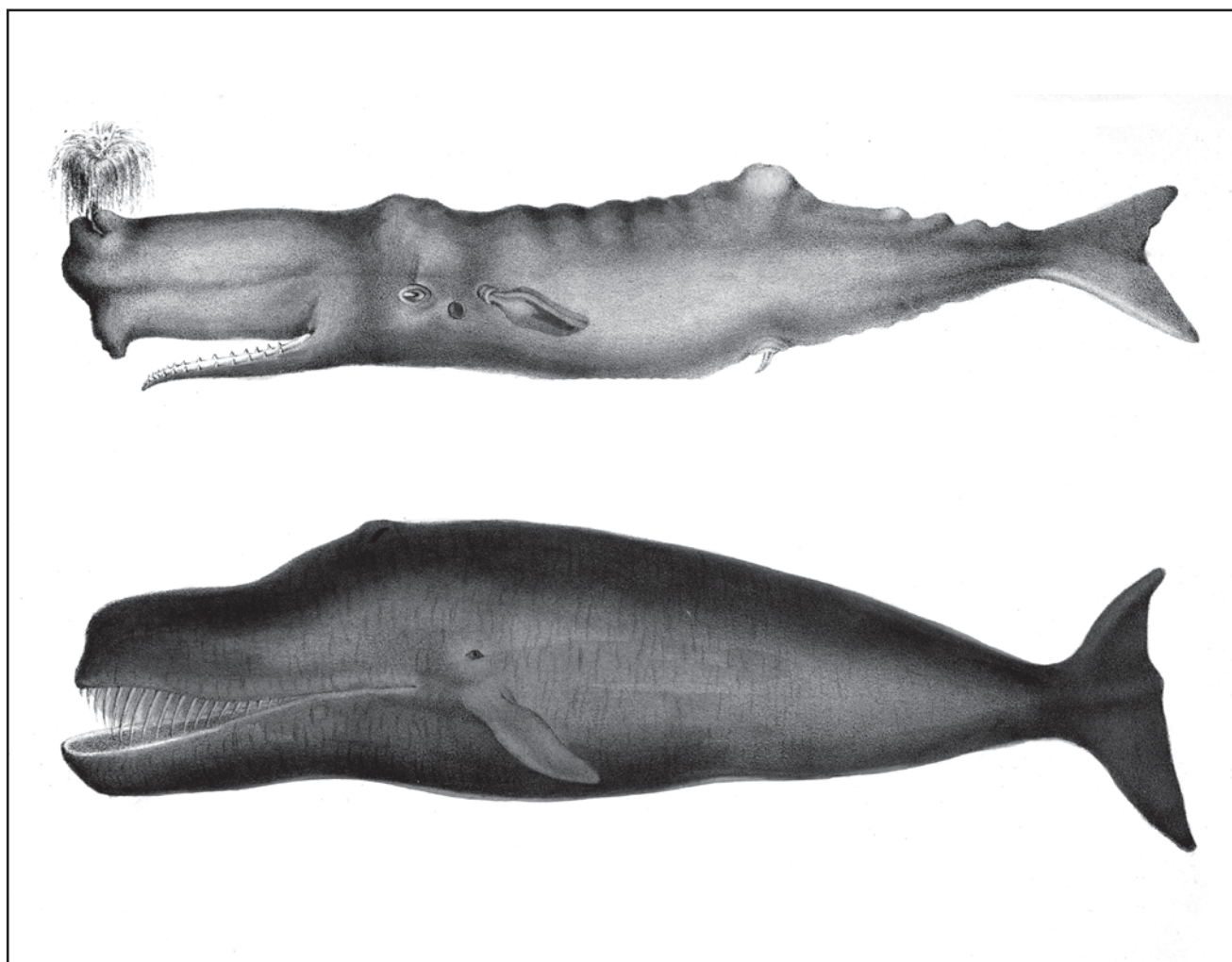


IA

THE JOURNAL OF THE SOCIETY FOR INDUSTRIAL ARCHEOLOGY



THEME ISSUE: NEW BEDFORD

Volume 40, Numbers 1 and 2, 2014

EDITORIAL	3
FOREWORD: Kingston Wm. Heath and Randall May Heath	4
THEME ISSUE: INDUSTRY, CHANGE, AND CULTURAL IDENTITY IN NEW BEDFORD, MASSACHUSETTS	
From Whalers to Weavers: New Bedford's Urban Transformation and Contested Identities Kingston Wm. Heath	7
A Peculiarly Valuable Oil: Energy and the Ecology of Production on an Early American Whale Ship Bob Johnson	33
New Bedford: Whale Oil Refining Capital Mark Foster	51
The River and the Rail: The Industrial Evolution of the Port of New Bedford Michael Dyer	71
Water Wealth: The Quest for Economic Revival and a Public Water Supply in Nineteenth-Century New Bedford, Massachusetts Arthur P. Motta, Jr.	95
Steam Mills in a Seaport: Power for the New Bedford Textile Industry Patrick M. Malone	108
The Weave Sheds of New Bedford and their Place in American Industrial Architecture Charles Parrott	137
REVIEWS	
<i>Empire of Cotton: A Global History</i> , by Sven Beckert. Laurence F. Gross	155
<i>The Dawn of Innovation: The First American Industrial Revolution</i> , by Charles R. Morris. John D. M. Arnold.	156
<i>The Legacy of American Copper Smelting: Industrial Heritage versus Environmental Policy</i> , by Bode J. Morin. Alison LaFever.	157
<i>Infrastructure: A Guide to the Industrial Landscape</i> , by Brian Hayes. Paul D. Barnard	158
<i>Industrial Heritage in Denmark: Landscapes, Environments and Historical Archaeology</i> , edited by Caspar Jørgensen and Morten Pedersen. Torben Jenk.	159
<i>Megastructures and Masterminds: Great Feats of Civil Engineering in Southern Africa</i> , by Tony Murray. <i>Dams, Displacement, and the Delusion of Development: Cahora Bassa and Its Legacies in Mozambique, 1965–2007</i> , by Allen F. Isaacman and Barbara S. Isaacman. Stephen Goldfarb	160
<i>Home Fires: How Americans Kept Warm in the 19th Century</i> , by Sean Patrick Adams. T. Arron Kotlensky	162
<i>Water-Powered Gristmills of Union County, Pennsylvania</i> , by Thomas P. Rich and David W. Del Testa. Sam Wilder	162
<i>Justus S. Stearns: Michigan Pine King and Kentucky Coal Baron, 1845–1933</i> , by Michael W. Nagle. Lisa Gillis	163
CONTRIBUTORS	165

COVER: *The Romantic Whale*, anonymous lithograph. See “A Peculiarly Valuable Oil: Energy and the Ecology of Production on an Early American Whale Ship,” pp. 33–49.

A Peculiarly Valuable Oil: Energy and the Ecology of Production on an Early American Whale Ship

Bob Johnson

Abstract

This essay explores the pursuit of energy in a world dominated by human muscles and renewable fuels—in a world, that is, before coal and petroleum made us modern. It begins by reconstructing the metabolism of an early American whale ship, or what we might think of as the *ecology of production* that structured this early American energy industry. It demonstrates that the business of whaling was the business of tapping into, organizing, and attempting to control nature's multiple unruly, scarce, and sometimes contested energy resources, including its wind power, ocean currents, cordwood, food calories, and whale blubber—as well as the prime movers (i.e., seamen and sails) that animated the industry. Second, this essay turns to the *culture of production* that propped up the market value of this profitable commodity—that is, the cultural assumptions and practices concerning labor and nature that structured the economics of the whaling industry and that made whale oil both an affordable mass market commodity and a lucrative investment for capital.

Energy in the pre-industrial world did not come cheap. The global whale oil industry, anchored in New Bedford and Nantucket, provides a case in point. Whereas today a single coal miner can generate in his or her production of coal the equivalent of three million hours of work per miner in a day, the pre-industrial world of the whaler counted energy and power in much smaller units of men, women, horses, and some-

times whale oil.¹ *Power* in this earlier world derived primarily from one's own muscles along with the muscles of the men, women, and beasts of burden that could be commanded, and *energy* derived from food, trees, and other limited organic resources such as whales. This was a world severely constrained by access to energy and by the ability to convert that energy into usable work, heat, or light. If the energy of a whale barely registers today, if it would hardly be worthwhile to harvest a right whale for its 4,200 gals. of oil to fuel one American car for eight years or an American home for about five, to our ancestors living in the more parsimonious world before fossil fuels, the whale offered a rich bounty. It was a prodigious source of energy in both material and symbolic terms (figure 1).²

The economy of whaling rested, as does all economic activity, on an *ecology of production* that translated nature's energies into both a usable good and marketable commodity. The distinctive ecology that framed the economics of early American whaling and the lives of seamen in coastal whaling towns like New Bedford and Nantucket had its own unique structure focused, as one might expect, on the whale and its 10–100 tons of potential fuel oil. It also depended equally on tapping into and controlling nature's other available energy resources and their corresponding prime movers. This included vast subsidies of wind power and ocean currents that carried ships free of charge across thousands of miles, substantial (and sometimes scarce) stores of food to feed men and their muscles for years at a time, large quantities of wood fuel to boil whale blubber and cook meals, and various other energy resources that entered into the equation at different stages in the process of hunting, rendering, refining, and transporting oil. Whale oil might have been the object of the whaler's quest, but the industry's success and the culture of whaling that defined men's lives depended just as much on the organization of these other energy flows (figure 2).

Bob Johnson, "A Peculiarly Valuable Oil: Energy and the Ecology of Production on an Early American Whale Ship," *IA: The Journal of the Society for Industrial Archeology* 40, nos. 1 and 2 (2014): 33–50.

© 2016 by the Society for Industrial Archeology. All rights reserved. Please direct all requests for permission to photocopy or reproduce article content through the Society for Industrial Archeology's website: www.sia-web.org/ia-journal/siaia.html.

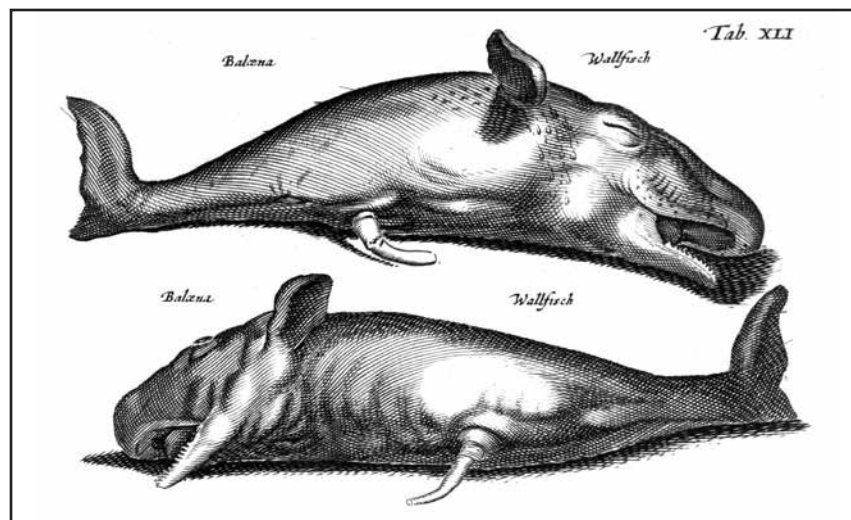


Figure 1. *The Hunted Whale*. Johannes Johstorius, *Historia Naturalis De Piscibus et cetis Libri V*, 1657. Property of Kingston Wm. Heath.

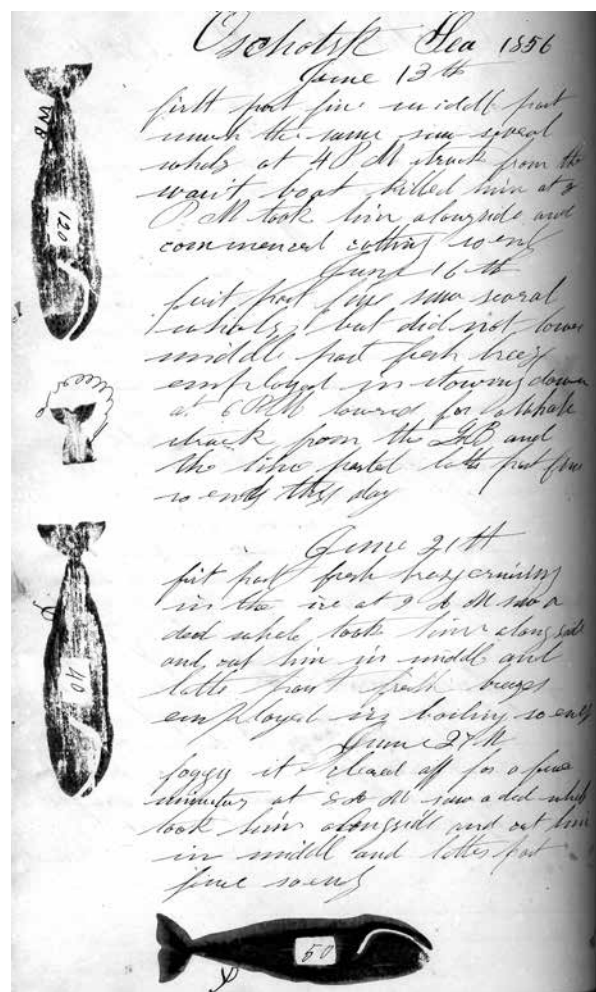


Figure 2. Whale Stamps from the Sea of Okhotsk. Logbook of the *Young Phoenix* (Bark), 1853-1857, ODHS 644, KWM #859, New Bedford Whaling Museum Research Library.

From sailors' diaries we learn that food, and its disbursement in the right ways and at the right times, was of critical importance to the efficient hunting of whales. Sailors were often put on rations when out to sea and resisted privately and publicly when the quality and quantity of their food did not meet expectations. Likewise, from captains' logs we learn that wind—which did not make it into accounting ledgers since it was not a commodified form of energy—was a precisely studied and valued energy in the whaling industry. Sailors, masters, and investors alike lamented the losses of time, comfort, and profit that came from being stuck, as Coleridge put it, amidst the “silence of the sea.” And from various sources, we learn that sailors or seamen (with their ability to convert food into work) were an essential, if highly exploited, prime mover in the whaling industry, valued for the punctilious labor they could execute in contrast to the brute force of wind and ship but subjected to severe corporeal and class discipline to keep them honed to the task. In short, lighting up the western world and extracting a profit in oil required substantial energy resources that left a profound material and cultural imprint on the world of the whaler (figure 3).

To be sure, it was the profit from whale oil that animated this enterprise, and thus this essay also reconstructs the *culture of production* that made whale oil—what Herman Melville called this “peculiarly valuable oil”—both a lucrative investment for shareholders and, at the same time, a mass-market commodity in the eighteenth- and nineteenth-century transatlantic world. The account books that tallied profits in the industry provide us with a clear record of the market

value of different grades of whale oil in this period, but they are otherwise opaque. They remain silent about the role played by the embedded assumptions and practices of the culture of whaling in structuring the market value of whale oil. By interrogating the easy assumption that market value is simply natural, we find that the exchange value of whale oil was, like all commodities, structured by the cultural context in which it was produced, traded, and consumed. In this case, that exchange value was structured by an industrializing commercial culture that not only widely tolerated, and even endorsed, the degradation of labor but that had also developed few social or political mechanisms for protecting the ecological basis on which its industries depended. Good profits and a mass market in cheap light went hand in hand with a careless disregard for

the energies of both people and nature. Value too, it turns out, is a peculiar thing and the second half of this essay seeks to problematize how we assign it.

The Hunt for Light

The whale hunt was primarily a quest for light. Its business was the business of supplying fuel to illuminate homes, public spaces, and lighthouses. While the liquid wax taken from the sperm whale's head "case" or the oil taken from the whale's blubber was frequently also used as a lubricant in industrial processes and the baleen taken from its gigantic mouth was the nineteenth-century's alternative to plastic, the whaling industry was at bottom an *energy* industry, even if we have not always placed it as such in our historical narratives (figure 4).

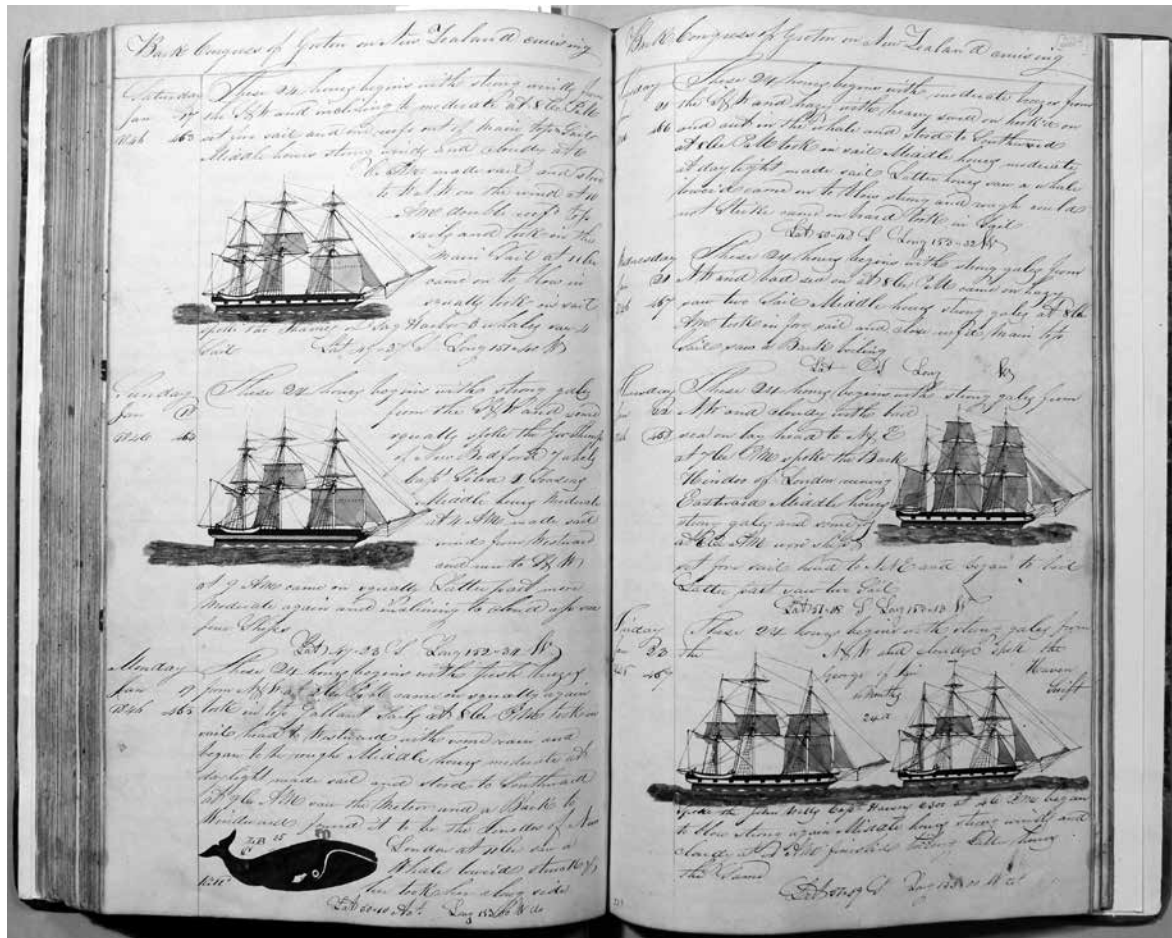


Figure 3. Right Whaling in the South Atlantic. Logbook of the *Congress* (Ship), 1842-44, ODHS 1068A, KWM55, New Bedford Whaling Museum Research Library.



Figure 4. Glass Whale Oil Lamp. Accession #1993.0154.001, Nantucket Whaling Museum.

The growth and industrialization of the whale oil industry in the United States, as Eric Dolin explains, went through four basic stages. It began with the extension of property rights over a few dead drift whales in the seventeenth-century northern colonies. It then expanded to the practice of part-time shore whaling along the Atlantic coast in the years shortly thereafter. It grew by fits and starts through the late colonial and early national period until it matured into economies of scale and capital-intensive floating

factories in the mid-nineteenth century. And finally, it collapsed in grand style after the discovery of petroleum in 1859, the demolition of much of the American whaling fleet in the course of the nation's civil war, and the abandonment of the remaining New Bedford fleet in the Arctic in 1871 when ice floe patterns abruptly closed off routes of return.³ At its peak, the whale oil industry was, however, a major American business on a par with the nation's other extractive industries and among the top twelve manufacturers in the country.⁴ Thus Melville's claim that the whale's "brain" (the precious spermaceti oil from the head case) "enlightens the world" was not actually that far off in the years before the Civil War.⁵

The whale oil hunt—and in particular the sperm whale hunt—was predicated on the assumption that all light is not equal, that burning cow fat in a candle or firewood in the hearth is of a different order than burning the wax from the casing of a whale's head or the oil from its blubber. Sperm oil and spermaceti, with their unique molecular structures, had the capacity to give off a rare luminosity.⁶ According to former president John Adams, the sperm whale's oil projected "the clearest and most beautiful flame of any substance that is known in nature," and the product's boosters claimed similarly that it gave off a "soft, easy expanding Light" and a "sweetness of scent" that set it apart from all other illuminants on the market. The most precious of fuels used in the most important of social functions (like powering lighthouses, conducting public business, and entertaining in homes of the notable), sperm oil was a coveted energy source that sold on the market for two to three times the price of generic whale oil and tallow candles.⁷

Sperm oil and, in particular, spermaceti, was prized for its rare capacity for luminescence, but even generic whale oil (derived from the blubber of humpback whales, pilot whales, walruses, gray whales, bowhead whales, and right whales) out-competed other nineteenth-century illuminants like tallow and firewood. Until technological developments made vegetable oils and kerosene cheap and dependable substitutes in the 1850s and 1860s, whale oil was the only affordable substance that held up reliably across climates and changing seasons. Competitors such as tallow candles, made from the fat of cows and sheep, gave off a rank odor and dirty smoke. They also melted in hot weather and sometimes froze in cold weather, making them unreliable at certain times of the year.

In ecological terms, whale oil had a final advantage over other illuminants. Harvested from the world's oceans, rather than from nearby farms or forests, it made otherwise unavailable energy accessible to land-locked populations. A few hundred ships a year, each chasing after whales in the seventy or so hunting grounds of the world, had the advantage of adding millions of gallons of particularly useful fuel to the energy options of North America and Europe.

The Metabolism of a Whale Ship

The whale oil that lit up the trans-Atlantic world for over half a century depended on the energies of both humans and nature. Consumers who bought that oil at the marketplace and burned it in their lamps knew this commodity mostly through its use value and market value, but what they bought and consumed was the finished product of an entire ecology of production that had been called into existence in order to produce and carry that oil to market. Nature's energy in its various manifestations—its wind power, ocean currents, cordwood, food calories, and whale blubber—were all, in effect, condensed into and represented by this end product. This ecology of production that propped up the industry can be seen in its most concentrated expression in the metabolism of the early American whale ship.

Wind and Current

Whaling was viable because of wind power. The men (and a few women) who spent their lives scouring distant oceans in search of sperm whales and other blubbery creatures needed a cheap and inexhaustible source of power to make their work economically feasible. The earth's winds blow at a speed of about eleven miles an hour on the average, and at nearly twenty-two miles an hour in the upper latitudes.⁸ Sailors who were familiar with the general patterns of those winds (as well as the ocean's currents) knew how to translate that vast, undomesticated energy into the forward movement of the ship. Pre-modern whaling—in all its inefficiency—in fact, depended on this vast energy subsidy. It is hard to imagine the business being economically or practically viable without the ocean's winds and currents (figure 5).

Whalers tapped wind power and ocean currents in order to hunt whales, but nature dictated that they do so in a fairly predictable pattern. Since most whale ships left from ports on the east coast like New Bedford, they followed a well-sailed route shaped by global wind patterns, a route that included catching the Westerlies towards Cape Verde off the African coast, weaving back west towards Brazil on the North East trade winds, and then working down along the east coast of South America on the pole-ward ocean currents. Once



Figure 5. Wind and Current. *Ships in Storm with Whale*, etching by Wenzel Hollar, 1665. Print #2001.100.7124, New Bedford Whaling Museum.

a whaling vessel arrived in the southern hemisphere, it typically opted for one of two routes: either continuing south to take on the brutal headwinds of Cape Horn en route to Pacific hunting grounds or splitting off towards the east on the Westerlies to hunt in the southern Atlantic grounds or the Indian Ocean. Whatever route whalers chose, they snatched their power from a global system of churning winds and ocean currents that they commanded only in part.

Not surprisingly, wind is the most frequent topic of sailors' diaries and logbooks and a key trope in whaling literature. In a very basic way, wind shaped the sailor's material and cultural experience. Every whaling story, logbook, and journal contains episodes with the different varieties of wind that sailors encountered—the "gentle breeze," the "howling gale," the "dead calm," the "unruly squall," the "hurricane," and many other types. What emerges from sailors' writing is that wind power dictated an erratic rhythm to the sailors' work that contrasts sharply with the type of standardized energy flows we take for granted. The unpredictability of wind power kept sailors attuned to the limits of their own power in the world. A few examples help to flesh out the meaning of wind energy in the world of the whaler: they comprise the beginnings of a pre-industrial discourse on wind power.

Christopher Almy, a greenhand aboard the ship *Barclay*, claimed that he had never thought much about "how the wind blowed" until he signed onto a whaling voyage in 1797. From that point forward, however, he claimed to assess the quality of his life by the wind. Almy wrote in his journal that the work of whaling was "agreeable" when the wind cooperated but that all-too-often unruly winds impeded the work of whaling and made the sailor's life unbearable. Rounding Cape Horn in South America, Almy said, presented considerable problems for his vessel as it did for most whaling ships. In the midst of "snowy squalls" and strong headwinds, the *Barclay's* crew sat powerless for more than two weeks, unable to make any forward progress. According to Almy, the crew alternated between intense bouts of activity to fight the wind and depressingly dull periods of inactivity, sitting out the storm in the ship's cramped forecabin. Time and space, in other words, did not readily submit themselves to human discipline in the pre-industrial world of the whaler.⁹

Wind dictated a different relationship to the world of work than did fossil fuels.¹⁰ Even when the winds blew

in one's favor, their irregular energy could adversely affect the work of whaling. A ship heading west from Argentina to the Cape of Good Hope, for example, might expect quick sailing and maximum efficiency of movement as it caught the Westerlies that blow in the higher latitudes of that region, but progress ultimately depended on the ability of the crew and the ship to manage the unpredictable power surges of those winds. Unlike electricity, the wind did not arrive in a steady flow. All too frequently, ships and crews proved no match for the excess energy of the wind. The *Emigrant* out of Bristol, Rhode Island, for example, was sailing swiftly just north of the Roaring Forties when it encountered a wild gale that rocked the vessel and swept the cook's pet pig overboard. Later, another more serious gale tore down the ship's "topmast fore" and the "topgallant masts." Too much energy, in this case, left the crew and the *Emigrant* a "wreck," disabled in the midst of a wide-open ocean.¹¹

Similarly, every whaler knew the untamed power of the squall, or even hurricane, when the wind came down in all its fury. Charles Haley, a harpooner on the *Charles Morgan* out of New Bedford, described it in primal terms: the squall came upon the ship "like a mad bull . . . screeching . . . worse than forty tomcats," its wild force causing the ship to tremble "from stem to stern . . . the yards and blocks creaking, ropes slatting, shrouds and backstays weaving, rudder jumping and groaning, [and] wheel ropes slacking and tauting from strain." Haley was lucky; the *Morgan* suffered only the loss of its sails.¹² Many ships were not so fortunate.

The calm stood at the opposite end of the spectrum. It represented to sailors the absence of energy, its total cessation. These were moments, as Melville put it, of "utter helplessness," when the wind withdrew its energy and refused to work. Sailors, in fact, felt wind most keenly when it was absent.

William Abbe's experience gives us some sense of how maddening it could be to live, even temporarily, without power. The ship he sailed, the *Atkins Adams*, encountered several calms during its four-year voyage. The first calm came on December 30, 1858. He found the experience unnerving: "Almost a dead calm. Night black . . . the calm so perfect that we could hear the officers conversing. . . . Patches of glowing phosphorescence . . . unlike anything . . . & the strangeness . . . & the silence & stillness of everything . . . wakened, I must confess, a feeling of dread and a sense of supersti-

tious fear—that I should be ashamed of.” A little philosophizing relieved Abbe of his “timid state” of mind in this instance, but as he sat for the first time in his life powerless in the midst of a limitless ocean, he lost his composure and couldn’t help but think about how his life, once lived oblivious to the wind, had come to depend so completely on how “the wind blows.”¹³

In logbook, sailor’s diary, and story, the examples multiply beyond count. People who lived in the world before fossil fuels understood the complex relationships among life, labor, and energy in ways no longer accessible to us. Today, we have the luxury of parsing out our movement in a standardized clip of fifty to seventy miles per hour, mindless of the intricacies of geography and element, but sailors who lived in a world in which six or seven knots per hour was “swimming off gallantly” were always more mindful of the role of energy in their lives. Unable to dictate the relationship between time and space, and unable to move through the world on their own terms, they had to accept the fact, as Melville did, that “calms, light breezes, and currents made everything uncertain” in the work of whaling.¹⁴ Lost men, lost rigging, lost sails, lost time and, occasionally, lost ships were the accepted, if regrettable, consequences of relying on the wind’s power to get work done.

Food and Muscle

Wind was not the only critical energy input into the ecology of whale oil production. Food and sailors’ muscles were equally important factors. Food, for its part, was an essential energy source in the production of whale oil. Ships were islands unto themselves while out to sea and had to be stocked with hundreds of barrels of cheap calories of dried meat, biscuits, cornmeal, and other goods to fuel men’s muscles. Those who ate that food were (with the exception of the whale ship) the most essential prime movers in the industry. While their muscles were puny in output when compared to something like the brute force of wind, ship, or whale, men had the advantage of being intelligent prime movers who could be coordinated, disciplined, and shifted around to execute the complex and more exacting labor that was needed throughout the various stages of the whale hunt. From both an ecological and economic standpoint, we might say that the business of whaling was, at least in part, the business of coaxing men to convert cheap and accessible food calories into the rarer calories of whale oil.

Food was no minor business on a whale ship. Coveted by sailors and rationed out by masters, food shaped the politics and economics of whaling. To the investor, it was always an overhead cost that cut into the profits of a whaling voyage; and to master and crew, it was a fixed symbol of power and hierarchy as well as a constant reminder of the fragile interconnections of energy, life, and labor (figure 6).¹⁵

During the peak years of whaling, the typical whaling vessel carried an average of twenty-six to twenty-nine men for voyages that lasted over two to four years. If our estimates can be trusted (and they are highly speculative), an average ship pursuing sperm whales might have stored as much as five pounds of food per day for each crew member (some of which was invariably lost to spoilage). The average whale ship carried approximately 240 barrels of hardtack and dry flour, 240 barrels of salt pork and dried beef, 100 barrels or so of lard and molasses, bushels of corn, rice, and potatoes; lesser quantities of items like vinegar, nutmeg, chocolate, raisins, and pepper rounded out the essential food stores. Meeting the sailor’s subsistence requirements comprised a substantial portion of the energy budget of a ship and was, consequently, a significant cost to investors (estimated at \$35–\$60 a year per sailor in 1844).¹⁶

A whaling vessel was, of course, not a self-sustaining island. In addition to being outfitted at the beginning of a voyage with food, clothing, water, timber, rigging, and iron, it required new energy inputs on a regular basis in order to continue its business. For this reason, formerly isolated islands across Oceania, the Indian Ocean, and the Atlantic came to be forcibly integrated into the world system during the eighteenth and nineteenth centuries—their harbors, breadfruit, bananas, timber, and water suddenly important to the world’s great empires and the growing global marketplace. Consequently, every ship’s logbook records coming to port in such places as the Marquesas, Madagascar, the Azores, or the Sandwich Islands in order to add essential water, wood, fruits, and live animals to their always shrinking provisions.

The metabolism of a whale ship positively depended on such ports. Since dry goods provided bulk calories but otherwise lacked the nutritional balance that sailors required, ships regularly needed to supplement their provisions with at least a few fresh vegetables and fruits. Failing to do so, a ship invariably found itself with an outbreak of scurvy caused by vitamin C

deficiency. This was especially true in the nineteenth century when an individual whale hunt lasted years rather than weeks or months. A ship with scurvy meant watching as a crewmember's gums became spongy, as his skin grew spotty, as his mucous membranes dried up and seeped blood, as his moods turned increasingly depressive, and as the sailor ultimately approached death. While many sailors suffered an episode of the disease, the vast majority of those affected were restored to health upon returning to port and consuming fresh fruits and vegetables.

There were unfortunately notable exceptions to that general rule. The crew of the *Ansel Gibbs*, for instance, found itself shipwrecked in the fall of 1872 and forced to live exclusively off its dry stores during a long winter in Hudson Bay. Hundreds of barrels of dried beef, pork, bread, lard, and even dried potatoes were apparently not enough to sustain the men through the winter. Without fresh fruit or vegetables, the majority of the *Gibb's* crew died before the spring, learning the hard way that not all energy is equal.¹⁷

To this point, we have inappropriately regarded the human being as something of a machine, assuming that a certain quantity of food calories and some varied nutrition will produce so many calories of work. Humans are curious prime movers, however. To turn

food into work depends on their cooperation. In the world of the whaler, it depended, more specifically, on the ship master's ability to manage sailors' stomachs and discipline their bodies. In Greg Denning's apt phrase, sailors' stomachs were "spaces of power" in the maritime world, subject to the master's discipline and punishment and a source of frequent discontent.¹⁸

Food was part of the social wage of maritime work. It was a customary right that had been refined over several centuries of negotiations between masters and subalterns, and codified in maritime law by the late eighteenth century.¹⁹ Because the responsibility of feeding the crew fell to the ship's stakeholders who had every incentive to minimize labor costs, sailors' provisions always consisted of the least costly combination of calories that would keep men alive and active during the long days and nights of whaling without digging too deeply into investors' pocketbooks. Hungry sailors literally ate into the profits of a voyage, and so they were fed a monotonous combination of a few basic meal forms, such as lobsouse, a stew of hard-bread and bits of dried meat cooked in lard and water, and duff, which one sailor described as "a sort of pudding" comprised of "flour . . . wet up with equal parts of salt and fresh water" and then combined with "'slush' or lard, and yeast." Such fare, while typically served in healthy portions, would have been "repugnant to the

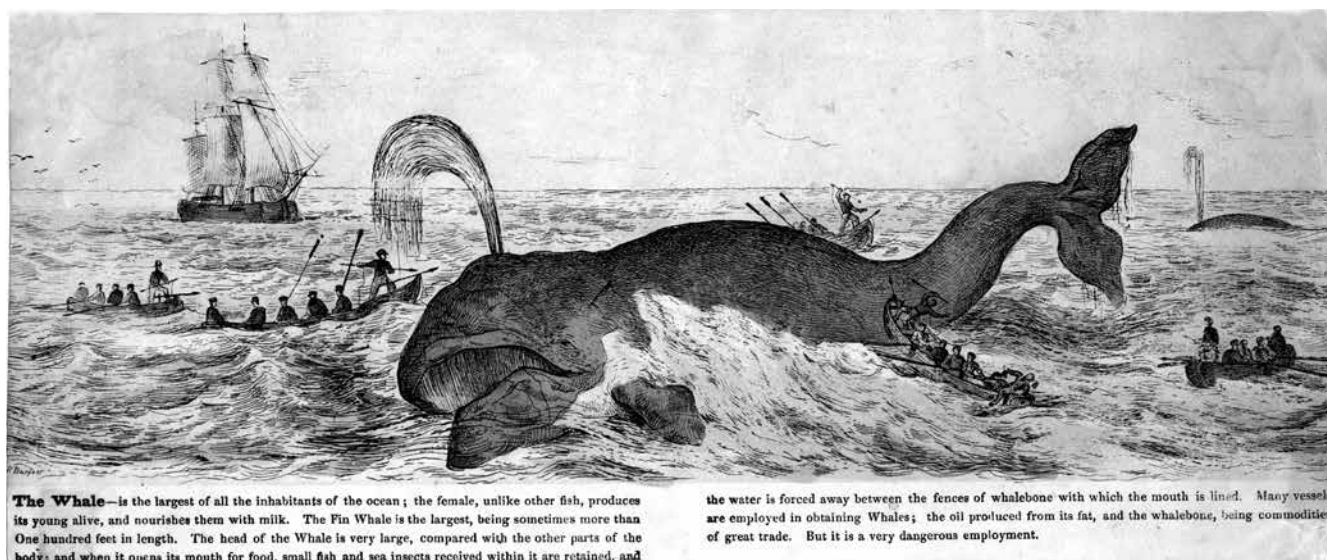


Figure 6. Men and Whales. *The Whale*, anonymous engraving. Print #00.128.10, New Bedford Whaling Museum.

taste of any landsman,” but it was an especially tough aspect of life in an industry that controlled one’s body from sun up to sundown (figure 7).²⁰

No one, including the captain, ate particularly well on a whaling voyage, but captains (who were answerable to the ship’s investors) ultimately decided what sailors ate, how much they ate, and when they ate it on a daily basis. Managing men’s stomachs was tricky business. It meant calculating food stores and rationing that food out for years at a time. It meant deciding when to stop whaling and take the ship into port. And, it meant carefully doling out small pleasures that had no real caloric value but that answered to men’s nonessential desires. The hard discipline of ship life, which included legal flogging until 1850, was always the stick in the equation, while the carrot consisted of small treats, such as the rare day of fresh meat, the stop in a port of call, or more frequently the daily cup of coffee, tea, and (unless one was on a dry ship) the occasional pint or spoonful of rum.²¹ In managing these intimate spaces of power, masters had to measure out the relative importance of vital aspects of the business: the

energy budget of the ship, the financial budget of the ship, and the sailors’ feelings of exploitation.

Sailors never managed to wrest many concessions from their masters concerning the quality of the food they ate, but they grumbled, struck sails, deserted, and even mutinied to remind masters and investors of the limits to their exploitation. According to one estimate, food was the source of work stoppages in about 13 percent of recorded cases.²² Even more frequently, sailors simply deserted. One of the decisions every captain had to make, in fact, was whether it was worth the risk to restock provisions in a port of call and give the crew a little liberty or to continue the whale hunt longer while relying on the ship’s stores.

Bringing a ship into port was not a simple matter. Ports of call were places where unhappy sailors fled unhappy lives, and everyone knew it. Melville’s desertion in the *Marquesas* is only one of the countless stories of sailors who jumped ship when they had the chance. Desertion in whaling was, in fact, expected. It was a standard form of worker resistance and sometimes even tolerated. A

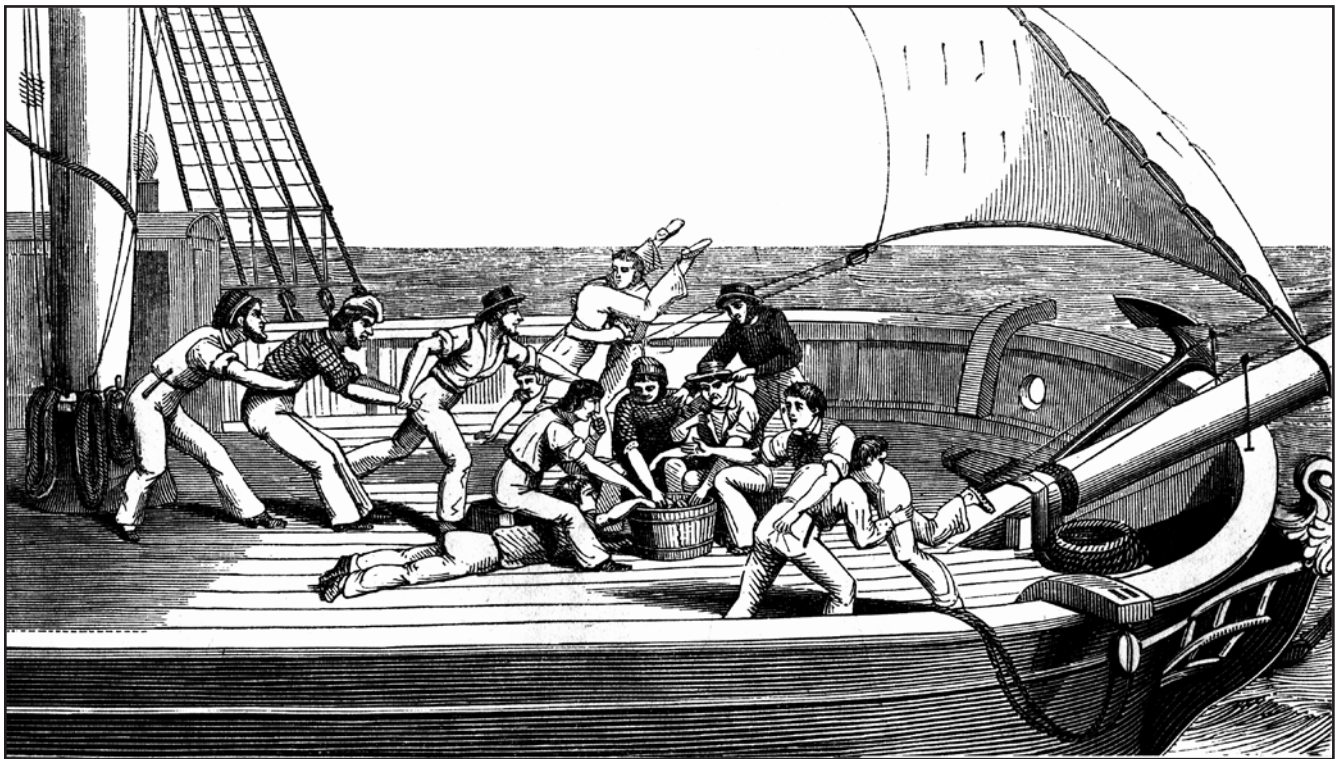


Figure 7. *A Scramble for Salt Junk*, in J. Ross Browne, *Etchings of a Whaling Cruise* (Harper & Bros., 1846), New Bedford Whaling Museum.

shocking one-half to two-thirds of the original crew of any long voyage exercised that option, and one of the many reasons that sailors did so was the poor quality of their grub and a visceral desire to manage their own stomachs.²³ Sailors might have supplied brute power as part of their job, but they were never simply brutes.

Whales and Whale Oil

Dwarfing men, and second only to wind power, was the whale itself. The whale, a prodigious source of energy in the pre-industrial world, supplied the blubber and the baleen that was prized by the whale oil industry and, perhaps perversely, made available the majority of the fuel that was needed to boil its own blubber in the ship's trypots. A dense repository of nature's energy, the whale consequently also became an important cultural symbol, standing in for the idea of power itself. Melville's Ishmael called the whale simply "an overwhelming idea," and countless real-life sailors measured their own strength, culture, and manhood by the immense power of the whale (figure 8).²⁴

Whales are excellent stores of energy; the work they perform is the predicate to whaling. At the top of the food chain (or at least nearly so), a predator like the sperm whale capitalizes on an entire ecology of pro-

duction that begins with the photosynthetic power of phytoplankton that is infinitesimal in size. That phytoplankton, like all plants, has the ability to utilize and condense the sun's radiation to build up living bio-matter, or a form of packaged energy that is microscopic in form, while higher up the food chain, zooplankton and other marine animals collect and harvest that chemical energy as a food source by undoing its bonds and further condensing it into a more palpable living mass that is visible to the eye. For its part, the whale feeds off the lower trophic layers of this system by working, in effect, to concentrate these dispersed energies into its singularly massive body of bone, blubber, and baleen which makes it a dense and desirable energy commodity. The way to think about it from an ecological vantage point is that the sperm whale, a toothed carnivore with an appetite for medium-sized squid, both capitalizes on and organizes the labor performed by phytoplankton, zooplankton, krill, small fish, and squid themselves, each of which have already worked hard hours to harvest the sun and the ocean's diffuse energies.

This concentration of the ocean's scattered energy in the body of the whale was, of course, the material precondition to whaling. Thus the whale in its immensity and force left a heavy imprint on the consciousness of sailors and the transatlantic world in which they operated.

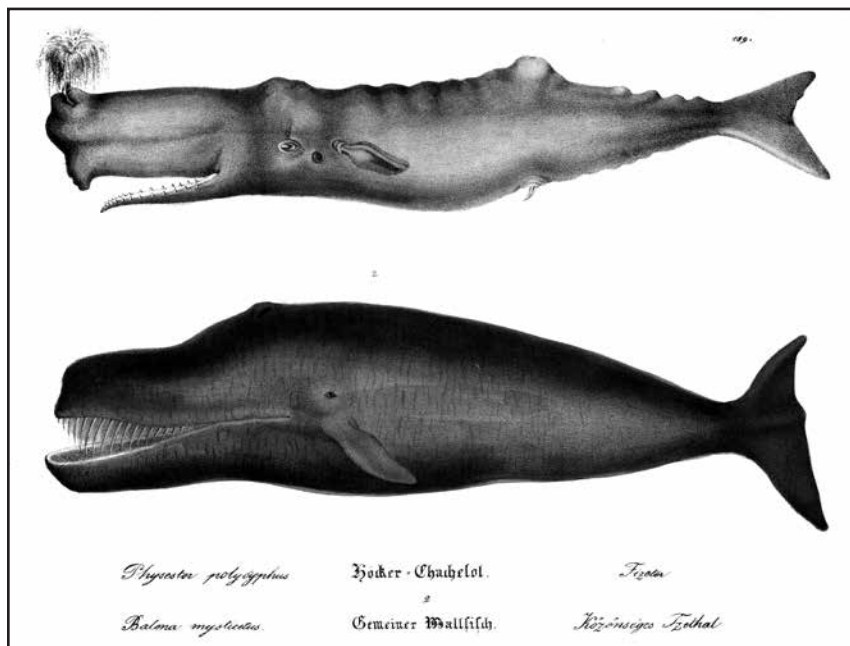


Figure 8. *The Romantic Whale*, anonymous lithograph. Print #2001.100.6277, New Bedford Whaling Museum.

Culturally, the most enduring perception of the whale was a romantic, albeit countercultural, one. The great white whale, *Moby Dick*, the ur-example in this romantic tradition, for example, spoke to the vast, undomesticated, and nearly incomprehensible otherness of the natural world, answering to people's need for a power greater than themselves—for God or for some other natural force that connected them back to the grandeur of the universe and its energy. When Ishmael reflects, for example, on the great white whale's immensity, he imagines that the "great flood-gates of the wonder-world" swing open for him and that his "inmost soul" begins to float "in endless processions of the whale." This transcendental orientation towards the whale, which derived from its elusiveness, its power, and its defiance of the finite, captured one important facet of the pre-industrial culture of whaling. It spoke to the greenhand's hope of escaping the dull life of the farm or shop, and to humanity's more universal desire to find meaning through contact with nature's immense life force.²⁵

But the dominant manner in which the whale entered into whaling culture was more conventional. Sailors, investors, and consumers alike typically understood the whale within the more conventional framework of conquest and progress that gave ideological legitimacy to the subjugation and industrialization of nature. N. Byron Smith's diary is richly representative in this respect.

How grand and full of stirring emotions is the thought, that a handful of puny men should venture out upon the stormy ocean, thousands of miles from land, in a mere cockle-shell as it were, to pursue the huge monsters that roam the unfathomable depths of ocean—the acknowledged king of the whole finny tribe—and possessed of power sufficient, if directed by Reason, to destroy all who might venture to attack them in their native element. Well has the command of God been obeyed, wherein he said unto man, "Subdue the earth, and have dominion over the fish of the sea, and over the birds of the air, and over every living thing that moveth upon the earth." For none are so powerful but he [who] has been able to subdue and bring them under his power, and make them subserve to his comforts and convenience.²⁶

In other words, the dominant understanding of the whale—which carried with it the fantasy of the sailor's conquest of nature, of reason's triumph over animal instinct, and of a prevalent nineteenth-century interpretation of the biblical concept of human dominion over creation—tended to reinforce a burgeoning transatlantic economy that was hell-bent on turning nature to use, to profit, and to progress. We might

think of Mocha Dick, the forgotten inspiration behind the great white whale, as representing this more pedestrian understanding of the whale as something to be conquered and reduced to its more proper "hundred barrels of clear oil."²⁷

Even so, neither the symbolic whale nor the biological whale should be conflated with the actual whale oil that people bought and sold on the market. For whalers knew the whale most intimately through its disembodiment and its fleshing out into commodity. This process of rendering the whale, termed the "trying out" of the whale's blubber, was another defining feature in the ecology of whale oil production, and it too left a deep imprint on the material and cultural life of the whaler.

Trying out the whale was a complex industrial process, requiring two or three days of work for each whale as well as the careful coordination of the energies of whale, wood, and human. The process of rendering began with the laborious work of towing the whale back to ship after the kill and then roping it to the ship's side. Once the whale had been secured, whalers then pumped the windlass to pull blankets of blubber off the whale and hoist them on board. At that point, they proceeded to put the whale through a disassembly line that included several distinct steps of cutting into its massive body until the blubber was of a size called "books" that could be handled in the ship's trypots. Then came the boiling of blubber. That task required not only the careful attention of several men but also enormous quantities of fuel to maintain the fires at the proper temperature during the long days of rendering. The fuel used in the early stages of this process was firewood picked up from islands and the mainland, but once a sufficient quantity of cracklings (the dried remains of the whale's blubber after it had been boiled) became available, they were substituted for the more precious firewood. As more than one author has said, it was at this point that the whale was compelled to "consume himself," his energy used to boil down his own flesh. The process was complete once the oil was cooled, poured into barrels, and stored below deck to await the market (figure 9).²⁸

Trying out the whale was dirty and grueling work that exhausted the energies of the entire crew and shrouded the ship in the smoky and oily remains of the energy that had been expended. William Abbe described the process in lurid detail.

To turn out at midnight & put on clothes soaked in raw oil—to go on deck & work for eighteen hours among blubber—slipping—and stumbling on the sloppy decks—till you are covered from crown to heel with oil . . . to dream you are under piles of blubber heaping & falling upon you till you wake up with a suffocating sense of fear & agony only to hear the eternal clank of the cutting machine & the roar of the fires under the try works . . .—to fall asleep only to dream again till you are called on deck to [cut] off the raw blubber—to handle the greasy pikes . . .—to stand under the lee of the try works—cutting up & carrying to casks the soaked & dripping case—till your eyes are filled with pain & your mouth is filled with the suffocating black smoke from the chimneys . . .—to be weary—dirty—oily—sleepy—sick—disgusted with yourself & everybody & everything. . . .

This labor-intensive enterprise concluded on a final, less fleshy, formality when, after the trying out was complete, the ship's record keeper pressed an ink stamp in the shape of a sperm whale into the pages of the logbook (see figure 2). That stamp, which tallied the number of barrels of oil taken from the whale (with sometimes an added flourish of a bloody plume or jagged teeth), meant that the body of the whale had formally completed its transition to a mass-market commodity. And while a non-seasoned sailor, like our

greenhand Abbe, might have found such work to be a filthy and disgusting business, he could still leave off his meditations in his diary by wishing that his peers and “his valuable ship” would do well in its pursuit of this peculiarly valuable oil.²⁹

Muscle and food, wind and ship, sea and whale—these were the basic energies and prime movers in the metabolism of this industry. Others' energies were also vital, such as the precious cords of fuel wood that were bought in port or collected from islands, the sun that was to churn the winds on which the ship relied, the timber for the construction of the vessel and the hundreds of barrels in storage, and the cotton, iron, coal, and other necessities that were used in various stages of whale oil production and that tied the industry back to terrestrial energy flows as well. But these other energies played a secondary role to the ones we have already described, and thus can be simply noted as we move on to our final consideration—the peculiar value that whale oil had on the trans-Atlantic market.

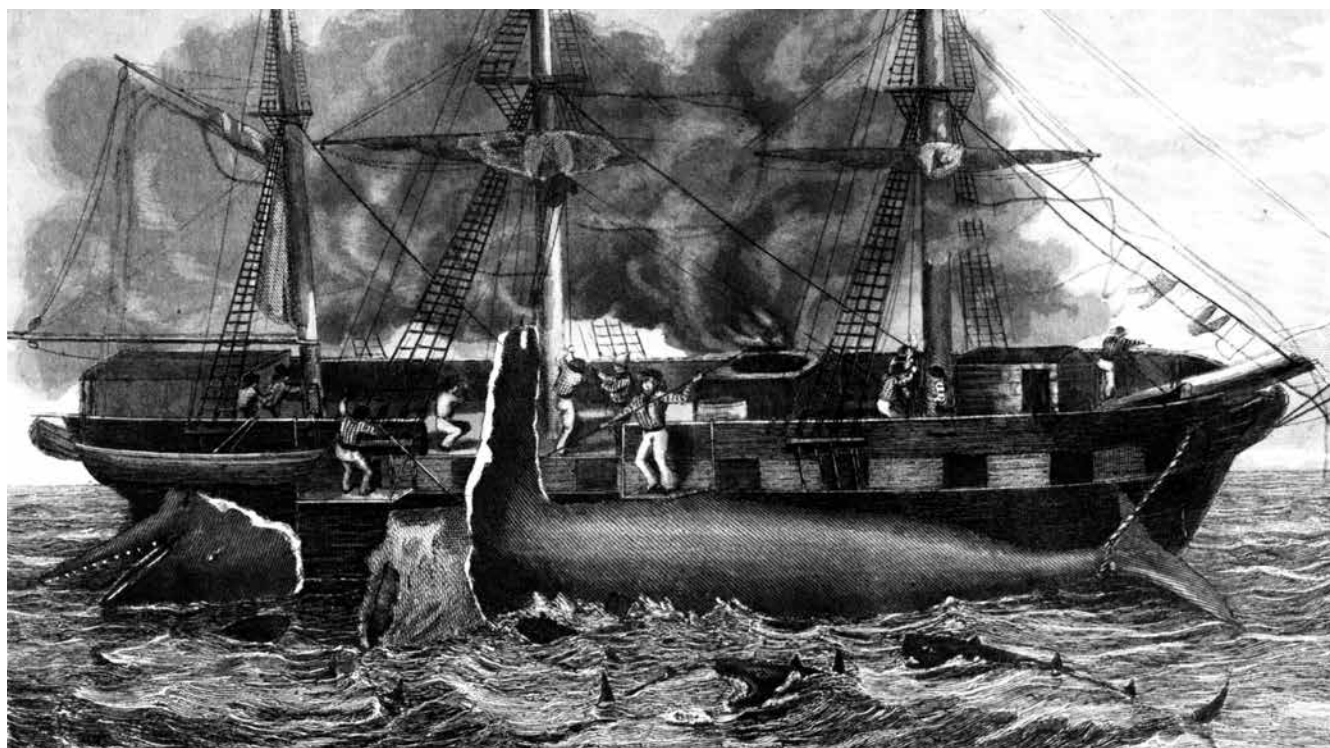


Figure 9. *Cutting in and Trying Out*, in J. Ross Browne, *Etchings of a Whaling Cruise* (Harper & Bros., 1846), New Bedford Whaling Museum.

The Peculiar Value of Whale Oil

We have, until now, skirted the main issue. Whalemen surely valued the energies of wind, whale, and food in intimate and varied ways, but it was ultimately the market value of whale oil that animated the entire enterprise, calling these other energies of the hunt into play and organizing them into this distinctive ecology of production. While the value assigned to whale oil in the marketplace was understood to be its most important and objective measure, market value was never a hard material fact so much as a cultural product shaped by other elastic factors. In the case of whale oil, that value was determined by one basic fact and two important assumptions. The fact was that wind, unlike whale, wood, and food, could not be commodified and was thus a vast, free energy subsidy to an industry that required considerable energy inputs in order to conduct its business. The two cultural assumptions, for their part, were: 1) that the whale was a free energy resource in the commons that could be adequately accounted for through market mechanisms; and 2) that the human as a prime mover was an expendable and replaceable source of power. In short, our first mass market in cheap light was built on a widespread cultural tolerance for the exploitation of both people and nature.

"Can he who has discovered . . . the values of whalebone and whale oil be said to have discovered the true use of the whale?" Henry David Thoreau asked his peers at the height of the whale oil industry's influence.³⁰ It is to that question that we finally turn.

Despite our tendency to regard exchange value as an inviolable product of hard material forces, the market value of whale oil was a cultural product that had been structured both by the political institutions that framed the market itself and by the historically specific perceptions that Americans had developed for gauging the value of a number of subsidiary things, including the value of manual labor, of capital investments and, of course, of the natural resources that made up the ecological infrastructure of commodity production. The exchange value of whale oil was, in other words, a dense, unpacked signifier that reflected the culture of its time and place, and that worked, like all commodities, to distill in opaque form the dominant values of the societies involved in its exchange.

We know in detail the market value of whale oil in the nineteenth century. Reading through any issue of the *Whalemen's Shipping List*, the main newsletter of the

whaling industry published in New Bedford, we see clearly the dominant market paradigm that conditioned early Americans' relationship to the whale. "435 bbls [barrels] of South Sea" oil at "38 cents a gallon"; "250 bbls sperm oil" at "102 cents a gallon"; "the market is firm"; "the market is quiet"; "the market is dull"; "the market is unusually active"—these were the type of weekly reports that shaped the whaler's mentality, the investor's concerns, and the consumer's encounter with the whale.³¹ In fact, we know worlds more about the commercial value of whale blubber and spermaceti than we do about the habits and population of the actual whales from which those products came. Economic historians tell us, for instance, that the price of whale oil was seventy-nine and a half cents per gallon in the 1850s and that sperm oil was more than twice that price. We know, too, that a pound of generic spermaceti candles went for about thirty-four cents. We can even measure those prices against such things as conventional tallow candles that cost about thirteen cents a pound, or approximately one-third the price of sperm candles.³² In fact, one of the more peculiar facts about our knowledge of the historical whale is that even our marine biologists have been forced to deduce much of their own knowledge of early whale populations from this sort of market data.

But the assumption that we might equate a right whale with a \$1,000 debit in someone's checking account is a peculiar one in historical terms. Not all societies have flattened their relationship to the whale in quite this way. To the Yupik on St. Lawrence Island in the Arctic, for example, the whale was never fully reduced to its potential as a commodity. The whale remained rather a central feature in both the material and the spiritual life of the community. That relationship is clear from several features of Yupik society. The clan structure of Yupik society, or *ramka*, for instance, was firmly rooted in the religious and practical work of hunting whales. Yupik material architecture likewise reflected a practical and spiritual connection to the whale. Yupik economic practices were bound up in concerns with communal rights over whales rather than the proprietary rights of the individual. And, the broader Yupik worldview was structured by a widely shared sense of a reciprocal obligation between people and whales.³³

In sharp contrast, the culture of commercial whaling in the transatlantic never developed a relationship to the whale that emphasized either this sort of reciproc-

ity with the natural world or a strong sense of communal responsibility; nor did it develop the type of modern legal constraints on production that govern resource use today. Whales were, instead, assumed to exist in a vast open and unregulated commons; and as long as they were in supply—even in short supply—they were free for the taking with few intervening variables. The whale existed, that is, as potential property with the only rule governing society's relationship to it being the "rule of capture," a common law doctrine that assumed wild animals were free game that became the property of the person or persons who caught them. That restrictive framework for gauging the value of the whale unfortunately encouraged a serious erosion of the ecology of production on which the whale oil industry depended.

The story is familiar to historians, although it is not quite as simple as one might assume. Two examples should suffice to flesh out the ecological parameters of that story. The history of the northern right whale follows the standard plotline. Right whales, allegedly named for being the "right" whale to hunt, were among the earliest commercial varieties targeted by Americans. They were close to home, they were close to shore, and they had a thick layer of oil-rich blubber. Moreover, once harpooned, they did whalers the favor of floating rather than sinking. Theirs is the "tragedy of the commons," that is, the story of a natural resource being depleted because no one has clear property rights over that resource and because those who harvest it do so according to self-interest without orientation to the common good or to long-term proprietary considerations.³⁴

Historical marine biologists describe the pattern of right whale exploitation as a "prolonged" assault characterized by "discovery, depletion . . . and abandonment." During the early period of shore whaling when the hunt was short and sweet, whalers intensively and unselectively exploited right whale populations from the Gulf of Maine down to the Carolinas. The sub-fishery off the Carolina coast, as just one example, was worked, exhausted, and abandoned as early as the 1750s and 1760s (although that fishery recovered and was then subjected to a second collapse in the 1870s and 1880s). Similar stories are true of the fisheries off Cape Cod, New York, New Jersey, and Maine, with the cumulative effect being the virtual annihilation of the northern right whale.³⁵

The case of the sperm whale, the most prized of whales, is more complicated than that of the types of whales that lived closer to shore, such as the North Atlantic right whale and the California grey whale. The sperm whale, found in less accessible regions of the oceans, was harder to find and, significantly, more numerous. Historians tell us that the 700 or so whaling outfits and their 20,000 crew members who hunted sperm whales in any given year before the Civil War could not have seriously depleted the global sperm population that numbered over one million. While some breeding grounds may have been adversely affected, the evidence suggests that there were plenty of sperm whales to go around. The most current estimate is that the whale oil industry cut the size of the sperm whale population by about 33 percent of its global total—quite a substantial figure but still short of depletion. Although it is not likely true, as some historical economists have argued, that the rate of capture never exceeded the rate of reproduction, the argument serves to remind us that the decline of the whale oil industry did not come about simply from the whale's exhaustion so much as from the entrance of cheaper and more reliable products into the lighting market.³⁶

There is no getting around the fact, however, that the value system by which whalers regarded the whale both sanctioned local collapses of whales, like the California grey whale and the Northern Atlantic right whale, and paved the way for the full-scale slaughter that came in the late nineteenth and twentieth centuries with the advent of faster steam ships and a revived market in baleen. Moreover, the industry's impact on the larger sperm whale population, even before coal and steam, makes it clear that the development of an early mass market in cheap light came at the expense of eroding the ecological foundation on which the production of that light depended.

The second assumption embedded in the exchange value of whale oil was that not all people were equally valuable. The early trans-Atlantic world not only sanctioned corporal punishment for sailors similar to that of slaves but it assessed the value of sailors according to a strictly hierarchical, and starkly unequal, profit-sharing arrangement. The common sailor's earnings relative to both capital and skilled labor give us some sense of how early America judged the worth of sailors and the muscle power they provided. It is perfectly

clear that they bore the brunt of exploitation in the whale oil industry, their sacrifices being a structuring factor in the market value of whale oil.³⁷

Commercial whaling relied on what was known as the “lay system,” a system in which investors, skilled workers, and common laborers all received a set proportion of the net profits of a voyage. Investors who risked their capital in the enterprise took the vast majority of the net profits of the whale oil collected (some-

thing like 70 percent).³⁸ The skilled labor on board, including the captain, the mates, and the boatsteerers, received their lays on a sliding scale: the master receiving on average a lay of approximately 1/15 lay (or 7.7 percent of net profits), the mates receiving a 1/23 to 1/57 lay (4.3 to 1.8 percent of net profits), and the boatsteerers an approximately 1/87 lay (or 1.1 percent of net profits). Typically, a worker fared tolerably if his lay added up to a percentage point. He did poorly otherwise (figure 10).³⁹

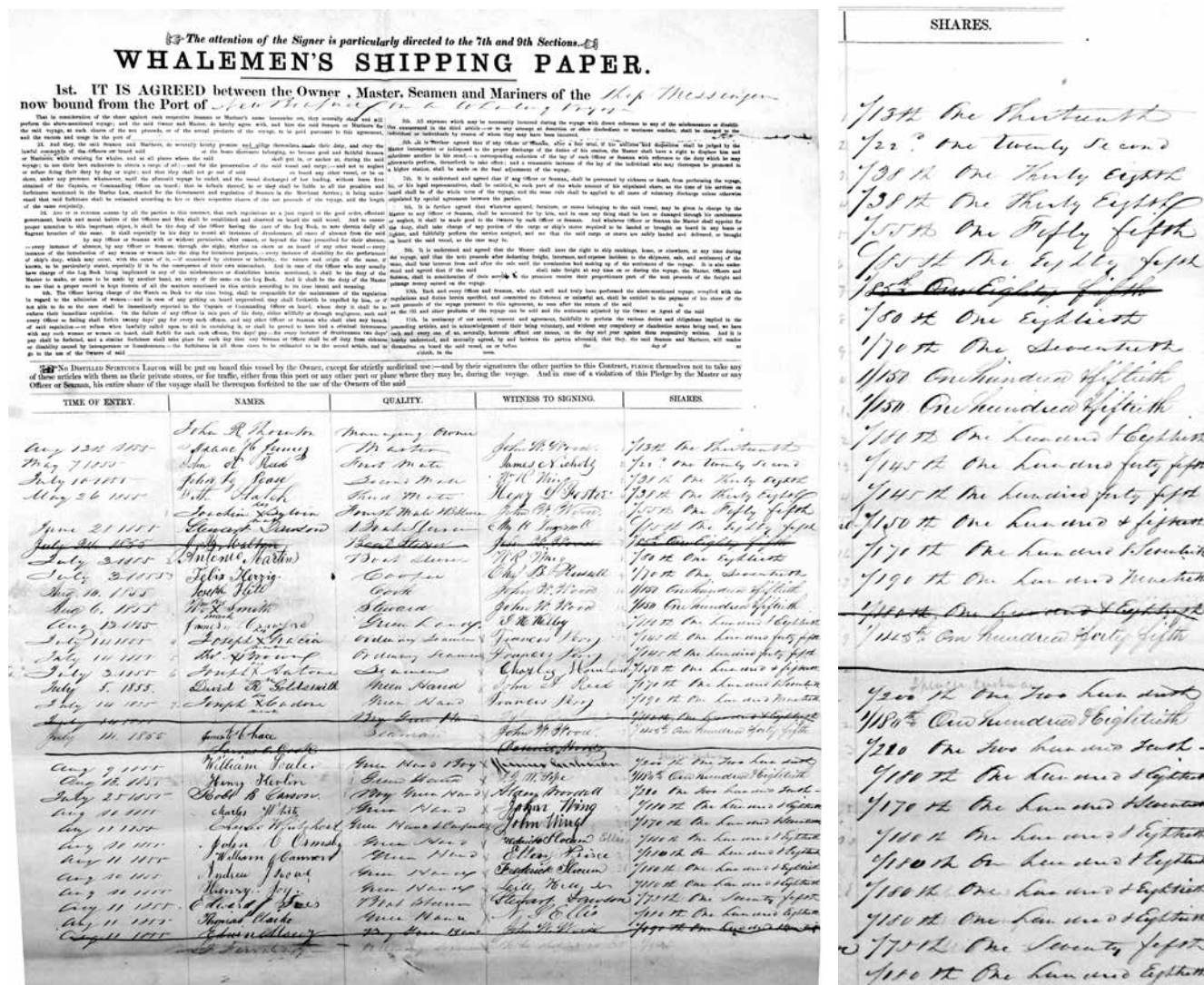


Figure 10. “Lay” system, by which sailors received their pay, illustrated by (left) a copy of Whalemens’s Shipping Paper from summer 1855 showing the terms of the agreement between the owner of the *Messenger* and the master, seamen, and mariners who would be sailing her on a voyage, and (right) a detail of the right-hand column showing the shares each person would receive, depending on job status. Whalemens’s Shipping Paper (standard document), New Bedford Ship *Messenger* on Whaling voyage, Mss 16, folder 5 and 6, drawer 11, New Bedford Whaling Museum.

The common sailor was exploited labor in a profitable industry. An experienced sailor typically received a 1/150 lay; if inexperienced, a 1/186 lay, or about half a percentage point of the net profits of the voyage. Penny-pinching investors made sure to minimize labor costs by parsing out the sailor's wages in very small fractions. They conventionally distinguished among a 1/190 lay (0.005263158), a 1/195 lay (0.005128205), and a 1/200 lay (0.005) when calculating the crew's wages. That small difference amounted to a mere handful of dollars at the end of two, three, or four years of work; but in the economy of whaling, that handful of dollars kept out of a sailor's pocket was money added to capital's return on investment. While stakeholders received on the average a strong return on investment (about 14.9 percent annually), the common sailor who risked life and limb rather than dollars and cents, earned approximately seventeen cents per day, or about 60 percent of what laborers on land earned.⁴⁰

Added to the sailor's distressing financial situation was the fact that, like sharecroppers in the South, he was forced to share in the risks of whaling. The lay system meant that the sailor took a profit only if the voyage was successful. A few sailors got lucky. Their ships brought in a load of ambergris or a full hold of sperm oil when the market was high. All too frequently, however, sailors ended up in poverty or in debt after a few years of work. After subtracting the advance of credit that a sailor received in order to buy his clothing and required gear, the small cash allowance he received while at liberty in port, the various items he bought from the owner's slop chest at exorbitant rates, and his share of the costs of insurance, oil leakage, storage, and handling of the oil, the sailor had little left to show for his labor. By one contemporary estimate, he likely ended up with about fifty dollars after several years of work. While that figure might be exaggerated, there is no doubt that the whale oil industry was a "sweated industry," comparable to working in the nation's textile mills during the late stages of the industry.⁴¹

The structural injustice of the system was felt most keenly in the petty and intimate methods of economic exploitation that sailors experienced—in the sailor's dependence on the master to provide cash allowances while in port, in the interest paid on the advance received to purchase gear, and on the high prices paid for items in the ship's slop chest. This last, the slop chest, was frequently singled out by whaling critics as

a symbol of the sailor's egregious exploitation. It was what Francis Olmsted called a "pitiful . . . plan of fraud and oppression." The slop chest was the equivalent of the company store in miniature. From it, sailors bought the things they required while they were out at sea—pants, hats, coats, suspenders, shoes, utensils, pipes, tobacco—but at an "exorbitant" increase on the price they would have otherwise paid in port. Because every sailor found need for a cup, a hat, or a pair of pants at some inopportune time, he typically managed to rack up a substantial debt after a few years of work. The slop chest "swallowed up" the hard-earned wages of workers who were already poorly paid and served as a special source of "discontent" among a class that already had plenty about which to be discontented.⁴²

In an age notable for its exploitation, the "common hand" in the whaling industry was among the most exploited of workers. Poorly compensated, replaceable, and socially denigrated, the sailor lived what Ben-Ezra Ely Stiles characterized as "short," "demoralized" lives. No sailor who was privy to the system could rationally expect to accumulate savings, to acquire land or a fee simple house, to build a family to come home to, or even to move up the ranks in his profession. And while many sailors chose their lot in life, the notion of choice is as tricky a concept as value. Whatever sailors might have thought about their chances for success, it is clear that in the somatic world before cheap light and power, he was the human sacrifice for a mass market in affordable energy.⁴³

Conclusions

The metabolism of a whale ship was a carefully documented affair. Those involved in the whale oil industry were exacting with a ship's energy budget. They kept fastidious record of the wind power on which the ship relied; they rationed out food and parsed out the costs of that food with great care; and they never failed to squeeze, almost literally, whatever energy they could out of the whale and the men who hunted them. Whalers, in short, knew the value of energy. Every chicken was accounted for, every gale was felt, and every barrel of oil stored. *How* they valued that energy was, however, framed by the cultural assumptions that they brought to work.

Wendell Berry has claimed that we need to rethink how we value the world around us.⁴⁴ Do we know the

value of a whale when we know the price of whale oil and whalebone? We obviously do not. But with a little work we can see that the exchange value of whale oil can tell us something about how a society chooses to gauge value and how it consequently assesses the worth of things like wind, whales, and people.

In hindsight, the problem with the historical shift to a full-fledged market society in the United States during the peak years of whaling was not the intensification of exchange (in fact, all societies exchange things among themselves and with others); rather, it was the growing tyranny of “exchange value” over all other values. The problem has never been the market, in other words. It has been our willingness to assume that the market is enough, that it adequately accounts for the human and ecological costs of what we produce and trade. The problem lies in our willingness to believe that the health of nature and the well-being of the worker do not need our utmost attention. The hidden story behind the “peculiar value” of whale oil was that the whale and the common sailor were expendable.

Today, we have come around to the conclusion that it is unsound to measure a whale by the units of energy that can be culled from its blubber or from the price that can be gotten from its oil. But with regard to the value of men and women (and to the rest of the natural world) we have not come nearly so far.

Notes

1. Vaclav Smil, *Energies* (Cambridge, MA: MIT Press, 1999), 137–38. Worker output in the United States can exceed thirty tonnes [metric ton] per day of high quality bituminous coal (28 MJ/kg).
2. Whale oil, like other animal fats, has an energy density slightly lower than gasoline, 38 MJ/kg versus 46–7 MJ/kg. The above estimate assumes a car driven approximately 12,500 miles annually at 25 mpg. The average US home utilized ninety million BTU in 2009, or the equivalent of 672 gals. of petroleum, or what is equivalent to 813 gals. of whale oil. See DOE statistics at http://www.eia.doe.gov/emeu/mer/pdf/pages/sec1_17.pdf. For US EIA statistics on home electricity see <http://www.eia.gov/consumption/residential/index.cfm>.
3. Eric Dolin, *Leviathan: A History of Whaling in America* (New York: Norton, 2007). Whaling continued after the war but whaling as an energy industry was rendered unviable. In New Bedford whaling continued on a limited scale into the 1920s.
4. Teresa Hutchins, “The American Whale Fishery, 1815–1900: An Economic Analysis,” PhD diss., Univ. of Michigan, Ann Arbor, 1988, 43–44.
5. Herman Melville, *Typee, Omoo, Mardi* (New York: Library of America, 1982), 663.
6. Malcolm R. Clarke, “Physical Properties of Spermaceti Oil in Sperm Whale,” *Journal of the Marine Biological Association of the United Kingdom* 58, no. 1 (1978): 19–26.
7. Quoted in Dolin, *Leviathan*, 94, 110–113, 152, 168 (see n. 3).
8. Smil, *Energies*, 12–14, 130–1 (see n. 1).
9. Christopher Almy, whaling journal, “Barclay,” 29 August 1797 and 1 January 1798, “Christopher Almy papers, 1797–1919,” mm82099572, Library of Congress, Washington, DC.
10. See Stephen Kern, *The Culture of Time and Space, 1880–1918* (Cambridge, MA: Harvard Press, 2003) for a discussion of changing conceptions of time and space in the transition to modernity.
11. “The Journal of Seth Lincoln,” in *“There She Blows”: A Narrative of a Whaling Voyage in the Indian and South Atlantic Oceans*, ed. Ben-Ezra Stiles Ely (Philadelphia: James K. Simon, 1849; Middletown, CT: Wesleyan University Press, 1971), 186. Citations refer to the Wesleyan edition.
12. Charles Haley, *Whale Hunt: The Narrative of a Voyage by Nelson Cole Haley: Harpooner in the Ship Charles W. Morgan, 1849–1853* (New York: Ives Washburn, Inc., 1948), 84. Quotation transposed.
13. William Abbe, “Journal of my whaling cruise in ship *Atkins Adams*,” 30 December 1858, ODHS Log 485, New Bedford Whaling Museum [hereafter NBWM], see also <http://www.whalingmuseum.org/explore/library/projects/atkins-adams>.
14. Joseph Hersey, *Esquimaux*, 1 May 1843, Log 366, Reel 12, NBWM; Melville, *Mardi*, 769 (see n. 5).
15. For a brief, if lucid, discussion of food and whaling, see Briton Busch, “Whaling Will Never Do for Me”: *The American Whaleman in the Nineteenth Century* (Lexington: University Press of Kentucky, 1994), 13–16.
16. For example, see the inventory of food stores in the ship outfitting book for the *Archer*, n.d., Box A87-113D, A-90, Ship Outfitting Books, NBWM. For an estimate of the cost of feeding sailors in this earlier period, see Lance Davis, Robert Gallman, and Karin Gleiter, *In Pursuit of the Leviathan: Technology, Institutions, Productivity, and Profits in American Whaling, 1816–1906* (Chicago: University of Chicago Press, 1997), 154, 211–13, 247, 251–52, 304–5.
17. Ansel Gibbs, 1 July 1873, Log 464B, Reel 281, ODHS, NBWM.
18. Greg Denning, *Mr. Bligh’s Bad Language: Passion, Power and Theatre on the Bounty* (New York: Cambridge University Press, 1992), 23.
19. Marcus Rediker, *Between the Devil and the Deep Blue Sea: Merchant Seaman, Pirates, and the Anglo-American Maritime World, 1700–1750* (New York: Cambridge University Press, 1987), 117.
20. Francis Allyn Olmsted, *Incidents of a Whaling Voyage* (New York: D. Appleton & Co., 1841; Rutland, VT: Charles E. Tuttle Co. 1969): 152–153, 358. Citations refer to the Tuttle edition.
21. Busch, 18–31 (see n. 15).
22. Ibid., 54.
23. Ibid., 92.
24. Herman Melville, *Redburn, White Jacket, Moby Dick* (New York: Library of America, 1983). See also Margaret Creighton’s analysis in *Rites and Passages: The Experience of American Whaling, 1830–1870* (New York: Cambridge University Press, 1995), which discusses the male whalers’ class and gender identity as tied to the whale hunt.
25. Melville, *Redburn, White Jacket, Moby Dick*, see *Moby Dick*, 800 (see n. 24).
26. N. Byron Smith, Manuscript “Narrative of N. Byron Smith, 1851–1854,” pp. 120: 69–70, mm76005998, Library of Congress, Washington, DC.
27. J. R. Reynolds, “Mocha Dick, Or the White Whale from the Pacific

- ic," *The Knickerbocker, or New-York Monthly Magazine* 13, no. 5 (May 1839): 377–392.
28. Granville Allen Mawer, *Ahab's Trade: The Saga of South Seas Whaling* (New York: St. Martin's Press, 1999), 53–76.
 29. Abbe, July 17, 1859 (see n. 13); see also Creighton, 58–84 (see n. 24).
 30. H. D. Thoreau, "Chesuncook," *Atlantic Monthly* 2, no. 9 (July 1858): 229.
 31. *Whalemen's Shipping List and Merchants' Transcript* 7, no. 20 (July 17, 1849), Collection 386, Nantucket Historical Association, Nantucket, MA.
 32. Davis et al, 357 (see n. 16).
 33. Carol Zane Jolles, *Faith, Food, and Family in a Yupik Whaling Community* (Seattle: University of Washington Press, 2002), 287–300.
 34. For historians, Donald Worster's version of the tragedy of the commons is canonical. See "Cowboy Ecology," in *Under Western Skies: Nature and History in the American West* (New York: Oxford University Press, 1994), 34–52.
 35. Randall R. Reeves, Tim D. Smith, and Elisabeth A. Josephson, "Near Annihilation of a Species: Right Whaling in the North Atlantic," in *The Urban Whale: North Atlantic Right Whales at a Crossroads*, ed. Scott D. Kraus and Rosalind M. Rolland (Cambridge: Harvard University, 2007), 54–55.
 36. Hal Whitehead, "Estimates of the Current Global Population Size and Historical Trajectory for Sperm Whales," *Marine Ecology Progress Series* 242 (October 25, 2002): 295–304; Davis et al, 131–149 (see n. 16).
 37. On discipline and punishment in whaling, see Creighton, chap. 4 (see n. 24).
 38. *Ibid.*, 35.
 39. Davis et al, 161–66 (see n. 16).
 40. Davis estimates profit rates averaged 14.9 percent annually during the peak years of the whale oil industry, 1846–1860, and 13.7 percent over the nineteenth century. That compares favorably to the profits made in the nineteenth-century's two dominant sectors, the railroads and commercial agriculture. Davis et al, 185, 444 (see n. 16). See also Busch, 12 (see n. 15).
 41. See Appendix A in Elmo Hohman, *The American Whaleman* (New York: Longmans, Green, & Co., 1928); Creighton, 21–40 (see n. 24); and Busch, chaps. 2, 4, and 6 (see n. 15).
 42. Olmsted, *Incidents of a Whaling Voyage*, 53 (see n. 20).
 43. *Ibid.*, 118–19.
 44. Wendell Berry, *The Unsettling of America* (San Francisco: Sierra Club Books, 2004).