WHALES

> And I am convinced that from the heads of all ponderous profound beings, such as Plato, Pyrrho, the devil, Jupiter, Dante, and so on, there always goes up a certain semi-visible steam, while in the act of thinking deep thoughts. . . . And how nobly it raises our conceit of the mighty, misty monster, to behold him solemnly sailing through a calm tropical sea; his vast, mild head overhung by a canopy of vapor, and that vapor—as you will sometimes see it—glorified by a rainbow, as if Heaven itself had put its seal upon his thoughts.
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> —HERMAN MELVILLE, Moby Dick

Members of the order Cetacea, the forty-nine speciesof whales, dolphins, and porpoises native to North American coastal waters vary in length from 4 to 90-some feet, in weight from 150 to 250,000 pounds, in coloration from black to white to blue to sinuous and/or mottled combinations thereof, in diet from micro-scopic phytoplankton drifting with the currents to giant bioluminescent squid, in ecological status from seemingly stable to seriously doomed, and in brain size from 100 to 600 percent that of humans.

The blue whale, the largest creature that ever lived, has a brain six times the size of a human's; killer whales outweigh us in gray matter four to one; and even bottlenose dolphins, those popular, perennially smiling seaquaria attractions, have a brain half again as large as our own. What, one wonders, do they do with all those brains? Melville's hypothesis that they use them to ponder deep thoughts is probably as valid as any other theory to date. For indeed, the cetaceans have adapted so felicitously to their universe that the mundane problems we terrestrials must deal with never so much as enter their cavernous minds.

Extraterrestrials in no uncertain terms, the ceta-ceans live in an environment unimaginably more sta-ble than ours, in a vertical landscape where even the concept of weather is moot, food abundant, upward mobility a flick of the flukes. Their brain is in most cases larger and in all cases more complex than our own, with four major sections instead of three and a higher ratio of abstract function to motor control neurons. For all its sophistication, the cetacean brain hasn't had to deal with the mind-boggling contingencies of life on the surface of the planet. It has no concern for volcanoes and glaciers that cover the place with fire or ice, nor for the major hassles of food, shelter,and clothing. For some cetaceans, eating requires little more than swimming in a circle below a school of fish while exhaling a stream of bubbles that corrals them, and then simply surfacing with an open mouth through the enbubbled feast above. For other species, the daily feast takes place among tens or scores of family members and hundreds of friends, none of which ever got caught in the rain or lacked

the appropriate outfit. The cetacean brain hasn't had, as it were, to suffer the slings and arrows of atmospheric fortune, albeit of harpoons they have had their share.

Several cetacean species exist now as the rear guard of their kind, effortlessly gliding through vast oceans pitiably barren for them. The northern right whale,a 50-foot-long animal equal in weight to the Statue ofLiberty, used to exist in such abundance that early Massachusetts colonists claimed in their diaries that one could almost walk across Cape Cod Bay using thewhales as a bridge. Fewer than 300 individuals prevail, out of an estimated pre-whaling population of over 100,000. If the species manages to escape extinction, a miracle will have come to pass.

Thev were called right whales because they were the right whales to hunt: they yielded generous amounts of oil, they swam so slowly you could easily overtake them in a primitive boat, and they didn't flee from approaching vessels. They float when dead. Primitive whalers decimated them long before the advent of sophisticated whaling apparatus, such as steam engines and explosive harpoons, which opened up new marketing vistas to late nineteenth-century entrepreneurs. Every whale became the right whale.

In Chapter Eighty-one of Moby Dick, Melville makes fun of a whaling captain who gives chase to a fin whale, which species he peremptorily classifies as "uncapturable . . . because of its incredible power of swimming." At the expense of this foolish captain, named Derick, Melville goes on about the human tendency for wild-goose chases: "Oh! many are the Fin-Backs,and many are the Dericks, my friend." Observed to swim at 20 miles per hour fin whales were, in the days when only the power of wind or muscle moved boats through the water, subject to Melville's dictum—there was no way to catch one. Times change. Modern whale fisheries decimated the fin whale, only a fraction of their original population remains, and decimated as well the also previously uncatchable blue whale.

Even though they realized nothing short of realistic catch quotas could preserve the valuable stock of blue whales, commercial whaling entrepreneurs hunted the species to virtual extinction, lowering themselves, at the eleventh hour, to taking sexually immature individuals. To perpetuate a species, each mating pair must have at least three offspring. Perusing the average length of blue whales taken over the years—during the 1931 Antarctic season, 31,000 were taken—you can't help but notice that their body size decreases progressively. In the final years of the blue whale harvest, it becomes obvious that even the virgins were game.

The Japanese are perhaps the most guilty of killing large whales in great numbers. International pressure was finally brought to bear, the effect being a diminution of Japanese whaling activities in one place while they formed joint companies with smaller Chilean and Panamanian whaling interests in another.

On closer shores, indigenous American peoples in northern Alaska have claimed that the hunting of the bowhead whale represents the central ritual of their culture. The claim was

upheld by a district court judgein San Francisco who proclaimed that the hunt should go on because the preservation of a culture supersedes the preservation of a species. Surely we should all be thankful for being members of a culture rather than a species. That the endangered culture in question long ago traded in oars for outboard engines and harpoons for Winchester 300 magnums seems to have had little effect on the well-intended decision.

Is it ethically valid for us to tell indigenous peoples whose lands we have usurped what species native to their territories they may or may not kill? What came first, the species or the culture?

Cetaceans evolved some 40 million years ago, in all probability from an ancestor that inhabited the shallow estuaries and seas that covered the better part of the continents during the Oligocene epoch of geologic time. In those days competition for food and space was fierce, and so it behooved the cetaceans' ancestors to take to the water where competition was almost niland space what you made it. Terrestrially disastrous phenomena like glaciers represented comparatively minor concerns—they were unthreatening clouds concentrated solely at the peripheries of the horizon, the edges of the sea. As time went by, the cetaceans adjusted more fully to life in the water: their nostrils moved from the front to the top of their head, their hind legs disappeared entirely, their genitals and ears receded into slits in their incredibly smooth body, and their front limbs evolved into hydrodynamic stabilizers, flippers, which may also function as a thermo-regulation apparatus.

Adapting to their marine environment, the cetaceans developed highly specialized biological mechanisms that enable them to frolic for years in water sufficiently cold to kill a human in minutes, and to dive to depths that would kill a human in seconds.They have a thick outside layer of blubber that insulates them from the cold as well as increases their buoyancy. It permits some species to store enough fat to spend an entire winter without eating.

To ensure that the blood pumped to the extremities of their body does not cool down too much by the time it makes the return trip to their heart, their arteries and veins run parallel to each other so that the warm arterial blood on the way out heats up the cool venal blood on the way in. Cetaceans' ribs are not connected to their breast-bones, affording some species the ability to collapse their lungs completely. Thus oxygen and carbon dioxide are exchanged about six times faster than in humans. With each breath, cetaceans achieve an exchange rate of 90 percent, whereas humans transfer only about 15 percent of their lungs' contents. Consequently, the cetaceans can suffuse themselves with enough oxygen to go for prolonged periods of time without breathing—in the case of the sperm whale for as longas two hours.

They have in their system as well an unusually rich supply of myoglobin. This protein binds to and stores oxygen in their muscles, so that the hemoglobin circulating in the blood can dedicate itself to nourishing the brain and heart during deep and extended dives below the air.

More streamlined than the most high-tech of pro-jectiles, some species of cetacean move more quickly through water than mathematical models of their theoretical hull speed would permit. Theoretical hull speed represents the maximum velocity at which a particular body can move through a fluid medium, and anyone who's crewed aboard a well-trimmed sailboat will relate to the concept. At a certain point—say, when a wind far faster than a boat's theoretical hull speed coincides with the direction it happens to be proceeding in, and prevailing currents similarly propel it—the entire vessel vibrates with an ominous hum. It is as though obscure but powerful Newtonian forces are about to tear the boat apart. The halyards buzzlike high-voltage cicadas, the hull sends pins and needles up through your feet, and the owner of the boat, more likely than not slightly behind in insurance payments, rushes to trim the sails. To some that hum is frightening, to others exhilarating. To the United States Navy, a funder of cetacean research, the hum of maxed-out theoretical hull speeds represents a challenge: if dolphins can move throughwater at such speed, why can't torpedoes and submarines? Funded by the Navy among others, research has revealed that, in addition to achieving an almost perfect laminar flow, some dolphins literally shed their skin as they swim—sloughing off, as it were, a microscopic envelope they slide through like a sheath, almost frictionlessly. When taking a shower, humans shed dirt and dead cells; to do as much, dolphins need only accelerate. And accelerate they do. Some researchers report dolphins attaining speeds of 40 milesper hour and reaching escape velocities strong enough to propel them clear out of the water in graceful arcs three times their height. What's a theoretical hull speed to them?

Cetaceans have an unusually poor sense of smell, doubtless because they'd drown if they sniffed, even though the design of their esophagus allows them to breathe and swallow at the same time. In all their lives cetaceans never once take a drink of water. Some species have limited eyesight, even unto blindness, while others see quite well. All species have, apparently, a keen sense of hearing, which makes available to them a repertoire of vocalizations that the human ear finds baffling. The most hauntingly beautiful songs of all time are surely those sung by male humpback whales, who lay neutrally buoyant at an angle of 45 degrees to the zenith, and, with their flippers straight out, declaim sometimes for hours the timelessness of love. After-ward, with 7-foot penises that deliver 15 gallons of semen upon ejaculation, the successful males mate.

Their song is the longest, most complex in the animal kingdom, and it seems to have about it the rudimentary elements of a culture, a shared, universal experience. Whether their bizarre songs intend to cajole nubile females into tasting the delights of procreation or to discourage competing males from entering their territory, no one knows. It seems clear, however, that all the humpbacks of a particular population sing the same song, in concert subtly improvising upon it during the course of the mating season.

Curiously enough, all the sexually mature males of a specific stock begin singing each mating season the precise song they seem to have agreed upon at the end of the previous season, and exactly how they remember that song and how or why they universally improvise upon it, and to what end, will probably always remain a mystery. Could it be

they're passing something on? Whatever it means, the song of the humpbacks surely represents that most atavistically powerful of cultural traditions—that is, myth. Humans, too, embody myths in song, and that we fail utterly to comprehend the eerily beautiful myth of the humpbacks in no way diminishes its potency. Only ponderous profound beings can make a myth.

The vocalizations of other cetacean species also baffle us, for their enormous brain has adapted to life in a medium through which sound travels five times faster than through air, and where the difference between daylight and darkness sometimes measures 6 feet. Many species depend more on hearing than on sight, sensing the world about them with an incredibly sophisticated sonar, or echolocation, system. The sounds they emit bounce back to them off objects in the wateror on its surface, in some cases with such accuracy that their mind's eye registers an image not only of shape but also of mass. Some species of dolphins literally perform sonograms on objects, easily distinguishing between hollow and solid forms of the same shape, which task a human can accomplish only with ultrasound technology, X rays, or other nuclear imaging systems. Scientists believe, furthermore, that the sperm whale emits subsonic sounds of sufficiently thunderous power to stun its prey, which are as a general rule, 1- to 30-foot-long squid that illumine themselves in the absolute darkness with a light-emitting enzyme, luciferase, named for Lucifer.

Blue and fin whales emit the lowest sounds in the animal kingdom, broadcasting who knows what at frequencies below 100 hertz, a wavelength far below the threshold of human hearing. Sounds so low in frequency, like the distant rumble of thunder, can travel enormous distances under the right conditions, and under about 3000 feet of water where—variables of temperature, pressure, and salinity create a lowvelocity sound channel—the right conditions exist. Sounds emitted not too far above or below this channel sort of gravitate toward it until it traps them, carrying them much farther than they could otherwise have gone. Accordingly, sparse populations of blue and fin whales might be able, simply by moaning into vast conduits of highdensity water, to reach out and touch someone, and subsequently to perpetuate a few and far between species.

Cold, high-density water carries life as surely as sound, for at temperatures down to about 39 degrees Fahrenheit water contracts before expanding again as ice, thereby enabling vital nutrient gases, in particular oxygen and carbon dioxide, to become soluble.The ocean's quantity of living matter, its biomass, reaches its highest concentrations in cold, high-latitude water, where negligible temperature differences between the surface and the depths facilitate a thorough mixing, a rising and falling, of water layers.Water saturated with oxygen and carbon dioxide rises to a surface thick as soup with green plants waiting for its nutrients, and so the food chain begins. Though beautifully clear, tropical waters retain sufficient solar heat to create steep thermoclines, drastic changes in temperature that prohibit the upwelling of deep, cold, nutrient-rich water. Sharply defined at the equator, the ocean's thermocline disappears at the poles. The decreased visibility in northern sections of the Atlantic and Pacific is due primarily to high populations of phytoplankton, tiny aquatic plants. The presence of these gives the water its characteristic color by dispersing light insuch a way that

only the wavelengths of green and yellow get reflected. The ethereally clear blue water of the tropics exhibits a more generalized, less interfered with, reflection of light, rather like that of the sky. In terms of biological fecundity, tropical waters resemble a barren desert, clear as a bell but for the most part empty; whereas high-latitude waters recall a dense jungle teeming with life.

You can see whales at the equator and near the poles, and, if you know where to look and when, just about everyplace in between. Seeing whales requires far less effort than most people imagine. Organized whale-watching excursions visit everyplace from the tepid lagoons of the Sea of Cortez to the chilling pack ice floes of Baffin Bay. To accommodate those of us whose time or budget proscribes journeys to such exotic climes, a significant industry of whale-watching facilities has sprung up along both coasts of the continent. People in Boston and New York City, San Diego and Seattle, San Francisco and Miami, regularly see whales.

Of course, they have to go out of their way to do so, but not terribly much. I have left Manhattan at 5A.M., watched a rainbow materialize in the deafening spout of a nearby fin whale, and returned to town in time for dinner at eight. In Vancouver I have left after brunch to watch killer whales breaching and got back to my hotel in time to shower before a fashionably late supper. From dunes on Cape Cod and the coast of Oregon, picnicking and toting binoculars, I have sat, watching whales swim by.

I have also watched the most unanimated of people transformed utterly by the sight of a whale, turned instantly from a bored-looking adult enduring the afternoon to an astonished-looking child, wide-eyed and overwhelmed by the immensity of life, the mystery, the grace. People become silent in the presence of whales, reverently so, as though to give them a chance to speak if they would. When large whales get close the sound of their exhalations overpower even the drone of idling diesel engines. And if their spout rises at an appropriate angle to the sun you'll see a rainbow appear for a melting second and think, surely,of Melville and the world of deep thoughts. Identifying cetaceans requires, primarily, a knowledge of what you're most likely looking at, what's most likely there. You are not going to see beluga whales in the Gulf of Mexico, nor need you lose any sleep about having to identify a gray whale in the Gulf of Maine. Some cetaceans make brief appearances, breaking the surface only slightly, and only for a second, before disappearing; others breach, leaping clear out of the water, time after time, begging to be identified. Some whales have names, and a few have biographies—painstakingly assembled by researchers using photographic identification techniques. Either out of curiosity or for the sheer fun of it, some cetaceans approach boats so closely that whale watchers, at once exhilarated and terrified, get to pet them.

There is no reason to fear any cetacean species. Even the formidable killer whale, the largest predator on the planet, has never been known to attack a human, and over the years reports have come in of dolphins rescuing struggling swimmers by lifting them to the surface. Fun-loving, affectionate, and intelligent, the cetaceans harbor no ill feelings toward

humans, who have persecuted them. While whalewatching, one should reserve one's fear for the safety of the whales, which for all their acres of brain do not necessarily understand propellers or the frequently careless folks who operate them.

None of the whale-watching vessels described below ever leaves port for an excursion without a serious naturalist aboard, and for the sake of these larger-brained-than-us, more gentle mammals, one should never patronize a commercial whale-watching operation without thoughtfully assessing its sensitivity to cetacean welfare. I have heard reliable accounts of crazed, dangerously uninformed captains chasing terrified whales and their calves for an hour, gunning their engines within 50 feet of the animals.

In 1984 the National Marine Fisheries Service established a set of guidelines that the captains of whale-watching vessels should follow, if need be at the insistence of passengers. Prospective whale watchers should keep these simple, common sense rules in mind and openly express indignation to any captain who ignores them: 1. Vessels within a quarter mile of a whale should avoid excessive speed and sudden changes in di-rection. 2. Vessels within a hundred yards (the length of a football field) should not approach a whale at more than idle speed or bear down on them head-on: approach stationary whales from the side, cruise parallel to moving ones. If, at this distance, several vessels attempt to approach a whale, the captains should not surround the animal nor obstruct itspath. 3. Vessels within a hundred feet of a whale should make no attempt to approach the animal more closely: at this range the vessel's engines should be put in neutral and kept there until the animal moves farther away. (Note: If at this range the anima dives, the vessel's propellers should not be reengaged until it appears on the surface again, farther away.) To appreciate a whale-watching excursion one need only show up. Although some whale watchers tote along all manner of specialized equipment, others will appear entirely empty-handed, and in high-heeled shoes. On a beautiful, clear, calm day it does not matter terribly much what you wear on a whale-watching boat, but if the weather turns and the seas get rough you can easily expose yourself to serious discomfort by wearing unsuitable clothing. I recommend sneakers or rubber-soled shoes with good traction, and a heavy sweater or windbreaker you can easily put on and take off.

Bear in mind that even on a windless, sunny, 70-degree day a boat moving 20 miles per hour generates, for all intents and purposes, a 20-mile-per-hour wind, which makes 70 degrees feel like 50. People with sensitive skin or who haven't spent recent time in the sun should surely consider sunscreen lotion before spending several hours on the open water. The effective wind generated by a moving boat cools off the skin so well that many people never realize how badly they're being burned, until later. I always apply a skin moisturizer before and after a boat journey, in sunny or cloudy weather.

I also always wear sunglasses (polarized, if possible) to avoid the kind of eye strain vast expanses of sky and shimmering water generate, not to mention unexpected blasts of salt spray. Seasickness debilitates the most physically fit of humans, and to avoid this most unpleasant of syndromes one should eat sensibly before and during any boating excursion.

Eat lightly before boarding a boat: avoid coffee, alcohol, and greasy and heavy foods. Foods like tea, cold cereal, and toast tend not to upset the stomach, which erupts with uncommon violence during a seasickness episode. Physiologically, seasickness represents a disagreement between the eyes and the inner ear, which can perceive motion so differently as to involve the stomach in the dispute. In my experience the syndrome occurs in direct relation to the roughness ofthe water and its consequent effect on the motion of the boat. If you begin to feel ill, stay outside on deck, preferably near the stern, where motion is least. Keep your eyes on the horizon, breathe deeply, and try to distract yourself. For reasons unexplained, people seemingly hopelessly lost in seasickness suddenly revive when a whale shows up.

Whales usually show up at all of the locations detailed below, with sufficient regularity that those who go seeking usually find.