed by well-educated, cultivated men."[21] Here, Moody referred to retired officers, which the Hydrographic Office had used to staff its branch offices. Moody personally expressed respect for the American naval officer whose military education had prepared him to command a warship, not, as Moody suggested, a surveying party. Leave that to men of science, he argued, trained specifically for the work, philosophically and professionally interested in it, and not subject to leaving it whenever a matter of greater military importance boiled up. Moody's creed was "every man to his own trade."[22] For Moody and Pritchett, this was a question of professionalism, reminiscent of that Bache and Henry leveled against Maury fifty years earlier. "It is the same old story of the expert professional against the amateur," Pritchett, an astronomer and future president of Massachusetts Institute of Technology, told the Naval Affairs Committee.[23] In this age of professionalization—and particularly in science—the naval officer seemed unqualified to undertake such specialized duty.

But naval officers claimed authority as well, arguing that they, more than scientists or engineers, made their life on the sea and were possessed of a particular understanding of what constituted a good nautical chart. Of course, the claim that naval

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[21] *Congressional Record*, 56th Congress, April 19, 1900, 4428.

[22] Ibid.

[23] "Statement of Mr. Henry S. Pritchett," Naval Affairs Committee, March 19, 1900.

officers did not make good surveyors was problematic since navigation was a fundamental part of their profession. Moreover, as numerous congressman pointed out, naval officers had done the hydrographic work of the Coast Survey for much of its existence. “We, who have to go to sea in the vessels, know the immeasurable value of accurate charts,” Commander Todd, the Hydrographer of the Navy, wrote to one of his subordinates.[24] As Todd’s commanding officer Rear Admiral Bradford put it, “the work is mainly of a nautical character, and the Navy is a nautical body.” Furthermore, Bradford concluded, “the experience gained will diffuse through the naval service a knowledge of the waters surveyed, which will act as a measure of security in the navigation of the vessels of the Navy.”[25] As Foss put it on the House floor, “when you expect [naval officers] to know every rock, and every reef, and every shoal . . . you ought to give them the right to make the surveys for the uncharted seas.”[26] Naval officers were not only proficient surveyors, these men argued, the whole process was central to the naval officer’s profession for navigation and for strategic reasons in time of war as well.

The dispute extended to the charts themselves as each side discredited the other’s method of representing the sea on paper. The Mercator projection was the cartographic standard—the method still used by the Hydrographic Office and, indeed, by most maritime nations. This projection went back to no less an authority than Gerardus Mercator himself, the sixteenth-century Flemish map-maker and the father of modern

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[24] C.C. Todd to Cameron McRae Winslow, Hydrographic Office, Washington, D.C., April 25, 1900, RG80, General Records of the Navy Department, General Correspondence, 1897-1915, Box 486, NARA.

[25] Royal B. Bradford, “Memorandum for the Secretary of the Navy in Relation to Ocean and Lake Surveys,” RG 80, General Records of the Navy Department, General Correspondence, 1897-1915, Box 487, NARA.

[26] *Congressional Record*, 56th Congress, April 19, 1900, 4442.

cartography.[27] On the House floor, Congressman Littlefield referred to the Mercator projection as "the law of the sea."[28] But the Coast and Geodetic Survey, whose scientists were ever mindful that the earth was spherical, published most of its charts on the polyconic projection, which took into consideration that the shortest distance between two points on a sphere was not a straight line, as on the Mercator chart, but a curved one. On a chart of large scale, like those most commonly used for coastal navigation, the difference between these two projections was almost indiscernible. At stake, though, was less geodetic fidelity than which projection best suited the mariner.[29] As Secretary of the Navy John D. Long wrote to Treasury Secretary Lyman G. Gage, the mariner did not care much about "the means for obtaining the utmost refinement of distance between two places separated by wide stretches of water."[30] By the spring of 1900, the Coast Survey had acquiesced and begun to publish its charts in both projections, grudgingly accepting the fact that what was more scientifically precise was not necessarily most useful or most popular. But the Survey's new Mercator charts, Todd claimed, were "wholly lacking in essential navigational features."[31] For various reasons, not least their sustained faith in Mercator, the Hydrographic Office continued to reap the benefits of the American mariner's favor. Here, then, was an old story renewed in the context of empire. The

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[27] See Nicholas Crane, *Mercator: The Man Who Mapped the Planet* (London: Phoenix, 2003).

[28] Ibid., 4434.

[29] See John Blake, "Cartography," in John B. Hattendorf, ed., *The Oxford Encyclopedia of Maritime History*, vol. 1 (New York: Oxford University Press, 2007), 362-64.

[30] John D. Long to Lyman G. Gage, Navy Department, Washington, D.C., January 2, 1900, RG 23, Records of the Coast and Geodetic Survey, "Superintendent's File," 1866-1910, Box 529, National Archives and Records Administration, College Park, MD.

[31] C.C. Todd to Royal B. Bradford, Hydrographic Office, Washington, D.C., April 10, 1900, RG 80, General Records of the Department of the Navy, General Correspondence, 1897-1915, Box 169, NARA.

Navy, whose officers were only part-time scientists at best, nevertheless enjoyed the support of a maritime world, which wanted charts it could easily use—like those that it had always used—and not necessarily those grounded in sound geodesy.

As this debate over the amendment to the Naval Appropriation Bill digressed toward a vote in the House on April 19, a number of Congressmen began to question the legal and political standing of the sea itself, which increasingly seemed to underscore the whole issue. At the close of the day's discussion, an exasperated Foss returned to the question with which he had begun. "Can not the work of the Coast and Geodetic Survey go on on the coast of this country, and can not the Navy look after the surveys of our insular possessions?" he asked. To him, the distinctions still seemed clear. But in his response, Congressmen John F. Shafroth, Republican from Colorado, muddied the waters: "The law is that each one has jurisdiction, and consequently we can not control where the Coast and Geodetic Survey shall work and where the Navy Department shall work." Congressmen Littlefield, of the Naval Affairs Committee, then took the question further. "You say that the law now authorizes the Coast and Geodetic Survey to go over this territory. Will you be kind enough to point out to the House the provision of the statute that authorizes them to survey the Philippine Archipelago?"[32] Indeed, there was no such provision explicitly stating this. The question remained, what did waters "under the jurisdiction of the United States" actually mean? The 1899 amendment to the Coast Survey's appropriation had been broad and unclear on this point. And so, at the end of the day on April 19, the question about the larger meaning of these waters first entered the debate as the subtext to the Naval Appropriations Bill.

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[32] *Congressional Record*, 56th Congress, April 19, 1900, 4443.

On May 4, the House again took up the question, and this time it was not so much an issue of money as it was an issue of the larger meaning of these waters to the United States in the context of empire. Foss and the Naval Affairs Committee, unable to sway the House from Cannon's influence the previous month, now moved to amend the Civil Appropriation Bill, not by cutting funds, but by striking the troublesome clause "and of coasts under the jurisdiction of the United States" from the Coast Survey's appropriation.[33] "Upon these words alone is based the authority of the Coast and Geodetic Survey for going out into the deep ocean waters and surveying, especially in the Philippines, in Porto Rico, and in Cuba," Dayton told the House. "This provision has widened their work," he continued "until it is impossible for them in an economical limit of time or with an economical amount of expense to furnish to the Navy and to the maritime establishments . . . proper and suitable charts."[34] Moody then picked up on the ambiguities as the House began to grapple with the meaning of the language. "It is a controversy that not unnaturally arises out of our present situation," Moody admitted, referring to the new imperatives of empire. He then attempted to clarify the matter. By coasts under the jurisdiction of the United States, Moody argued, it "had always been interpreted to mean coasts belonging to the United States wherever they might be situated." As the nation expanded over the continent during the nineteenth century, the Coast Survey's work had expanded with it. Moody put it bluntly. "Now, we got new territory last year," and he argued that tradition held that the Coast Survey should

[33] Ibid., May 4, 1900, 5134.

[34] Ibid., 5136.

follow.[35] The House defeated Dayton's amendment, and the clause stood. But the congressmen had begun to grapple with the larger issue at stake in this debate—how did the waters of the new territories fit into the established political and legal contexts of American territory?

Through the spring of 1900, as the Senate debated and then fully restored the Naval Appropriation Bill, Todd corresponded with officers in command of the branch hydrographic offices, urging them to appeal to maritime interests on the Navy's behalf. "Difficulties . . . may be expected, but surely will have to be met, when the bill goes to conference or is reported back to the House from the Senate as amended," Todd wrote to one of his branch officers.[36] On April 20, the day after the House had amended the naval appropriation, Todd sent a circular letter to the commanders of these branch offices to put pressure on the House.[37] In it, he listed the members of the Appropriations Committee and ordered his subordinates to use their associations with chambers of commerce and maritime exchanges around the nation to write to their congressmen, urging the House to accept the Senate's version of the bill. He cautioned them to "exercise the greatest care and discretion," since they would, under his orders, be violating Navy regulations in soliciting to influence congressional legislation. As Todd said, these officers would be writing "in the interests of commerce" and "in the interests of our naval vessels that are endangered in the absence of correct charts." He told them that it was "of the gravest

[35] Ibid., 5137.

[36] C.C. Todd to The Officer in Charge, Branch Hydrographic Office, Chicago, Ill., Hydrographic Office, Washington, D.C., March 12, 1900, RG 37, Records of the Hydrographic Office, Correspondence, 1885-1924, Entry 32, Letters Sent and Received, Feb. 1885-Dec. 1901, Box 127, NARA.

[37] C.C. Todd, "Circular Letter to the Branch Hydrographic Offices," Hydrographic Office, Washington, D.C., April 20, 1900, RG 37, Records of the Hydrographic Office, Correspondence, 1885-1924, Entry 32, Letters Sent and Received, Feb. 1885-Dec. 1901, Box 129, NARA.

importance to the future of the fleet and the merchant marine."[38] Here, then, were the two great interests—commercial and naval—that had animated the Navy's hydrographic work for much of the previous century. Todd drew on both in hopes of convincing the House that naval hydrography was worth sustaining.

The Hydrographic Office enjoyed broad support in the Senate, which restored the Navy's appropriation to one hundred thousand dollars, echoing Foss and Dayton's contention that an expansion of the Coast Survey was a usurpation of the Navy's traditional domain. Senator Henry Cabot Lodge, Republican from Massachusetts, was the Hydrographic Office's champion in the upper house. He had read letters from various maritime interests in support of the Navy like that of the American-Hawaii Steamship Company, telling him, "we believe that these new possessions would be more suitable and efficiently surveyed by the Hydrographic Office of the Navy Department than by the Coast and Geodetic Survey."[39] Lodge told the Senate, "I think nothing more mischievous could possibly be done than that which is proposed by the House Committee. It is an attempt to take from the Navy its hydrographic surveys and throw them into the Coast Survey, building up another great department with . . . another little navy."[40] The Senate would not compromise, and so the bill went back to the House with its funding largely restored. A flood of private letters, all similarly phrased, also accompanied the Senate's rebuke, urging Cannon and his colleagues to pass the bill as restored by the Senate.

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[38] Ibid.

[39] H.E.D. Jackson to Henry C. Lodge, American-Hawaii Steamship Company, New York, NY, April 28, 1900 in *Congressional Record*, 56th Congress, June 7, 1900, 6872.

[40] *Congressional Record*, 56th Congress, June 1, 1900, 6359.

As Cannon investigated these suspicious letters, he turned his attention on the House floor to the aspect of the bill that most irked him, the inclusion of the word "hydrographic" as indicative of the kind of work the Hydrographic Office could do. On June 6, as the House considered the outcome of the conference committee, Cannon first raised the implications of that word. "Now, I want to say that the words 'hydrographic surveys' include every water course that is navigable, fresh or salt, deep sea or coast, on earth." Cannon wanted this language stricken from the whole appropriation. So important was this word, in fact, that the House cited Noah Webster to insure that its meaning was clearly understood. "Will the gentleman let me give him the definition of "hydrographic" as given by Webster?" inquired Congressman Theodore F. Kluttz, a Democrat from South Carolina. Cannon assented. Thumbing through a copy of the dictionary, Kluttz came to the problematic term. "Hydrography," he read "—the science and art of determining and making known the conditions of navigable waters, whether ocean or inland, charting the coasts and rivers, determining the depths, the quality of the bottom, the time of the tides, and measuring the currents." Satisfied, Cannon replied, "certainly. That is Webster," Kluttz closed the book.[41] Perhaps this seemed a trifling matter, but it nevertheless speaks to the growing centrality of language to this debate, and the increasing sense that hydrography was an ambiguous term that could be construed to sanction all manner of ocean surveys.

But on the sixth, Cannon also entered the House chamber for renewed debate incensed by the curiously-written letters he and his colleagues on the Appropriations Committee had received from maritime interests all over the nation. To Cannon, it again

[41] Ibid., June 6, 1900, 6849.

smacked of militarism—of a dangerously cavalier Navy that not only intended to expand its domain over American coastal waters, but also over the civilian process charged with determining the whole question. The debate on this day and on the next was the climax of the Appropriation Bill and, indeed, the first session of the Fifty-Sixth Congress as well. It displayed the fiery Cannon in his element. Referring to an earlier speech by Moody, Cannon warmed to his subject. "It was a contest to determine whether this House, the representatives close to the people, was stronger than a few men connected with the Navy and in bureau positions in the Navy Department," he declared. "Now, I will give you, in substance, proof of it." With loosed tie and rolled sleeves, Cannon recounted his suspicion of the letters he and his colleagues had received, as if from "some central intelligence." When Cannon had broached the matter with Long, the secretary cleared the Navy of any collusion, trusting in Todd and Bradford's insistence that they had no records of the letters. Cannon, however, continued to press until he had obtained a copy of Todd's Circular Letter of April 20. Long, seeking to avoid any further embarrassment, then suspended Todd from duty. "There was nothing! nothing! nothing!," Cannon told the House, referring to his correspondence with the Navy Department. "I knew that was a falsehood in substance, if not in letter."[42] Cannon and his colleagues, smarting at the Navy's insubordination and at the Senate's refusal to acquiesce on the appropriation, resolved to form another conference committee, which would stand firm on the issue and drive the debate to the very end of the congressional session, which concluded the following day, June 7.[43]

[42] Ibid.

[43] See Manning, *U.S. Coast Survey vs. Naval Hydrographic Office*, 143-51.

By this time, the Naval Appropriations Bill, which did not commonly transcend the drudgery bureaucratic wrangling, had caught the attention of the American press. Stories from all the major American newspapers seized the occasion to recount Cannon in his element as he railed against the Navy in the interests of government economy. Cannon had always been a polarizing figure, and his animated, backwoods idiosyncrasies often made for good press. The newspapers had framed the debate as Cannon's personal fight, equating the outcome of each day as an explicit referendum on his power in the House. The press largely interpreted the April 19 vote to amend the naval appropriation as a victory for Cannon. "'Uncle Joe' Cannon unbuckled his armor late yesterday," *The Washington Post* reported on April 20, "added two notches to his record of legislative victories" and "established more firmly his reputation as a leader in the House."[44] *The Chicago Daily Tribune* was less sanguine. Of the June 6 debate, the paper blamed Cannon for reviving an issue that seemed "almost trivial," and criticized the House as a "patient" in a "comatose condition" as the Congressional session digressed into its last day. "The unexpected adjournment" on the evening of the sixth "was a wonderful testimonial to the personal power over the House of Mr. Cannon."[45] The prospect of an extended session caught the press and the public's attention. The debate, often lifted word for word from *The Congressional Record*, gave the public a sense of the tenor of the issue and the ways the House was struggling to come to terms with the vexing question of American territorial waters.

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[44] "Cuts the Cost in Two," *The Washington Post*, April 20, 1900.

[45] "Cannon Holds Congress Over," *The Chicago Daily Tribune*, June 7, 1900.

The stage was thus set for the final, decisive debate in which the House would attempt to agree on the political and legal meaning of American territorial waters. The first conference committee had returned to the House with some concessions from the Senate, namely, that the appropriation would no longer cover lake surveys, which, in any case, was largely the responsibility of the Army. The conference committee also conceded that the money for the Navy's remaining ocean surveys be readjusted to fifty thousand dollars. But this had not satisfied Cannon, who held firm on the wording, wanting no reference to the word "hydrographic." Once again, the House debate degenerated into a parsing of language, indicative of the larger issues at stake in legislating hydrographic jurisdictions in the new territories.

On the seventh, Cannon, desirous of a compromise before the end of the session that also gave him what he wanted, offered a new amendment to the bill that permitted the Navy to survey waters adjacent to the American territories, but not the coasts themselves. The new amendment read, "for ocean surveys, including the waters of Cuba and the Philippine Archipelago, but not the coast thereof."[46] As his confused colleagues in the House observed, it was an absurd amendment, both precise in its language and maddeningly unclear in its intent. Congressman William W. Grout, Republican from Vermont, immediately grasped the significance of the ambiguity. "I suppose that the clause prohibiting the survey of these coasts of those possessions has been inserted because their status is not yet definitely ascertained. Some say that they belong to the United States, and that the Constitution goes there by its own force, while others say the

[46] *Congressional Record*, 56th Congress, June 7, 1900, 6880.

contrary. It is for that reason, I presume, that the exception is made."[47] Cannon nodded. But the amendment itself was murkier than the waters themselves. What had Cannon meant by waters of Cuba and the Philippines, if not "the coast thereof?" Where did the boundary between the Hydrographic Office and the Coast Survey, between territorial and foreign waters, lie? Cannon had offered a new, if confusing, definition of what the sea might mean, and the broader significance of it was not lost on the House.

The congressmen then dug into the meanings implicit in Cannon's new amendment. "What is the meaning of the exception which the words imply 'or coasts thereof?'" asked David A. De Armond, a Democrat from Missouri. Cannon attempted to clarify, arguing that whether or not the coasts of Cuba or the Philippines were American territorial waters, his amendment would bar the Navy from them while allowing it to chart the shallows up to twenty leagues from the coast. "Gentlemen I am sure will agree," Cannon explained, "that Cuba is not a part of the United States. Some perhaps think so. I do not say they are. Others are under the impression that the Philippine Islands are not part of the United States. Others think that they are, but ought not to be; others say they are and ought to be. There is a manifest difference of opinion on that question." He was, of course, hinting at the confused status of these new territories, for which the United States had not set up a comprehensive political framework. The meaning of these coastal waters remained equally unclear. "I wanted to know where ocean surveys might be made properly," William P. Hepburn, Republican from Iowa, interjected. Referring to the waters of Cuba and the Philippines, Hepburn continued, "under the provision for 'ocean

[47] Ibid., 6881.

surveys,' surveys might be made in those waters."[48] No, Cannon replied, not inside twenty leagues. "But under your resolution [naval ships] are not permitted to make surveys of the coast," Hepburn pressed. "This provision lets them go inside the Philippines," Cannon responded. "But not the coasts?" Hepburn asked. "Up to the coast," answered Cannon.[49] The exchange testified to the difficulties inherent in this debate. These waters were full of imprecise meanings and fraught with political motives. "I think at least some members of the House do not clearly understand what is meant by the proposition of this committee," Robert B. Hawley, Republican from Texas, observed. "I desire to make it plain whether this amendment means that shoal water at the coast carries with it the survey of the bays and landlocked harbors in the Philippines and the island of Cuba."[50] Cannon's amendment to the bill seemed to both allow and bar the Navy from charting these coastal waters, to say nothing of the new questions about what coastal waters now meant—twenty leagues? shoals? shallows? territorial waters? No one but Cannon seemed to know, and even he could not articulate its meaning in a comprehensible way. Pressed by the House to revise the amended bill as Congress waited to adjourn, Cannon could only offer a more confusing and contradictory solution.

Congressman Foss, who had remained silent through the day's debate, now stood to make a revealing statement that cut to the crux of the imperial question and the implications of Cannon's various amendments. Foss believed that the debate should turn on the question of empire—not whether the United States should have one, but to what

[48] Ibid.

[49] Ibid., 6882.

[50] Ibid., 6883.

extent it should be incorporated into the territory of the United States. "I want a military government maintained there for the present," Foss declared, referring to the Philippines. "I am surprised at gentlemen on the other side of the House who are against the retention of the Philippines and fight "expansion" so vigorously, who do not believe that the civil government can go over there, and yet are voting for a proposition to extend the Coast and Geodetic Survey across the seas into those far-away regions." Assenting to the Coast Survey's jurisdiction in Philippine coastal waters, according to Foss, would acknowledge that the Philippines were inseparably a part of the United States. As Foss acknowledged, the implications could well be profound:

> That means, Mr. Speaker, if you send your Coast and Geodetic fleet over there to make these surveys, it will be followed by other departments of the Government in order. It will be but a short time before the Geological Survey will go; the Land Office will go, and you will find every branch of the civil government as it is organized here gradually extending itself into the Philippine Islands. Now, I ask how gentlemen on the other side of the House can reconcile themselves to that condition of affairs? I ask how they, holding the views they do, can vote for a proposition like this? I would like to have them explain that question.[51]

Foss had confronted the House with the true significance of the appropriations debate. Begun as a straightforward conflict of fiscal responsibility and bureaucratic infighting, the issue had grown into a critical question of empire—one in which territorial waters and control of the sea now figured importantly. Moody, who had, in the beginning, prefaced the debate by saying that much of significance was wrapped up in the Naval Appropriation Bill of 1901 was more prescient than he knew. Permitting the Coast Survey to chart these waters committed the United States, as far as Foss was concerned, to a definition of these islands as a civil extension of the United States. Civil government led inexorably to a permanent American empire that at least some members of Congress

[51] Ibid., 6884.

were unwilling to sanction. Annexation had, in fact, not settled the imperial question, rather it had raised difficult new ones.

Then, in a curious turn that held much underlying significance, the House voted to restore the full one hundred thousand dollar appropriation to the Hydrographic Office before deciding on Cannon's new amendment. Having endured hours of endless discussion through the spring of 1900, numerous amendments, conference committees, bureaucratic charges and counter-charges, the parsing of words, and the ultimate ambiguity of the whole debate, the House voted by a margin of 118 to 96 to pass the Naval Appropriations Bill as originally conceived.[52] On the same day, June 7, Acting Secretary of the Navy Frank Hackett reinstated Todd at the Hydrographic Office, clearing him of any wrongdoing in the matter of the circular letter.[53] Alongside the Coast Survey, the Hydrographic Office continued to survey the waters of the new American empire. Foss had made a compelling argument. The House, with its back against the wall of a closing session and swayed by Cannon's inability to come to a comprehensible compromise, restored the Hydrogaphic Office's funding.

Cannon had apparently overstepped his bounds. In calling for this second conference committee, which came back to the House with an amendment of incomprehensible contradictions, and in threatening to hold Congress into its summer holiday over a disagreement of ninety thousand dollars, Cannon lost the critical following he had gained in April. As *The Los Angeles Times* observed, "over night the sentiment of

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[52] Ibid.

[53] See "Commander Todd's Case," *The Washington Times*, June 8, 1900.

the House underwent a complete change."[54] To headlines reading "Defeat of Uncle Joe" and "Cannon Beaten; Congress Ends," the press spun the vote as a singular loss for the would-be Speaker.[55] "During the night the members of the House had an opportunity for reflection, and the result was in every way disastrous to Mr. Cannon," *The Chicago Daily Tribune* reported. The House, it continued, had "administered a disastrous blow to Uncle Joe's reputation as a leader."[56] Clearly, the sting of this defeat did not hinder Cannon's ultimate assumption of the Speakership, but it did preface the heavy-handedness with which Cannon would rule the House from 1903 to 1911 and which ultimately led to his defeat. For the moment, however, the press interpreted the vote as a blow to Cannon and a victory for the Navy.

The press, which had altogether latched onto this climactic drama during the first week of June, framed the debate largely as Cannon's fight or as a personal rivalry between "Uncle Joe" and Foss, but it was much more. Cannon's arguments during the debate over the Naval Appropriations Bill were commensurate with his staunch defense of fiscal conservatism and his intent to maintain the interests of good economy over the interests of the Naval Affairs Committee. Foss' final stand, in which he invoked the prospect of civil administration in the Philippines, is more revealing. It remains difficult to understand the individual motives behind the House's vote. The issue transcended party affiliation and geographic region. It is unknown whether Foss' appeal to House Democrats suspicious of American expansion actually swayed any votes, but he made the

[54] "End of Session," *The Los Angeles Times*, June 8, 1900.

[55] "Defeat of Uncle Joe," *The Washington Post*, June 8, 1900; "Cannon Beaten; Congress Ends," *The Chicago Daily Tribune*, June 8, 1900.

[56] Ibid.

connection to the larger debate over empire at a critical moment in the House's deliberations. Foss, of course, was no anti-imperialist, but he nevertheless managed to strike common ground with them by applying the specter of a permanent empire to the nation's territorial waters. The House's reversal, of course, was also motivated by Cannon's unchecked influence and, more importantly, the House's inability to come to an understanding about what exactly constituted territorial waters. Asked to legislate the boundaries of the American empire on land and at sea, the House demurred, unable to come to a definite conclusion.

Another factor perhaps assuaged those Congressmen who had found it so difficult to accept dual hydrographic jurisdictions over the same territorial waters—that is, the sea itself. As both sides charged, neither the Coast Survey nor the Hydrographic Office had been particularly thorough in finishing the hydrographic work already set before them. The debate had repeatedly, albeit subtly, touched on the great challenge with which hydrographers had struggled since the beginning of the century. This was the vastness and dynamism of the sea. As Pritchett told the members of the Appropriations Committee, the Navy's claim that it could complete the survey of the Philippines in ten years was a ridiculous proposition. At the same time, he addressed criticisms against his own office. "The resurvey of our long coastline . . . will never be finished," he concluded. "Is it not true," Cannon had asked him, "that from the trenching of the ocean upon the land and the land upon the ocean, and the actions of currents, and the improvements of rivers and harbors, and variations in tides, and many other forces artificially or naturally require that this work should go on as long as those forces operate?" Pritchett responded, “Unquestionably.”[57] The state of hydrography was, by nature, always unfinished. As the setting and, indeed, an active agent in the course of maritime commerce and naval operations, the sea was an ever-changing environment that flouted the hydrographer and the nautical chart’s attempts to keep pace with it. This work, as always, was an extraordinary undertaking for any two organizations, let alone one. The Hydrographic Office and the Coast Survey thus proceeded, however inefficiently, to chart common waters. Asked by Dayton before the Naval Affairs Committee in 1902 whether there was “any conflict now existing” between the two hydrographic institutions, Rear Admiral Bradford replied no. “There is plenty of work for both, and will be for years to come?” Dayton pressed. “Yes,” Bradford answered.[58]

Surveying and charting the sea was thus an important activity that had animated the Navy for much of the nineteenth century, coming to an acrimonious climax in the House of Representatives in the spring of 1900. Many of the arguments that framed the debate drew on issues that had long informed the history of hydrography in the United States. Empire, however, had imparted them with new meaning. Always, the question remained how to control the sea and who would control the sea. Perhaps the sea was uncontrollable, subject only to its own agency. These were questions that united sometimes disparate strands of American hydrography, and they were central to the American navy and the nation during the nineteenth century. By 1900, the sea, for various economic, political, scientific, technological, cultural, and strategic reasons, had a

[57] Statement of Henry S. Pritchett, “Efforts Made by the Navy Department to Obtain Control of the United States Coast and Geodetic Survey, April 1900, RG 23, Records of The Coast and Geodetic Survey, “Superintendent’s File,” 1866-1910, Box 529.

[58] “Statement of Rear Admiral R. B. Bradford,” Hearings before the Naval Affairs Committee, December 6, 1902.

firm place in the American imagination. The coasts of the empire had become an American domain, however ill-defined. But, faced with legislating precisely what sort of American space these waters were—civilian or military, territorial or foreign—Congress had balked. The House's collective indecision is perhaps more instructive than the individual opinions of each congressman. These waters, while in various ways American, were nevertheless fraught with contested meaning. Ultimately, Congress could not make a distinction, and thus these waters continued to exist in ill-defined terms. It was indicative of the complex and conflicted relationship that the United States had with its empire. And so the Navy and the nation opened the twentieth century, intent on controlling the great common with its charts and its battleships, but uncertain and uncommitted as to precisely how, or to what extent, that should be done.

CHAPTER 8: EPILOGUE – STEINBECK, RICKETTS, AND THE TWENTIETH CENTURY

> The maps of the region were self-possessed and confident about headlands, coastlines, and depth, but at the edge of the Coast they become apologetic—laid in lagoons with dotted lines, supposed and presumed their boundaries.
>
> -John Steinbeck and Ed Ricketts, *The Log from the Sea of Cortez*, 1941[1]

There is a story—perhaps partly apocryphal, but probably not—about the writer John Steinbeck and his friend, the marine biologist Ed Ricketts. As Steinbeck wrote in his memorial following Ricketts' death, the two had just returned from a scientific research trip to the Gulf of California that formed the narrative for Steinbeck's *The Log from the Sea of Cortez*. It was early 1942. The Japanese had attacked Pearl Harbor, and the United States was at war. In preparing their research findings and attempting to put their work in the context of the broader marine biology of the Pacific Ocean, Steinbeck and Ricketts had come across a number of scientific monographs written by Japanese scientists. Steinbeck surmised that they had been commissioned by Tokyo to study the islands administered by Japan as League of Nations mandates after Germany lost the Great War. As "good scientists and specialists," these Japanese had published their secret research as academic studies available, presumably, to their "friends all over the world who would appreciate and applaud their work in pure science." To Steinbeck and Ricketts' astonishment, they had stumbled upon hydrographic and zoological studies of the littoral waters of Japanese-held Pacific islands, which were now of the utmost strategic importance to the United States military for its pending amphibious counter-offensive

[1] John Steinbeck, *The Log from the Sea of Cortez* (New York: Penguin Books, 1995), 5.

across the Central Pacific. What followed, as Steinbeck recalled, was "truly comic opera."[2]

Aware of the probable import of their discovery, Steinbeck wrote Secretary of the Navy Frank Knox. "It is not generally known," Steinbeck told Knox, "that the most complete topographical as well as faunal information about any given area is found in the zoological and ecological reports of scientists investigating the region."[3] Soon thereafter, a lieutenant commander from the Office of Naval Intelligence appeared at Ricketts' Pacific Biological Laboratories along Monterrey's Cannery Row to investigate. Presented with the monographs, the naval officer was skeptical. "Do you speak or read Japanese?" the officer asked Ricketts. No, he replied. "Does your partner speak or read Japanese?" Again, he answered no. "Only then," Steinbeck wrote, "did Ed understand him." The naval officer could hardly believe that such studies would be written in English, not Japanese. The former, of course, was the international language of science, and so it was only natural that these Japanese scientists wrote in English. "This thought, Ed said, really made quite a struggle to get in, but it failed." The officer promised, "you will hear from us."[4] But they never did. As Steinbeck quipped:

> I have always wondered whether they had the information or got it. I wonder whether some of the soldiers whose landing craft grounded a quarter of a mile from the beach and who had to wade ashore under fire had the feeling that bottom and tidal range either were not known or ignored. I don't know. Thus was our impertinent attempt to change the techniques of warfare put in its place. But we won.[5]

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[2] Steinbeck's account can be found in "Appendix: About Ed Ricketts" in Steinbeck, *The Log from the Sea of Cortez*, 267-71.

[3] Steinbeck to Frank Knox, Palisades, California, May 5, 1942 in Elaine Steinbeck and Robert Wallsten, eds., *Steinbeck: A Life in Letters* (New York: Penguin Books, 1976), 246-47.

[4] There is no record of this meeting in the correspondence of Record Group 38, Records of the Office of Naval Intelligence, National Archives and Records Administration, College Park, MD.

[5] Steinbeck, *The Log from the Sea of Cortez*, 269-71.

Perhaps Steinbeck intended to say that the United States won the Pacific War without accurately knowing the hydrography of so many Pacific islands. Or perhaps he had meant to say that he and Ricketts had been validated when the Marines met folly, and near disaster, on the coral reefs of Tarawa atoll. The United States took the atoll from the Japanese in November 1943 with a loss of more than one thousand American dead, many of whom never reached the beach.[6] Or perhaps Steinbeck's summative had a double meaning. Whatever the case, he and Ricketts' brief encounter with Naval Intelligence speaks to the continued—indeed, the expanded—importance of hydrography and the sea in the context of twentieth-century warfare, and the ongoing challenges that the Navy experienced in understanding and thinking about the marine environment for strategic purposes.

For American naval hydrography, the twentieth century perhaps began after 1903. In that year, Bradford left the General Board and his position as chief of the Bureau of Equipment for command at sea. The *Yankton*, *Eagle*, and *Vixen*, which had surveyed Cuba and Puerto Rico every winter since 1899 ended their hydrographic work, Cuba gained nominal independence, and the General Board's debate over naval bases, so vigorous since 1900, largely gave way to other matters. America's brief, vigorous period of imperial expansion had, by and large, come to an end.[7] But the empire remained, and the United States, as evinced by the House debate of 1900, was unsure exactly how to make sense of it, to say nothing of administration and defense. In the first decade of the

[6] Tarawa was, in fact, not a Japanese mandate, but a British possession prior to the Japanese occupation.

[7] The United States acquired the Danish West Indies, the modern-day United States Virgin Islands, in 1916.

twentieth century, a tight-fisted Congress refused to appropriate money sufficient for the construction and defense of bases at Guantánamo and Subig bays. By 1908, Admiral George Dewey had grudgingly accepted a Joint Army-Navy Board decision echoing the Army's claim that Subig's topography made the base indefensible from land attack. Despite Dewey's strident appeals to the Secretary of the Navy concerning Subig's importance in this era, the strategic situation was rapidly changing. An emergent Japan, victorious in its war with Russia in 1905, became an imminent threat to the United States in the Pacific.[8] As historian Edward S. Miller has written, "In less than a decade, U.S. strategists had retreated from seeing their nation as the firm guarantor of China to a nebulous restraining force that Japan would assail someday to unblock its ambitions." By the 1920s, American military planners had codified this threat as War Plan Orange, a contingency for war with Japan, in which the United States reoriented its military strength in the Pacific to Hawaii. Under this plan, American forces in the Philippines—now only an outpost of the empire—would hold off the Japanese and await the American battle fleet's sortie from the Atlantic, through the Panama Canal, in a trans-Pacific campaign to relieve the islands.[9] Through the 1920s and 1930s, isolationism, international naval disarmament, and economic depression all continued a process in

[8] See William R. Braisted, *The United States Navy in the Pacific, 1897-1909* (Austin: University of Texas Press, 1958), 121, 174-180; Braisted, "The United States Navy's Dilemma in the Pacific, 1906-1909" *The Pacific Historical Review* 26 (August 1957), 235-44; Braisted, "The Philippine Naval Base Problem, 1898-1909," *The Mississippi Valley Historical Review* 41 (June 1954): 21-40; Richard D. Challener, *Admirals, Generals, and American Foreign Policy, 1898-1914* (Princeton: Princeton University Press, 1973), 233-42; Seward W. Livermore, "American Naval-Base Policy in the Far East" *The Pacific Historical Review* 13 (June 1944), 130-32; Rear-Admiral George W. Melville, "The Important Elements in Naval Conflicts" *Annals of the American Academy of Political and Social Science* 26 (July 1905), 130-31.

[9] Edward S. Miller, *War Plan Orange: The U.S. Strategy to Defeat Japan, 1897-1945* (Annapolis: Naval Institute Press, 1991), 25.

which the United States retrenched from the expansive vision of empire articulated in the first years of the new century.

American naval hydrography, so closely tied to the imperial discourse from 1898 to 1903, faded accordingly. To be sure, naval surveyors continued, alongside the Coast and Geodetic Survey, to chart the coasts of the empire, and to provide the charts and Sailing Directions fundamental to naval and commercial navigation. But absent any pressing strategic need and without the vision and leadership of a Maury or Bradford, hydrography once again receded from the forefront of naval affairs. Chronically underfunded and understaffed, the Hydrographic Office entered the Great War under much the same circumstances as previous conflicts.[10] The Great War, like wars past, once again put great demands on the Office to supply charts to the fleet. But more importantly, the war also expanded the scope and dimensions of the Navy's hydrographic interest. Combat in different and often unforeseen marine environments, of course, was not new to the Navy. But technological and doctrinal changes opened vast new vistas for inquiry, which was perhaps hydrography's most enduring theme during the twentieth century.

For the U.S. Navy—and the Royal Navy as well—the Great War defied prewar expectations by demonstrating the tactical and strategic importance of the submarine as opposed to the highly anticipated fleet engagement of battleships. Despite the Battle of Jutland, and various lesser battles between capital ships, German U-boats nearly defeated Great Britain. In the process, they necessitated technological innovations and opened new dimensions of naval warfare that would have profound impacts on hydrography and marine science for the rest of the century and beyond. As Chapter Five has shown, after

[10] See Marc I. Pinsel, *150 Years of Service on the Seas: A Pictorial History of the U.S. Navy's Oceanographic Office from 1830 to 1950* (Washington, D.C.: Government Printing Office, 1982), 54

the war with Spain American naval officers began to view the marine environment through a new strategic lens. It was a change precipitated by the imperatives of empire and the course of study at the Naval War College where officers used and re-envisioned nautical charts as part of their strategic studies. But the Great War posed ambiguous lessons for these officers who had so long sought and prepared for a fleet engagement in their war games. Though these and succeeding generations of officers never completely abandoned the dominant battleship-driven vision of naval warfare, the anticipated fleet action never quite materialized, and thus they were not able to put their tactical and strategic thinking into practice.

Among the most important results of the Great War, the U.S. Navy renewed its relationship with civilian science and demonstrated a growing commitment to oceanography. As naval historian Gary Weir has shown, this was a consequence of submarine warfare, technological innovation, and different, but increasingly convergent interests between the Navy and civilian oceanographers after 1918. Seizing mutual benefits, the Navy and scientists from the National Academy of Sciences and the National Research Council forged a collaboration united by the possibilities of the Sonic Depth Finder, a wartime anti-submarine innovation turned peacetime oceanographic tool. As Weir suggests, the SDF presented unprecedented possibilities for charting and understanding the deep sea environment.[11] This new relationship, of course, did not emerge without difficulties, partly, Weir argues, as a consequence of the inherent differences of naval and scientific cultures.[12] But it proved an important collaboration

[11] Gary Weir, *An Ocean in Common: American Naval Officers, Scientists, and the Ocean Environment* (College Station: Texas A&M University Press, 2001), 30-31.

[12] Ibid., 78-97.

that continued to grow as the Second World War and the Cold War increasingly demonstrated oceanography's tactical and strategic relevance to the Navy's operations.

But in 1941, this relationship remained only partly realized, and so the Navy, as in the past, entered the Second World War hydrographically unprepared to wage a global naval war in which submarines and the new doctrine of amphibious warfare opened new marine environments to naval operations. As the United States retreated from its most expansive visions of empire, Japan extended its own—first into the Central Pacific where it administered previously German-held islands as League of Nations mandates, and then into Manchuria and Southeast Asia. While Tarawa had not actually been a Japanese mandate as Steinbeck suggested, the fact remained that the United States military knew little about the hydrography of the islands now firmly in the sights of the American island-hopping campaign through the Central Pacific. The amphibious landings required to take these places brought Marines and soldiers from deep water across the littoral quite literally up to the beach and thus pointed to the necessity of charting this complex and dynamic environment in more depth than ever before.

Nowhere was this more horrifically demonstrated than the invasion of Tarawa atoll in November 1943, in which hydrographic knowledge was vague and American planners misinterpreted the complexity of the atoll's tidal cycle. The American Fifth Fleet arrived in the Gilbert Islands with a chart constructed by Lieutenant Charles Wilkes and the United States Exploring Expedition more than one hundred years earlier. Amended with some minor revisions by the British Admiralty, the chart remained otherwise unchanged since the 1841 survey. For all Wilkes' commitment to the precision of the trigonometric survey, he had set Tarawa nine degrees off its true axis. The

Americans quickly rectified the error, but they could not ultimately solve Tarawa's enigmatic tide—the key to a successful amphibious landing in which American amphtracs and Higgins Boats needed high water to clear the reef and proceed to the beach. Tarawa's "dodging tide," a cycle that hydrographers could not accurately predict, did not rise as anticipated. At Red 1, one of the three landing beaches, the Second Marine Division encountered a wide reef, and many abandoned their amphtracs as Japanese coast defense guns, anti-boat guns, mortars, and rifle fire rendered the boats untenable. The Americans secured the island after a bloody four-day fight. Superior numbers and American resolution in the face of a stubborn Japanese defense ultimately overcame the hydrographic debacle. In naval historian Samuel Eliot Morison's official assessment, "ignorance of how to tackle a strongly defended coral atoll surrounded by a fringing reef was responsible for most of the errors."[13] The tide, he argued, had been an "unavoidable bad guess." Steinbeck and Ricketts—and perhaps the 2nd Marine Division as well—were left to wonder whether the Navy had ever considered the hydrography of the Pacific. Tarawa had demonstrated this once again to be a strategic issue and a necessary prerequisite to future amphibious operations.

The Second World War was another watershed moment for naval hydrography, expanding the Hydrographic Office's staff and scope, demonstrating its centrality to naval operations, assuring hydrography's permanence within the fleet, and cementing its relationship with civilian oceanography. As Rear Admiral R.O. Glover wrote after the war, "With few accurate facts to go on, and information sometimes almost one hundred years old, it was necessary to go out and collect basic information about the areas before

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[13] Samuel Eliot Morison, *History of United States Naval Operations in World War II*, vol. 7 (Edison, NJ: Castle Books, 2001), 151-54, 182-83.

the construction of the new and complicated types of charts demanded by the precision accuracy of modern warfare could be accomplished." It was an extraordinary hydrographic effort that reflected the myriad new ways that the United States military attempted to extend control over the sea. In addition to the traditional hydrographic charts, the Navy constructed Combat Charts, "made," Glover related, "for use in direct attack on the enemy." The Navy also made Approach Charts for the bombardment fleet, whose vessels presaged amphibious landings by moving close to shore to knock out enemy defensive positions. War in the air, too, demanded a re-orientiation of hydrography to represent the marine environment in the small scales demanded by the longest bomber missions and with the kind of precision that airmen navigators could use to direct and deliver their destructive payloads.[14] The Second World War demonstrated the strategic importance of naval warfare in three dimensions, requiring an unprecedented hydrographic effort.

To meet these needs, naval hydrography expanded from the beaches of enemy-held islands to the fleet itself and the Hydrographic Office in Washington. The Hydrographic Office became "a chart factory," constructing charts from surveys in the field in a matter of weeks. The staff, working twenty-four hours a day in three shifts, for the first time included Women Accepted for Volunteer Emergency Service (WAVES).[15] At sea, the hydrographic fleet enlarged considerably, from two vessels in the interwar period to as many as twenty. The Navy conducted preliminary surveys of enemy held islands prior to invasion, in which hydrographic teams established baselines and erected

[14] See Rear Admiral R.O. Glover, "'Hydro' Charts a War," *United States Naval Institute Proceedings* 73 (January 1947), 27-37.

[15] Pinsel, *150 Years of Service on the Sea*, 59.

signals amid enemy fire. USS *Sumner*, the hydrographic command post of the Iwo Jima operation, carried printing presses on board so that charts could be constructed and disseminated rapidly from the fleet itself.[16] All this was indicative of hydrography's centrality to the naval campaigns of the Second World War, and the necessity of understanding new marine environments over vast ocean spaces and with unprecedented precision.

In no other aspect of naval warfare was this truer than submarines whose centrality to American strategy only grew in the postwar era. "The nuclear submarine has placed nautical chart requirements in a different and larger arena," Commander Scott Drummond, a hydrographic officer attached to the Pacific Fleet, wrote in 1970. "The need for detailed charts of the oceans, depicting the dangers to surface and subsurface navigation, now include the vast open ocean areas as well as the coastal areas and ports." Captain Robert P. Smyth, commanding officer of the survey vessel *Tanner*, likened submarine navigation to a "pilot being forced to fly at a low altitude, blindfolded, through the Rocky Mountains." Whereas the dangers to marine navigation had previously been confined largely to shallow waters in which natural hazards were most common, submarine operations opened the entire ocean, in all its depth and breadth, to study. Indeed, these hydrographic considerations were so vast that they easily exceeded the Navy's postwar surveying fleet, which initially consisted of only two vessels—the *Tanner* and the aptly-named *Maury*. "Estimates recognize that only 5 to 15 per cent of the oceans have been adequately charted," Drummond wrote in the April 1970 issue of *Naval Institute Proceedings*. "Considering that this represents the total collective effort in charting for about 400 years, the prospect for meeting our needs is not bright," he

[16] Ibid., 64.

concluded.[17] The imperatives of submarine warfare and expanded operations into new environments more fully incorporated hydrography into the duties of the fleet. In the postwar era, the Navy attached hydrographic officers to each fleet. Beginning in 1957, it also impressed upon the entire service the importance of making hydrographic observations through Project FLOOD (Fleet Observation of Oceanographic Data), an initiative whose origins reached back to Lieutenant Matthew Fontaine Maury in the 1840s.[18] Such an effort once again illustrated the importance of the marine environment to an American navy that after 1945 emerged as the predominant sea power, charged with commanding seas all over the world.

The Vietnam War extended naval operations into yet another marine environment—the rivers, canals, and deltas of South Vietnam. Just as the war on land defied military conventions, so did naval operations on water. These environments also presented unique challenges to the Navy. In a 1970 article published in *Proceedings*, Charles C. Bates, George Tselepis, and Daniel Von Nieda, all naval hydrographers, called for "shallow thinking. Where and when today's enemy cannot exploit the environment of blue water and seeks sanctuary in the brown," they argued, "the U.S. Navy must range the shallows in craft which, drawing only four feet of water, can get by without a paddle—but not without a chart."[19] In Operation Game Warden and Operation Market Time, shallow-draft boats policed the waters of South Vietnam like so many platoons on patrol. Bates, Tselepis, and Von Nieda cited tides, the physics of water flow,

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[17] Scott E. Drummond, "The Nautical Chart—It's What You Make It," *United States Naval Institute Proceedings* 96 (April 1970), 116-17.

[18] Ibid., 118.

[19] Charles C. Bates, George Tselepis, Daniel Von Nieda, "Needed: Shallow Thinking," *United States Naval Institute* Proceedings 94 (November 1968), 43.

and sedimentation as important considerations particular to riverine environments.[20] The Navy, they wrote, required "expanded chart coverage showing secondary, tertiary, and even quaternary waterways in deltaic regions."[21] It was a mission that the Navy, still primarily focused on blue water battle, was not prepared to carry out. Once again, naval hydrographers were pressed to survey new, uncharted environments in the midst of combat.

The twentieth century, then, ushered a much expanded marine environment for naval operations as new technologies and strategies changed the way the Navy used, understood, and thought about the sea. In the second half of the twentieth century, hydrography joined ocean physics, biology, and chemistry in a more inclusive oceanographic science that illustrated the growing breadth of naval interest in all aspects of the marine environment. In 1962, the Navy institutionalized this expanded inquiry when it established the Oceanographic Office, the last move in a long progression of institutional change that saw ocean science in the Navy increasingly specified through the nineteenth century and then broadened once again in the twentieth. Hydrography thus joined broader oceanographic questions that had begun in the interwar period. The course of the twentieth century has shown the continuing strategic importance of naval hydrography that emerged out of the Spanish-American War, Mahan's philosophy of sea power, and the nation's imperial obligations. This work, continued alongside the traditional commercial imperatives of maritime navigation that have always been central to the Navy's hydrographic mission, had roots in the nineteenth century. Indeed, it was an old story of scientific rivalry and the pursuit of capturing a dynamic, obscure, and vast

[20] Ibid., 47-50.

[21] Ibid., 44.

environment accurately on paper. At stake was the flawed, but powerful idea that the Navy could control the great common, first, for the nation's expanding maritime interests, and later, in pursuit of sea power. The sea, of course, remained the most fundamental element of this story. By placing it at the center of the narrative, historians can better understand the centrality of the sea in the commercial and imperial expansion of the nation. The sea, not surprisingly, is central to all aspects of naval affairs, and the Navy's effort to chart it throughout the nineteenth century demonstrates that science and knowledge were powerful ways for American mariners and naval officers to attempt to control it.

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