



“Bringing Humanity Full Circle Back into the Sea”

Homo aquaticus, Evolution, and the Ocean

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Abstract Futurists have recognized the ocean’s depths as resembling space in its promise as a setting for human success, survival, or redemption. Imagined futures of the ocean have been intertwined with reflections on human evolution and what it means to be human. In 1962 Jacques Cousteau announced *Homo aquaticus*, a vision involving both technological intervention and natural adaptation to intentionally evolve a species of human to live underwater. The story of *Homo aquaticus* reveals the extent to which humanity’s future has become tied to the ocean. This article historicizes the casual and common understanding that humans are connected to the sea by investigating the precursors to the *Homo aquaticus* idea, the attempts to realize this prediction through technology, and the legacies emerging from it. *Homo aquaticus* and its allied visions, while animated by older traditions, flourished in the historical context of intensely optimistic post–World War II hopes for human exploitation of the ocean, especially its depths. In the face of environmental change and awareness, subsequent versions reflect yearnings merely for survival of the human species. The origin, shape, and fate of the *Homo aquaticus* idea offer insights into our human relationship with the rapidly changing ocean environment, while its persistence may reflect hope for prospective solutions to encroaching, human-caused disasters.

Keywords *Homo aquaticus*, evolution, technology, underwater, futurism

Futurists have long embraced the idea that human survival will depend on the ability to survive in outer space. Some also recognized the ocean’s depths as resembling space in its promise for human success, survival, or redemption. Science fiction writer Arthur C. Clarke, more well-known for his space stories, created imagined futures in which the ocean proved key to humanity’s future. *The Deep Range* (1957) presents the ocean not only as a source of food and other material resources but also as an environment providing generative challenges to ensure social and moral development. The ocean’s critical place in the planet’s future and the survival of the human species has recently been recognized in the 2019 report of the Intergovernmental Panel on Climate Change, whose “assessment of the ocean and cryosphere in a changing climate reveals the benefits of

ambitious mitigation and effective adaptation for sustainable development and, conversely, the escalating costs and risks of delayed action.”¹ Mitigation and adaptation are needed to stave off some of the worst effects of climate-related problems, many of which, such as overfishing, acidification, plastic waste, noise pollution, and sea level rise, involve the oceans and, particularly, the undersea.

Imagined futures of the ocean have been intertwined with reflections on human evolution and what it means to be human. The aerospace engineer and futurist Erik Seedhouse anticipates the creation by genetic engineers of the new species *Homo aquaticus* three years before his predicted 2076 modification of humans for space.² Whether he knows or not, he is retreading a sequence anticipated by Clarke and other futurists in the 1950s and 1960s who expected ocean exploration to prepare the way for reaching space. In 1962 Jacques Cousteau announced *Homo aquaticus*, describing in a speech to the first World Congress on Underwater Activities in London the intentional evolution of a human species to live underwater, “bringing humanity full circle back into the sea.”³

By then, Cousteau was famous as the coinventor of the Aqualung, the first commercially available scuba gear, and as the creator of the popular underwater film, *Silent World*. While Seedhouse’s 2011 prediction for *Homo aquaticus* rested on genetic engineering and nanorobots, with no suggestion that nature might contribute, Cousteau’s involved both technological intervention and eventual natural adaptation.⁴

Cousteau invoked *Homo aquaticus* as the ocean, especially the undersea, came into focus as a prospective industrial site that, in parallel to the aerospace industry, inspired new technologies to enable undersea mining, aquaculture, oil drilling, and other ambitious uses. Many ocean scientists and engineers in the late 1950s and 1960s embraced a broader vision for working in and creating knowledge of the ocean than what came to be known as “oceanography.” Engineering and human physiology were viewed as integral to the ocean science that would support these new activities.⁵ Embraced by ocean boosters of the powerful metaphor of the ocean as a frontier akin to the American West animated this optimistic view of the sea as a place people could learn to control.⁶

Gaining the ability for people to work, and eventually live, in the sea was integral to the ocean frontier vision. Cousteau’s undersea work through the 1960s was animated by the goal of fully exploiting ocean resources. His *Homo aquaticus* speech came just after his Conshelf I experiment, in which two oceanauts, Albert Falco and Claude Wesly, lived for six days in a habitat at thirty-seven feet, working daily in depths down to eighty feet. Similar experiments were underway in the United States, including the

1. IPCC, “Summary for Policymakers.”

2. Seedhouse, *Beyond Human*, 133.

3. Quoted in Matsen, *Jacques Cousteau*, 160. There is no transcript of this speech, but it was described in media coverage at the time, especially Dugan, “Portrait of *Homo aquaticus*.”

4. Seedhouse, *Ocean Outpost*, 168.

5. Rozwadowski, “Engineering, Imagination, and Industry.”

6. Rozwadowski, “Arthur C. Clarke.” Cowan, *Frontiers of the Sea*.

Sealab program led by naval officer and physician George Bond, and another by the inventor-entrepreneur Edwin Link. While aerospace companies spun off divisions to develop small submersibles and other technologies to help people gain access to the ocean with the protection of hard shells and artificial environments, Cousteau's Aqualung was the linchpin of the anticipated new and more naturalized, though still highly exploitative, human relationship with the sea. Boosters assumed that human minds and hands, untethered from the surface, would be essential for coming undersea industries. Divers needed long decompression stops after deeper and longer dives, to allow accumulated nitrogen gas to dissipate so that divers did not get sick. Experiments with so-called saturation diving aimed to enable people to remain at depth for days or weeks in undersea habitats, from which they could go out and work in the ocean. The idea was to increase productive bottom time relative to decompression time.

Cousteau proposed medical intervention to create *Homo aquaticus*. As he explained, "They will breathe by extracting oxygen directly from water after operations to surgically implant gills in their throats."⁷ The gills would also enable carbon dioxide to be expelled. Lungs would be filled with an incompressible liquid to make them immune from the pressure that increases with depth, which Cousteau expected would enable swims to the depth of a mile and quick returns without decompression sickness. He predicted people would be born in sea floor habitats by 2000. Although they would require the same surgery as their parents, he implied that nature might soon intervene, declaring, "I think there will be a conscious evolution of *Homo aquaticus*, spurred by human intelligence rather than the slow blind natural adaptation of species."⁸ Invoking evolution, even if aided by intervention, naturalized the process.

The story of *Homo aquaticus* reveals the extent to which the future of humanity has become tied to the ocean, including as a font of moral rebirth and, more recently, as a refuge for the human species. Antony Adler argues that ocean sciences have been intertwined with fears and fantasies about the future, showing how "scientists, politicians, and publics have involved the marine sciences and ocean environments in discourse about the fate of humanity and of the planet—debates which have conjured fantasies about utopian futures, as well as fears about human weaknesses and of humanity's ultimate demise."⁹ If oceans have proven a site and focus of fear and fantasy across the nineteenth and twentieth centuries, as Linda Garforth demonstrates, apocalyptic and utopian science fiction visions of the future helped forge the sense of environmental crisis that arose in the 1970s.¹⁰ While the formal environmental movement focused more on air, fresh water, and land, the ocean also featured in dystopian as well as alternative utopian imaged futures. Media theorist Melody Jue views the ocean as "science fictional," not because of connections to aliens but because of "the effect of

7. Matsen, *Jacques Cousteau*, 160.

8. Matsen, *Jacques Cousteau*, 160.

9. Adler, *Neptune's Laboratory*, 2.

10. Garforth, "Environmental Futures."

cognitive estrangement underwater, of shocking the reader out of their normative habits of thinking and speaking about the world that belie our terrestrial acculturation.”¹¹ Jue’s attention to submersion, in her case diving as a method for the oceanic humanities, is shared by other blue humanists. Steven Mentz and Philip Hoare both write about their practices of ocean swimming and, in connection, invoke the so-called aquatic ape hypothesis, of a supposed aquatic phase in human evolution, not to debate the theory’s scientific strengths and weaknesses but to express “an ‘oceanic feeling’ that many of us recognize even when we don’t know where it comes from.”¹²

This article historicizes that “oceanic feeling” by investigating the precursors to and emergence of Cousteau’s *Homo aquaticus* idea and other similar visions, the attempts to realize these predictions through technology or the manipulation of bodies, and the legacies flowing from them. Evolution, as a biological and a social concept, and also as a metaphor, became fused to conceptions of the ocean by the nineteenth century and shaped the underwater imaginary thereafter. *Homo aquaticus*, while animated by older traditions, flourished in the context of intensely optimistic post-World War II hopes for human use of ocean, especially its depths. The imagined transformation of human bodies to survive underwater rendered the undersea, otherwise antithetical to them, into a natural environment for people. While Cousteau’s *Homo aquaticus* promised to unlock ocean wealth, subsequent versions shifted to yearnings merely for human survival. The origin, shape, and fate of the *Homo aquaticus* idea offer insights into our human relationship with the rapidly changing ocean environment, while its persistence may reflect hope for prospective solutions to encroaching, human-caused disasters.

The Ocean and Evolution

The association of the ocean with evolution surfaced by the nineteenth century. Charles Darwin worked out his theory of evolution by natural selection as men of science turned sustained attention to the ocean’s depths. He himself collected marine specimens with specially adapted oyster dredges, joining a growing community of naturalists intent on studying new marine species. During his HMS *Beagle* voyage, he gained “a familiarity with the seafloor that was unprecedented among naturalists of the day” through working side-by-side with naval hydrographers.¹³ Marine invertebrates figured prominently in Darwin’s thinking as he developed his theory, and a discovery in 1866 of a living species of stalked crinoid, previously known only through fossils, was greeted as possible confirmation of Darwin’s theory. This find suggested the ocean’s depths as an important site for evolution.¹⁴ Jules Michelet’s *La Mer (The Sea)*, popular in both

11. Jue, *Wild Blue Media*, 9.

12. Mentz, *Ocean*, 4; Hoare, “Homo Aquaticus.”

13. Sponsel, *Darwin’s Evolving Identity*, 33.

14. Darwin, *On the Origin of Species*, 90; Rehbock, “Huxley, Haeckel”; Alaniz, “Dredging Evolutionary Theory,” 94–189; Zuroski, “Depths of Knowledge,” 26–70; Adamowsky, *Mysterious Science of the Sea*, 37–72; Rozwadowski, *Fathoming the Ocean*, 3–35; Deacon, *Scientists and the Sea*, 306.

France and Britain, prompted contemplation of the human evolutionary relationship to the sea, encouraging readers “to imagine a fantastic metamorphic marine in which any organism might rapidly perform the physiological transformations that structure his evolutionary history.”¹⁵

Long before scientists looked seaward to contemplate evolution in action, the ocean fostered myths and traditions involving bodily transformations. Mermaids, creatures with the torso of a woman and a fish tail, appear in cultures in Europe, Africa, the Near East, and Asia and frequently portend disaster for mariners. In Ireland and the Orkneys, selkies were believed to transform from seal form to human by shedding their skin. Eighteenth-century natural philosophers investigated mermaids and tritons as specimens suggesting aquatic roots for humans.¹⁶ Such ancient traditions and scholarly musings may have inspired the Anglican theologian Charles Kingsley in his invention of “water babies” in his popular “evolutionary parable” of the same name, an 1863 tale that has not been out of print since its publication.¹⁷ The young chimney sweep Tom, on a life path veering away from cleanliness and virtue, enters an underwater fairy world and, in a scientific baptism, is transformed into a tiny water creature to give him the opportunity to redeem himself. By reversing his evolutionary development backward to the stage of gills, Tom can develop morally anew, in the right direction.

An influential promoter of Darwin’s theory, the German zoologist Ernst Haeckel, encountered evolution through his studies of radiolaria and other marine forms and, through his work, anchored human evolution to the sea. He argued that the development of the embryos of individuals of a species passed through the stages of that species’ evolutionary descent. He used embryos to illustrate his theory that “ontogeny recapitulates phylogeny,” pointing to structures in vertebrate embryos that in fish develop to support gills as representing a stage when the vertebrate resembles fishlike ancestors. In this influential, now discredited, formulation shown in figure 1, humans as they develop from fertilization onward pass through stages that reenact their oceanic origins.¹⁸

This link between human bodies and oceans was taken up by others. Sigmund Freud made Haeckel’s concept of recapitulation central in his doctrine of psychoanalysis, arguing that dreams about immersion in water not only sublimated anxieties about birth but also might reflect primordial oceanic ancestry.¹⁹ The British biologist J. B. S. Haldane, known for the “primordial soup” theory of life’s origins, for his work in population genetics, and for suggesting in vitro fertilization, among many other achievements, noted in 1927 the origin of humans in the ocean. Comparing blood’s composition to seawater, he wrote, “we pass our first nine months as aquatic animals, suspended in

15. Michelet, *The Sea (La Mer)*. Deam, “Great Melancholy Mother,” 88.

16. Scribner, “Such Monsters Do Exist.”

17. Beatty and Hale, “*Water Babies*”; Kingsley, *Water Babies*.

18. LeBrun, *Proteus*; Richards, *Tragic Sense of Life*.

19. Freud, *General Introduction to Psychoanalysis*, 132.

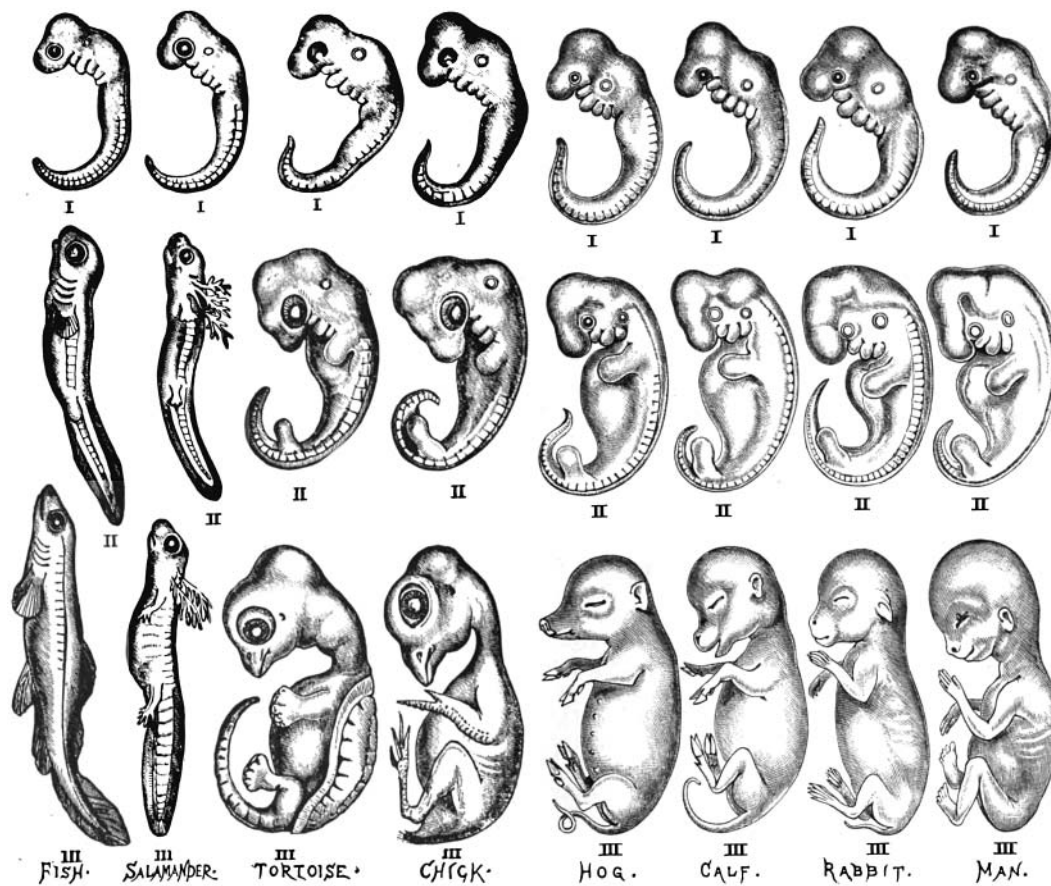


Figure 1. Ernst Haeckel's drawings of embryo development by the evolutionary biologist George John Romanes. From *Darwin, and after Darwin* (Chicago: Open Court, 1892).

and protected by a salty fluid medium. We begin life as salt-water animals.”²⁰ He foresaw humans’ having the capacity to control their evolution and face the necessity to do so.²¹ Science fiction writers at the time posited aquatic races and artificial gills, associating such adaptation with the primitive.²²

After the Second World War, the trope of human evolutionary origins in the sea pervaded writings relating to the potential of the ocean frontier. In her best seller *The Sea around Us*, Rachel Carson noted that, just as life began in the sea, “so each of us begins his individual life in a miniature ocean within his mother’s womb, and in the stages of his embryonic development repeats the steps by which his race evolved.”²³ Less poetically, the author of the popular 1954 book *Man under Water* exclaimed, “From

20. Haldane, “Man as a Sea Beast,” 60.

21. Adams, “Last Judgment,” 479–80.

22. Chambers, “Third Eye”; Karinthy, *Voyage to Faramido Capillaria*; Fezandié, “Secret of Artificial Gills”; Belayev, *Amphibian*.

23. Carson, *Sea around Us*, 14.

an evolutionary point of view, a person swimming underwater is back where he started from.”²⁴ The US President John F. Kennedy remarked at the celebration of the America’s Cup yacht race in 1962, “When we go back to the sea, whether it is to sail or to watch it, we are going back from whence we came.”²⁵ In 1960 Clarke published his nonfiction book *The Challenge of the Sea*, predicting innovative uses of the sea. Introducing it, the German rocket scientist Wernher von Braun noted life’s origins in the sea, then extended the evolutionary trajectory to prophesy: “From a poetical, but not too farfetched, viewpoint we on earth can consider the bottom of the sea as man’s point of departure on his extremely long trip to outer space.”²⁶

Natural evolution as understood through science gave way to progress that would lean on human ingenuity and technology, although the ancestral connection lingered. Carson asserted that people, who no longer live in the ocean, can reenter it by inventing “mechanical eyes and ears that would create for [their] senses a world long lost, but a world that, in the deepest part of [their] subconscious mind, [they have] never wholly forgotten.”²⁷ Clarke noted, “Every human being, during the nine months in the womb, retraces the story of evolution from sea to land, and at one time the embryo is almost more fish than animal.”²⁸ His invocation of human origins in the ocean laid the foundation for his hope that medicine might prove capable of “continuing development” of a human embryo at the “fish” stage to produce “men-fish who could live in air or water.” He mentioned ideas of unnamed scientists to make artificial gills and surgically attach them to human bodies and reported that Haldane thought men might breathe liquids if a suitable oxygen-carrying fluid could be developed.²⁹ These predictions animate the 1938 story “The Merman,” about an aquarist who invents a compound to turn lungs into gills and accidentally uses it on himself.³⁰ Clarke’s extensive diving expertise clarified the functional implication for human bodies underwater: lungs full of liquid instead of gas would free a person from the danger from crushing pressures of the depths.³¹ By the time Cousteau predicted *Homo aquaticus*, a number of observers both emphasized that human bodies had emerged from an evolutionary process that began in the sea, and predicted a future when a combination of intelligence and technology might render the underwater environment a natural one, even for the air-breathing human species.

Inspirations for *Homo aquaticus*

While Clarke’s book and “men-fish” prognostication predate Cousteau’s *Homo aquaticus*, Cousteau’s inspiration was likely similar to Clarke’s rather than derived from it. First,

24. Billings, *Man under Water*.

25. Kennedy, “Remarks at the America’s Cup Dinner.”

26. Von Braun, “Introduction,” 7.

27. Carson, *Sea around Us*, 15.

28. Clarke, *Challenge*, 37.

29. Clarke, *Challenge*, 37.

30. De Camp, “Merman.”

31. Clarke, *Challenge*, 38.

they shared a belief in the incredible promise of the ocean to provide material benefits if people could work in it. Second, the trope of human origins in the ocean was widespread by then and related to older associations of the sea as a site of respite, renewal, and spiritual rebirth through submersion.³² Aside from these general contexts, there are specific stories from the World War II and postwar years that kept afloat the idea of human bodies transformed to live underwater.

A 1942 humorous fantasy novel, *Mr. Limpet*, by the American writer Theodore Pratt, introduced a bespectacled bookkeeper who became a fish, aided the United States in the war against Germany, and swam off to evolve a new, better “race of men.”³³ Mr. Limpet, in despair because of the raging global war, worries that the human species “had reached the topmost stair in its evolution and would now go down the other side with a rush,” disappearing entirely so that “human life would have to evolve all over again.”³⁴ Standing at a pier, Limpet wishes he were a fish, falls in, and becomes one. On learning that the United States has entered the war, he convinces the navy to commission him as a lieutenant to spot German submarines. After his valuable service a friend warns him of plans to study then kill him, so he swims off with Ladyfish, whom he earlier rescued from a fishing boat, to the breeding ground where, “with human intelligence still contained in him, he and Ladyfish might produce something from which would evolve, if it were necessary, another race of men,” presumably free of those qualities that led to world war.³⁵

The tale of Mr. Limpet involves the partial rewinding of evolution. Limpet’s body transforms into a fish but retains his human intelligence—and his poor sight; he still needs eyeglasses! The grimly optimistic ending suggests that humanity’s future depends on the offspring of he and Ladyfish retreading evolutionary ground. The ocean not only fostered humanity’s original evolution but also was the obvious site for the do-over. Yet the new species of human must return to land: “As the present one had done, it would crawl from the salt sea.”³⁶ This element would be jettisoned in *Homo aquaticus* visions to come. *Mr. Limpet* inspired the 1963 movie, *The Incredible Mr. Limpet*, which opens with a top-secret meeting to discuss intelligent activity among dolphins. Those familiar with Limpet’s wartime service suspect he is responsible. The final screen reads, “The End?,” suggesting he will continue his exploits. The film does not invoke evolution explicitly, but Limpet tells Ladyfish that together they could be the start of a new and better world.

While the movie version of Mr. Limpet’s adventures could not have contributed to Clarke’s or Cousteau’s ideas about men-fish, which appeared in 1960 and 1962 respectively, either could have read Pratt’s novel. Other stories before then also played on

32. Corbin, *Lure of the Sea*, 21.

33. Pratt, *Mr. Limpet*, 141.

34. Pratt, *Mr. Limpet*, 7.

35. Pratt, *Mr. Limpet*, 141.

36. Pratt, *Mr. Limpet*, 141.

evolution's acting on bodies underwater and may have influenced *Homo aquaticus*. The 1954 film *Creature from the Black Lagoon* posits a Devonian-era amphibious humanoid representing a link between land and sea animals. James Blish's 1952 story, "Surface Tension," watches the crew of a human colonization ship create a race of microscopic aquatic humanoids to survive on a planet whose land is covered with shallow puddles.³⁷ Kenneth Bulmer's 1961 *Beyond the Silver Sky* similarly depicts a world whose "sky," the underneath of the sea's surface, is dropping. The gilled inhabitants actively try to prevent further aquatic adaptations such as webbed feet. In his earlier *City under the Sea*, aquaculture is staving off starvation for the world's billions, but the undersea has fostered a new race of water-breathing human monsters.³⁸

Whether Cousteau or Clarke encountered these stories of humans evolving to live underwater, they reveal oceanic meditations in imagined futures of the period. One story prompts detailed consideration because of its striking balance of natural and technological adaptation to the depths. In *Undersea Fleet*, published by Frederik Pohl and John Williamson in 1956, Sub-Sea Academy cadet Jim Eden befriends a classmate, David Craken, who was born in a pressure-protected dome four miles deep near the Kermadec Trench, one of the deepest on earth. Eden learns from Craken about a group of human-like creatures who evolved to live underwater and have been taught by Craken's father to domesticate the sea serpents who guard the rare and valuable Tonga pearls from the Trench (fig. 2). The Trenchers, as they call themselves, descended from Polynesians trapped on sinking land that became a seamount. "When their island submerged, they somehow managed to live. They reverted to the past, the far-distant past when every living thing lived in the water." Craken's father calls them "amphibians," David explains, because "their lungs are changed to work like gills."³⁹

Note the insistence on evolutionary reversal to enable survival. The underwater photographer John Williamson associated Polynesians and other Indigenous divers he hired with amphibiousness. Commenting on the 1941 American Museum of Natural History underwater diorama, "Pearl Divers in Coral Reef, Tongareva, French Polynesia" (fig. 3), on which Williamson worked, the cultural historian Ann Elias observes that the divers have strangely elongated fingers and limbs, suggesting the intent to show "that these are native people who long ago adapted to the underwater environment by becoming amphibians."⁴⁰ Williamson described an African-Bahamian diver he hired as "nearly as amphibious as human beings can be."⁴¹ Rendering Indigenous divers as more

37. Blish, "Surface Tension."

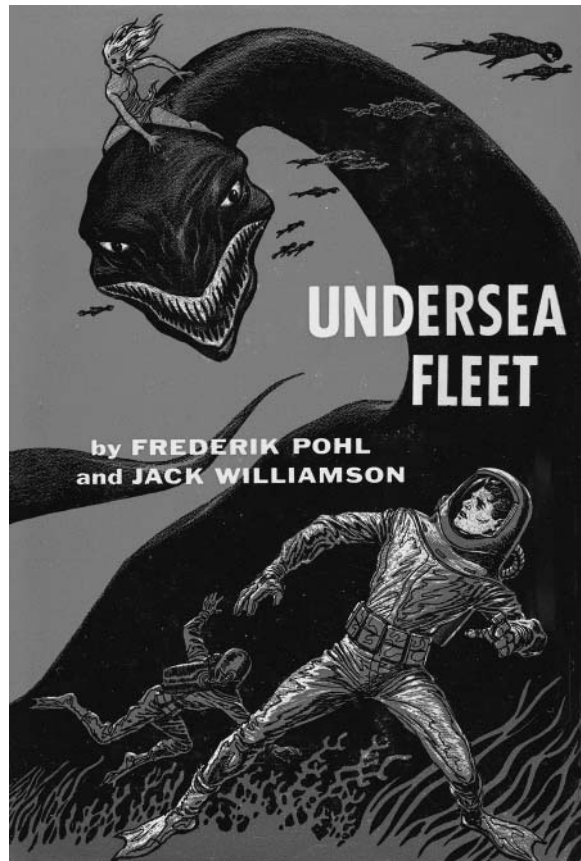
38. Bulmer, *Beyond the Silver Sky* and *City under the Sea*.

39. Pohl and Williamson, *Undersea Fleet*, 77–78.

40. Elias, *Coral Empire*, 77.

41. Williamson, *Twenty Years under the Sea*, 64; Nicole Starosielski and Jon Crylen also note the association of non-white native people as naturally suited to underwater activities, particularly by Williamson. Starosielski, "Beyond Fluidity," 155, 159–63; and Crylen, "Living in a World without Sun," 18–19.

Figure 2. Cover of Frederik Pohl and Jack Williamson's *Undersea Fleet*, which shows two cadet divers from the Sub Sea Academy in the foreground and a woman riding an underwater creature behind them. Cover art by Ed "EMSH" Emshwiller; courtesy of the Emshwiller family. Copy provided by the Special Collections Research Center, Syracuse University Libraries.



animal than human, a trope dating to the sixteenth century, condemned them as inferior to white people.⁴²

For white people to gain the ability to operate successfully underwater, ingenuity and technology, not nature, were the key. This trajectory is apparent in Captain Nemo's walk through the sea floor "forest" as Crespo enabled by special underwater breathing suits, as narrated by Jules Verne in *20,000 Leagues under the Sea* (fig. 4).⁴³ In *Undersea Fleet*, while the Trenchers are evolved from Polynesians, Eden and the other cadets undergo rigorous training and are issued specialized technology to operate at great depths. They are even part of an experiment with "depth adaptation" injections to make their tissues more resistant to pressure.⁴⁴ The historian Gary Kroll argues that post-World War II knowledge of the ocean was mediated by the twin dynamic of "technophobia" and "technophilia," best reflected for him by Thor Heyerdahl and Cousteau. Heyerdahl's technophobic engagement with the ocean, signaled by the balsa logs of the raft *Kon-Tiki* that carried him in 1947 from South America to the Tuamotu Islands,

42. Delbourgo, "Divers Things."

43. Verne, *Twenty-Thousand Leagues under the Sea*, 84–94.

44. Pohl and Williamson, *Undersea Fleet*, 4.



Figure 3. A Polynesian pearl diver working underwater on a coral reef in Tongareva, French Polynesia. Photo is part of the Pearl Divers Group diorama in the Milstein Hall of Ocean Life, American Museum of Natural History Library, Image # ptc-459.

celebrated the primitive and the exotic, exemplifying the postwar societal impulse to escape civilization. Cousteau's technophilia, by contrast, involved technologies such as his Aqualung, diving saucer, and undersea habitats that promised human conquest of the sea.⁴⁵ *Undersea Fleet* reflects this postwar tension in the respective relationships of the Trenchers, on the one hand, and the cadets, on the other, with the ocean.

Whether or not fiction summoned *Homo aquaticus*, more proximate evidence suggests that Cousteau, or perhaps the American journalist James Dugan, began early on playfully associating divers using Cousteau's novel "diving lung" with human evolutionary change.⁴⁶ Dugan met Cousteau in 1944 and wrote enthusiastically about his diving and filmmaking activities thereafter. His first article, penned immediately after the meeting (though not published until 1948), introduced readers to Cousteau's divers as "a new species of large mammalian fish," calling them "the first of the menfish, a new order of marine life."⁴⁷ Dugan dubbed Cousteau "the progenitor and first of the species *pices erectus*" and joked, "I think Commander Cousteau was reluctant to tell me that

45. Kroll, *America's Ocean Wilderness*, 152–88.

46. Dugan, "Portrait of *Homo aquaticus*," 38. Cousteau's biographer Brad Matsen dates their first meeting to spring 1945; Matsen, *Jacques Cousteau*, 90–91.

47. Dugan, "First of the Menfish."

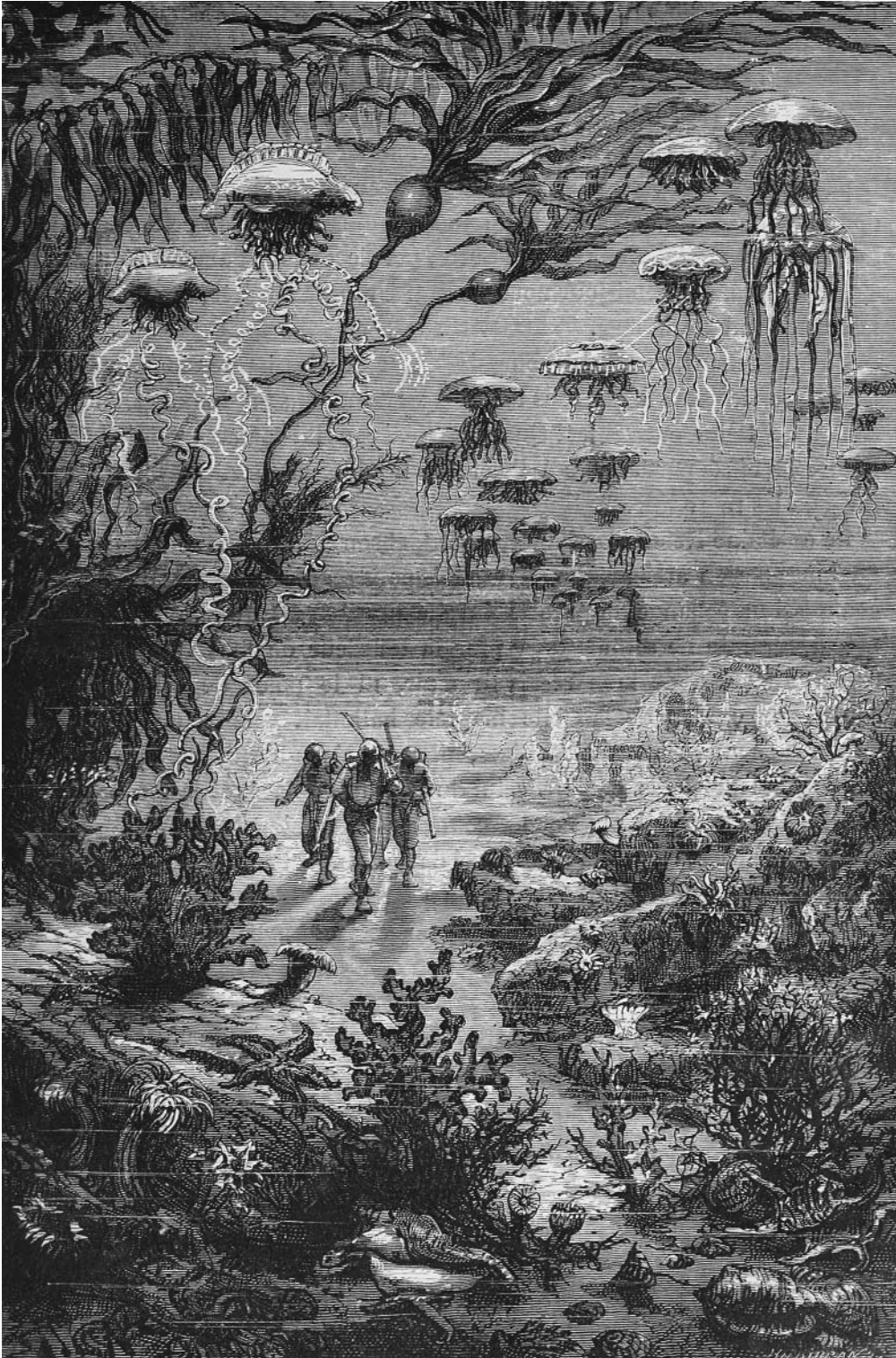


Figure 4. Illustration of Captain Nemo and his guests, who wearing diving apparatuses so they can walk and hunt in the submarine forest of Crespo. From Jules Verne, *Vingt-mille lieues sous les mers* (J. Herzel: 1870); plate by Alphonse de Neuville and Édouard Riou.

[diver] Frederic Dumas was turning into a fish.” Many of the photographs from the article appeared again in a *Life* magazine piece that garnered Cousteau his first Hollywood contact.⁴⁸ Dugan’s relationship with Cousteau extended to a partnership; among other projects he ghostwrote *Silent World* in 1953, coauthored *The Living Sea* in 1963, and assisted with the proposal for film industry funding of *Conshelf II*, the phase of Cousteau’s undersea habitat program that led to the 1964 film *World without Sun*.⁴⁹

Evolving *Homo aquaticus*

While technology would be essential to complete the transformation to *Homo aquaticus*, divers widely agreed that the experience of diving changed people profoundly. Divers’ bodies underwent not only physiological changes that technology or surgery aimed to overcome but also the bodily experience of the undersea that seemed to convey a privileged knowledge of the ocean. The oceanographers Willard Bascom and Roger Revelle explained that a scientist undersea using scuba “becomes part of the medium. Subject to the same forces, he partakes of the feelings of the underwater animals as he is swaying with passing waves and drifts along, weightless, with the ocean currents.”⁵⁰ This experience from the sea creatures’ perspective transformed divers. As Clarke declared, “Everyone who goes underwater becomes an amateur scientist.”⁵¹ Immersion also promised divers more. Shortly before Cousteau’s *Homo aquaticus* speech and two days after returning to the surface from his week in the *Conshelf I* habitat, Falco reported to Cousteau: “I don’t know exactly what happened. I am the same person, yet I am no longer the same. Under the sea everything is . . . moral.”⁵² Dugan insisted that “the coming undersea life will be inspiring,” drawing parallels to creative historical epochs such as the Renaissance.⁵³ The presumed efficacy of underwater experience to provoke lasting change in divers may have contributed to the vague but optimistic sense that, once human ingenuity enabled people to operate underwater, nature might take over.

The idea that humans could direct their own evolution emerged in the late nineteenth century with Francis Galton, the founder of eugenics. As Clarke, Cousteau, and others grew obsessed with ideas of bringing human bodies underwater, two famous biologists and public intellectuals, Julian S. Huxley and Theodosius Dobzhansky, embraced the possibility of intentional human evolution. Huxley argued that knowledge contributes importantly to cultural evolution because it can open up new modes of existence, as agriculture did in the Neolithic revolution. He believed evolutionary change could be “consciously directed.”⁵⁴ The geneticist Theodosius Dobzhansky pointed to

48. Matsen, *Jacques Cousteau*, 103–4.

49. Matsen, *Jacques Cousteau*, 119–20, 127–28, 162, 182.

50. Bascom and Revelle, “Free-Diving.”

51. Clarke, *Challenge*, 164.

52. Cousteau, with Dugan, *Living Sea*, 325.

53. Dugan, “Portrait of *Homo aquaticus*,” 218–19.

54. Huxley, “Guest Editorial,” 22. Another scientist who believed culture to be increasingly driving evolution was the physiologist Harold F. Blum (“Perspectives in Evolution”).

changing environments as spurs for human evolutionary change. He decried the problem of overpopulation and related environmental stresses that would require adaptation for human survival. Dobzhansky, like Huxley, believed that people could choose to introduce purpose into their own evolution and felt that anthropology could guide the effort.⁵⁵

Although neither Huxley nor Dobzhansky addressed conscious human evolution to use the ocean more intensively, it's not much of a stretch to imagine an enthusiast seeing ocean exploitation as a parallel to the development of agriculture. Colonizing the ocean could ease the ill effects of overpopulation, while the novelty of the underwater might in turn promote evolutionary change. Indeed, ocean boosters made claims that reflected such contemporary ideas. The author of one popular book declared, "In spite of these [physical] shortcomings the human species has achieved a mastery of the oceans unrivalled by any other animal. Man has succeeded here . . . not by physical adaptations made to a particular environment, but in the prodigious evolutionary development of his brain."⁵⁶ The US Senator Clairborne Pell, sponsor of the 1966 Sea Grant College and Program Act, similarly explained the challenges that arise because "man is no longer an amphibian and has not readapted to the ocean as his mammalian cousins—the whales, seals, and porpoises," noting, "he can succeed in reinvading the deeps only because he has a creative brain and skills that substitute for physical adaptation."⁵⁷ While these examples stress technology and skill, Cousteau extended the adaptation to bodily changes. He recalled accompanying Falco and Wesly to Conshelf I, reflecting:

The gist of my life's work had been to free man from the bondage of the surface. . . . And not only to put man there but to help him adapt, explore, subsist, survive, and learn. And he was beginning to live in the ocean, of the ocean, and for the ocean in the person of those two possessed men who calmly ignored me. I had a pang of envy for them. Men of a new kind were beginning to evolve, and I was not one of them.⁵⁸

For Cousteau, as for Pratt's Mr. Limpet, the process of subsisting, surviving, and learning in the ocean's depths would change the individuals, but with consequences for the species.

While innumerable observers ritually noted that human life emerged from the sea, a well-known marine scientist posited a direct human evolutionary connection with water. In 1960 Sir Alistair Hardy delivered a startling lecture to the British Sub-Aqua Club in Brighton, "Aquatic Man: Past, Present, and Future." Hardy by that time was famous for his research and writings; he served as zoologist on the RRS *Discovery*

55. Dobzhansky, "Anthropology and the Natural Sciences."

56. Carrington, *Biography of the Sea*, 197.

57. Pell, *Challenge of the Seven Seas*, 138.

58. Cousteau, with Dugan, *Living Sea*, 318.

investigations in Antarctica from 1925 to 1927, invented the continuous plankton recorder, and contributed greatly to the understanding of marine ecology. Soon after returning from Antarctica, he learned that humans differ from other primates in having a layer of subcutaneous fat.⁵⁹ From that time he entertained the idea that humans might have an aquatic past but did not make his hypothesis public until late in his career, after he had been knighted. As he explained in his lecture and a later essay, many uniquely human characteristics might be explained by evolution to live an aquatic life.⁶⁰ For example, apes can walk upright but do so only when wading through water, so perhaps erect posture and bipedalism emerged from spending time in water. Noting the amount and accessibility of food along both fresh and saltwater coasts, Hardy suggested that getting shellfish out of hard shells may have motivated tool use. Human hairlessness might be another vestige of a semiaquatic lifestyle.

Hardy not only posited an aquatic past for humans but also predicted that “history will repeat itself and Man will be forced once again into the sea for a living.”⁶¹ Global overpopulation and hunger were the forces that would turn people back to the ocean, he felt. The geographer Carl O. Sauer invoked Hardy’s theory in 1962. Sauer’s focus on relationships between human ancestors and their environments led him to speculate that seacoasts provided the best opportunity for human progenitors to “eat, settle, increase, and learn.”⁶² While Cousteau probably did not know Sauer’s work, the question remains whether he encountered Hardy’s thesis. To be sure, Hardy insisted, “I am not supposing . . . that we shall have an actual race of aquatic men.” Instead he saw “the pioneer aqua-men of today” as those who would develop industrial underwater fish culture on the continental shelf. In short, Hardy expected that the anticipated intensified use of the ocean would depend on technology, not evolution.

Although there is no clear evidence, it is difficult to imagine that Cousteau had not encountered Hardy’s theory. Cousteau gave his *Homo aquaticus* speech two years after Hardy’s lecture. Hardy was a well-known ocean scientist, and Cousteau, though himself more of an ocean technologist, was acquainted with many ocean scientists. Also, Cousteau was head of the World Underwater Federation, whose members were scuba divers from three dozen nations, and Hardy delivered his lecture to a diving club, so it seems likely he heard of it through diving circles. Finally, Hardy’s comments attracted media coverage, which though critical from the perspective of evolutionary biology should have caught the attention of Dugan, a journalist interested in underwater exploration who was working closely with Cousteau.⁶³ Indeed, Dugan wrote favorably about

59. Marshall, “Alister Clavering Hardy,” 252.

60. Hardy, “Was Man More Aquatic in the Past?”

61. Hardy, “Will Man Be More Aquatic in the Future?”

62. Sauer, “Seashore,” 45. See also Harris, ““Farther Reaches of Human Time.”” Earlier, Sauer had suggested that sedentary settlements in rich coastal environments with reliable access to marine resources might have domesticated plants; see *Agricultural Origins and Dispersals*.

63. Marshall, “Alister Clavering Hardy.”

Hardy's theory in conjunction with Cousteau's *Homo aquaticus* idea in a 1963 *New York Times* feature, claiming positive reactions to *Homo aquaticus* by physiologists and oceanographers and remarking that "it was no surprise to the distinguished zoologist Sir Alistair Hardy, who postulates that the human species has already gone through an aquatic stage in its development."⁶⁴

Enacting *Homo aquaticus*

Cousteau's *Homo aquaticus* vision, as sketched in a July 1963 *Popular Mechanics* article, required people to "live within the sea and take possession of it."⁶⁵ Although he became known as an environmentalist, his ocean exploration until the mid-1960s and his articulation of *Homo aquaticus* were both anchored in ambitions to colonize the ocean and exploit its resources.⁶⁶ As Jon Crylen and Nicole Starosielski point out, Cousteau's projects and the more general ambitions for the oceanic undersea were exclusionary, accomplished by white male bodies and constructing the sea generally as a place for whites.⁶⁷

The imagined future in *Undersea Fleet* posited a stark distinction between nonwhite bodies, male and female, that adapted naturally to the undersea and the white male bodies of the cadets who conquered the ocean through technology. Divers and ocean boosters in the 1950s and 1960s conflated nature and technology in much the same way Cousteau did through *Homo aquaticus*. With scuba, the author of a diving handbook explained, people "are returning to the atmosphere in which life began millions of years ago."⁶⁸ Lloyd Bridges, star of the popular television series *Sea Hunt*, noted that life originated in the sea, musing, "Perhaps this accounts for our quick adaptation to the fluid world."⁶⁹ To some observers, technology enabled a return to the environment that fostered life; others invoked the possibility of a lingering ancient memory assisting people who go underwater. Dugan claimed that *Homo aquaticus* was "completing the cycle" by returning men to the sea, while Cousteau explained that humans should do "what porpoises, seals and other mammals have done already—adapt to underwater living."⁷⁰ Achieving this would begin with technology, at first the Aqualung, but also saturation diving experiments aimed to prepare for permanent habitation. These experiments were viewed in evolutionary terms. A 1966 Sealab II report explained, "As man in the beginning came from the sea, the surface environment held the evolutionary design

64. Dugan, "Portrait of *Homo aquaticus*," 38.

65. Cousteau, "Ocean-Bottom Homes," 98.

66. Kroll, *America's Ocean Wilderness*, 152–88; Rozwadowski, *Vast Expanses*, 161–87; Crylen, "Living in a World without Sun."

67. Crylen, "Living in a World without Sun," 3–4, 18–20; Starosielski, "Beyond Fluidity." As Andrew Kahl shows, beaches were also enforced as white spaces in the twentieth century; *Free the Beaches*.

68. Sweeney, *Skin Diving*, 53.

69. Bridges, with Barada, *Mask and Flippers*, 5.

70. Dugan, "Portrait of *Homo aquaticus*"; *Time*, "Oceanography."

criteria—as we enter the program of retrogressive evolution, we must proceed with utmost care.”⁷¹ Researchers had to unwind human evolution to seek human survival in the depths. The obvious solution at first was technology.

In the years immediately following Cousteau’s speech, several institutions and experiments seemed to lead the way. In 1962 the British naval surgeon Stanley Miles published a book on medical problems of the underwater environment.⁷² In 1963 Per Solander took the helm of the new Physiological Research Laboratory at Scripps Institution of Oceanography. Intended as a bridge between Scripps’s physiologists, biologists at the University of California, San Diego, and the university’s new medical school, the lab undertook “cardiovascular and respiratory research on large marine vertebrates and ‘aquatic’ man.”⁷³ Four years later the Undersea Medical Society formed in Bethesda, Maryland.⁷⁴

Other initiatives concentrated on equipment rather than medical research. Walter Robb, in research for General Electric, created a silicone membrane that kept water out but let oxygen and carbon dioxide through. Articles in *Science News Letter* and *Life* magazine in 1964 touted potential uses for submarines, undersea habitats, or hospital patients needing enriched oxygen environments. Eye-catching photos of a hamster seemingly floating in water but with dry fur accompanied the articles. The “aqua-hamster” drew oxygen from the water surrounding its tank (fig. 5).⁷⁵ Another researcher, Walde-mar A. Ayres, tested an artificial gill at Jones Beach, New York, in 1962, a month before Cousteau’s speech. Ayres patented his device in 1966, which prompted *Popular Mechanics* to report on it as well as Robb’s membrane.⁷⁶

Experiments more aligned with Cousteau’s vision, attempting to flood the lungs of mammals with oxygenated liquid, took place alongside artificial lung construction. The Dutch physiologist Johannes A. Kylstra began a series of experiments in 1961 that flooded the lungs of mice, then dogs, with oxygenated liquid. The mice survived many hours before dying, not from lack of oxygen but from the inability to eliminate carbon dioxide. A shift to dogs as experimental animals enabled measurement of the actual exchange of gases in their lungs while breathing water. These experiments resulted in six of sixteen dogs surviving periods of water breathing with no ill effects. Finally, Francis J. Falejczyk, “a courageous deep-sea diver” and former Sealab aquanaut, volunteered to have his windpipe anesthetized and one lung flooded with oxygen-rich liquid. He reported that the liquid-filled lung did not feel noticeably different than his other one.⁷⁷

71. Mazzone, “Human Physiology Aspects,” 110.

72. Miles, *Underwater Medicine*.

73. Appel, *Shaping Biology*, 178–206. Quote is from Shor, *Scripps Institution of Oceanography*, 169.

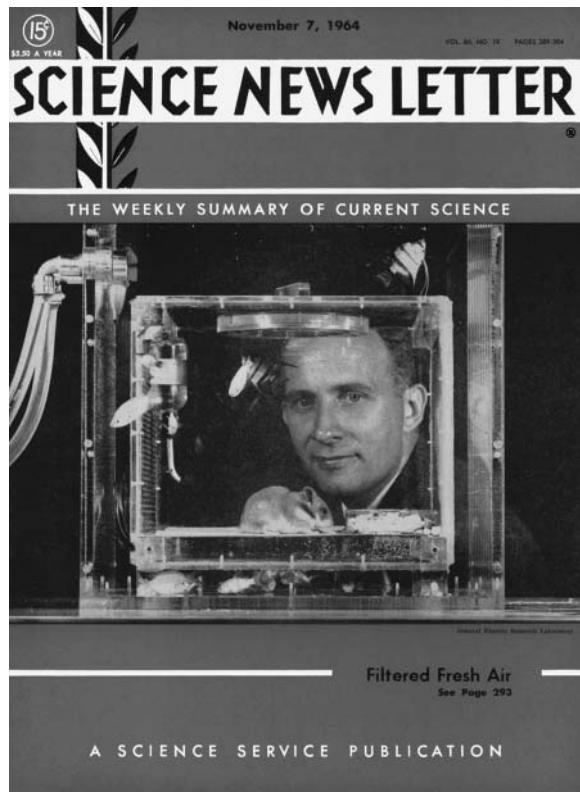
74. Chandler, *Undersea and Hyperbaric Medical Society*.

75. *Science News Letter*, “Membrane Filters Air”; *Life*, “Gills for a Hamster.”

76. Cloud, “Artificial Gills.”

77. Kylstra, “Experiments in Water Breathing”; *Buffalo News*, “Francis J. Falejczyk.” John Clarke. “Liquid Breathing: It’s Not as Easy as It Looks.” John Clarke Online, June 20, 2011.

Figure 5. *Science News Letter* cover from November 7, 1964, featuring Walter L. Robb looking from behind a fish tank and a second tank with a hamster that is breathing oxygen that has passed from the water in the fish tank through Robb's gill-like silicone membrane.



While possible applications of liquid breathing included space exploration, Kylstra was most interested in the possibilities for ocean exploration.⁷⁸

Kylstra considered his demonstration that mice could breathe oxygen in liquid evidence of the reversibility of evolution because adult mammals had accomplished “aquatic respiration.” He explained that people had for centuries tried to “invade” the oceans, “perhaps driven by a subconscious nostalgia for atavistic weightlessness in the vast hydrosphere.”⁷⁹ Although he believed that human desire to enter the ocean was natural, success would require technological manipulation of bodies. Many popular accounts of ocean exploration reported these experiments on artificial gills and liquid breathing.⁸⁰ Achievement of undersea colonization would require, Pell argued, the “creative brain and skills that substitute for physical adaptation,” and he predicted “true fish-men taking their oxygen from the water, their ears and skin protected by special films, living, working, and playing in the depths.”⁸¹ Similarly, the 1967 book *Riches of the Sea* anticipated the human ability to breathe oxygen from seawater based on the work

78. Kylstra, “Breathing of Pressure Oxygenated Salt Solutions.”

79. Kylstra, “Breathing of Pressure Oxygenated Salt Solutions,” 159.

80. Some examples are *Life*, “Mouse Breathes Liquid”; Pennington, *New Ocean Explorers*, 181; Pizer, *World Ocean*, 180; Bixby, *Seawatchers*, 175–77.

81. Pell, *Challenge of the Seven Seas*, 138, 141.

of Ayres, Kylstra, and others, eventually to result in Cousteau's *Homo aquaticus*, "the final step toward making men underwater creatures."⁸²

Legacy of *Homo aquaticus*

While Cousteau may have drawn inspiration from Hardy's aquatic ape hypothesis, his reported answer to critics at the World Underwater Congress suggested that futurism motivated him: "Ever since Jules Verne," he retorted, "the informed human imagination has projected what is to come."⁸³ Cousteau's *Homo aquaticus* idea, reported in media outlets including *Science Digest*, *Popular Mechanics*, the *New York Times*, *Life Magazine*, *Time*, and others, may have contributed to the popularity of *The Incredible Mr. Limpet* and other similar stories.⁸⁴ The first fictional "Homo Aquaticus" appeared immediately after Cousteau's announcement, introduced by its editors with Cousteau's comment on Verne. In Poul Anderson's 1963 story, space explorers investigate the fate of colonists who had built a planet's abandoned cities, discovering a group of air-breathing, hairless, pale swimmers with fins, webbed feet and hands, and no external ears who had evolved into a sentient aquatic species (fig. 6).⁸⁵ These beings had returned to the sea for survival when they lost the power sources for their highly technological society. Gordon Dickson's 1967 novel *The Space Swimmers* chronicled a division of humanity into the Land-Born and the Sea-Born; its sequel, *Home from the Shore* (1978), features the long-looming clash between them.⁸⁶

Science fiction of the 1970s likewise included evolutionary alongside technological changes enabling people to live and work undersea to survive terrible catastrophes on land. In Hal Clement's *Ocean on Top*, the narrator investigates missing fellow Power Board agents and discovers an unknown, self-sufficient undersea civilization that predates the global power rationing regime. Its surgically altered citizens breathe an oxygen-saturated liquid trapped near the ocean floor and subsist on cultivated plants in a lifestyle requiring enormous energy.⁸⁷ In Monica Hughes's *Crisis on Conshelf Ten*, moon resident Kepler Mastermann visits an undersea community on Earth and sees that the terrestrial governments are commandeering undersea resources, just as they do to space colonies. He discovers people who have modified their bodies to have gills instead of lungs, which has put them "out on a limb of the tree of evolution, and they're just about to saw off the branch!" The changes they undergo from living in the depths threaten their humanity.⁸⁸

82. Carlisle, *Riches of the Sea*, 124.

83. Dugan, "Portrait of *Homo aquaticus*," 66.

84. *Science Digest* 54 (1963), 86. *New York Times*, "Cousteau Envisions a 'Water Man'"; *Newsweek*, "Aquanauts"; Dugan, "Portrait of *Homo aquaticus*," 38; Cousteau, "Ocean-Bottom Homes"; *Time*, "Oceanography."

85. Anderson, "Homo Aquaticus." *Amazing Stories*, "Editorial," September 1963, 5.

86. Dickson, *Space Swimmers* and *Home from the Shore*.

87. Clement, *Ocean on Top*.

88. Hughes, *Crisis on Conshelf Ten*, 121.

Figure 6. September 1963 cover of *Amazing Stories*, which features an illustration from Poul Anderson's "Homo aquaticus."



While both these stories involve surgical manipulation of bodies to permit survival undersea, the 1975 science fiction novel *Red Tide* posits that the pressure at great depths could change a body to enable survival there. An experimental station on the Cobb seamount at 110 feet, which is dedicated to researching how humans could live independently underwater, receives orders to destroy its surface barge and cut communications because biological warfare has released a deadly epidemic. One project involves liquid breathing through surgical intervention, resulting in dramatic changes in the men who undergo the procedure: "They seemed a species apart. Their rhythms of life were different. They slept in short cat naps."⁸⁹ Whereas scuba felt to one of them like "fighting his way through an alien element," the liquid he breathed "seemed to flow in and out of him like life-blood. He felt ethereal, a disembodied spirit, energy through ether, working directly with the pressure and current like a hawk, catching a thermal."⁹⁰ A second line of research found that the pressure at great depths was permanently altering the bodies of the mice, and one scientist, stuck at the lowest level of the facility at seventy-two hundred feet. The scientist reports that mice are taking up carbon dioxide and metabolizing it to produce feces that have become their own food supply. She envisions surgery to recirculate feces to small intestines so that human deep-sea dwellers would not need

89. Chapman and Tarzan, *Red Tide*, 224.

90. Chapman and Tarzan, *Red Tide*, 230.

to eat. When the station crew try to rescue her, she refuses, explaining, "I'm not a regular member of the human race anymore."⁹¹ Dwelling at great depths has initiated a permanent change to her physiology, just as the surgical manipulation of the two men irrevocably transformed them.

Science fiction since then has continued to view the ocean as the site of alternative evolutionary possibilities, including for feminist- and pacifistic-imagined futures in addition to survivalist tales. The elaboration and promotion of Hardy's aquatic ape hypothesis by Elaine Morgan in her 1972 book *Descent of Woman* helped inspire such stories. Morgan called attention to the sexism embedded in theories of men hunting in savannah environments as the primary driver of human evolution. Although panned by biologists, the book became a best seller, making the idea of humans evolving in response to aquatic environments available to futurists.⁹² Historian of science Erika Lorraine Milam analyzed two works from the 1980s that posited novel biological and social orders in the far future in response to such evolution.⁹³ Kurt Vonnegut's *Galapagos* tells the story of a group of people stranded on an imaginary island who become the founding population of a new species of humanity to survive the human-caused catastrophes that killed off everyone else on the planet.⁹⁴ Through the extreme contingency of a shipwreck and the subsequent evolutionary adaptation to life in water, humans' brains have shrunk, their skin has grown fur, and their hands have transformed into flippers, rendering the far-distant species peaceful and content if animalistic. Drawing inspiration from Morgan's feminist critique, Joan Slonczewski's *Door into Ocean* similarly posits evolutionary and social changes associated with a population living on an oceanic moon.⁹⁵ The nonviolent, all-female Sharers have physical adaptations to their watery world including inner eyelids to protect eyes during diving and skin that appears purple as a result of symbiotic microbes that release oxygen to enable long dives.

Aquatic adaptation remains a theme in science fiction and popular culture, especially as awareness of near-future sea level rise has emerged. Some stories involve permanent physical changes to bodies to enable underwater survival or action. In the 1983 novel *Startide Rising*, dolphin bodies have been genetically altered by human patrons to enable space travel, but prostheses are needed by humans and dolphins depending on whether the action is in dry or wet spaces aboard vessels or on planets where they land.⁹⁶ Paul d'Entremont's 1990 story, "Waterbreathers, Inc.," chronicles a community whose citizens use nanorobots, in combination with a process that can be taught, to breathe underwater and then remove the water from their lungs on return to dry habitats. That children learn the process more easily than adults suggests future natural

91. Chapman and Tarzan, *Red Tide*, 236.

92. Morgan, *Descent of Woman*; Milam, "Dunking the Tarzanists"; Milam, "Elaine Morgan Obituary."

93. Milam, "Old Woman and the Sea."

94. Vonnegut, *Galapagos*.

95. Slonczewski, *Door into Ocean*.

96. Brin, *Startide Rising*.

evolution.⁹⁷ The 1995 film *Waterworld* features a main character who has acquired gills and webbed feet and hands in a future world where there may be no more dry land. The 2011 story *Dark Life* by Kat Falls and its sequel *Rip Tide* center around the adventures of Ty, the first child born in the Benthic Settlement, where people have retreated because of a lack of living space on land. Like other children there, Ty has a special ability, in his case sonar, resulting from the pressure of deep water on his developing brain. This story, like so many others before and after Cousteau's *Homo aquaticus*, presents underwater living as equally physically and societally transformative.

Conclusion

Scuba put people into the ocean, both contributing to and reinforcing the cultural construction of the undersea as an environment inimical to human bodies that was newly expected to be of increasing relevance. Throughout the 1950s and 1960s, evolution—as a biological and social concept and metaphor—colored the experiences of those who attempted to know the ocean through technology. Cousteau, Clarke, and their fellow ocean boosters drew on human evolution to naturalize their goal of putting people underwater to work and live. They constructed the underwater realm as a frontier where people could employ technology and direct their own evolution, extending the naturalness of biological evolution to assert the possibility of an intentional evolution to an aquatic form.

Compared with outer space, the ocean depths appeared during the postwar decades as a more accessible arena. While space exploration of that era involved work done initially exclusively by white men, the ocean emerged as a more democratic site where recreation joined work as the reason for being there and where amateurs, including women and children, could play.⁹⁸ Yet popular culture representations and diving manuals depicted white women and children entering the underwater realm, not people of color. Similarly, evocations of human evolution into aquatic beings from the 1960s onward involved white characters. *Homo aquaticus*, in most iterations to date, represents an anthropomorphic and an exclusionary vision.⁹⁹

While space enthusiasts admit that extraterrestrial colonies will never serve as a realistic solution to poverty and overpopulation, the ocean has from the nineteenth century appeared as a promising solution to human challenges.¹⁰⁰ Antecedents to *Homo aquaticus* such as *Water Babies* linked human moral development to biological evolution. Others involved imagined technologies for putting bodies underwater, starting with Verne, for the purpose of controlling or colonizing the undersea. A host of actual

97. D'Entremont, "Waterbreathers, Inc."

98. Rozwadowski, "Playing," 176–80; Martin, "Protecting Underwater Scientists."

99. Rachel Squire's analysis of animal actors involved with Sealab II demonstrates that an anthropomorphic perspective does not adequately reflect historical reality; see Squire, "Companions, Zappers, and Invaders"; Crylen, "Living in a World without Sun," 3–4; Starosielski, "Beyond Fluidity," 159–63.

100. Zubrin and Wagner, *Case for Mars*.

technologies ranging from diving bells used at least since antiquity and helmet diving starting in the late nineteenth century produced cyborgs, hybrids of human bodies and machines. After the Second World War, technology for underwater access became linked to evolution. *Homo aquaticus* proved a generative vision, inspiring a profound revision of the possibilities for human bodies in the sea. *Homo aquaticus* actively promoted novel cultural views of the ocean, initially as a limitless frontier, but shifting in the 1970s to a place of last resort for human survival.

In the present moment the ocean is viewed by many as a threatened environment that simultaneously threatens human societies with inundation and destruction. History reveals that the *Homo aquaticus* vision sketches just one of many possible ways that humans have interacted with the undersea. Recently scholars in a variety of disciplines have begun to recognize diving as an integral part of human and even hominid cultures through deep time and around the globe. Anthropologists have found evidence that Neandertals in Europe and Asia dove for aquatic species to use as food and tools.¹⁰¹ West African cultures prized and practiced swimming and diving long before European contact, and enslaved members of these communities carried these skills and their associated cultural values with them in the African diaspora.¹⁰² People in Oceania perceive oceans as part of the space of society, viewing their home as “seas of islands” that include the undersea as well as the surface.¹⁰³ Recent physiological and genetics research has suggested that the Bajau people of Southeast Asia, who can spend more than half of their workdays underwater gathering fish and sea cucumbers, exhibit physical traits different from those of nearby terrestrial populations, which may result from genetic adaptations to diving.¹⁰⁴ Recent free diving records to remarkable depths hint that human bodies may have greater capacity for being underwater than long imagined; one expert predicts the achievement of a depth of one thousand feet within the next decade.¹⁰⁵

This wave of recent recognition of the historical importance and geographic spread of human underwater activities emerges in part from the renewed attention the ocean attracts in the present moment. Its importance is not to suggest that Cousteau and other futurists were right that spending time underwater could cause humans to evolve into an aquatic form, although that may, perhaps, yet happen. These examples of human engagement with the underwater over deep time and across cultures suggest the possibility of alternative models for possible human relationships with the undersea than might have been imaginable in the past. It may be too soon to say whether

101. Trinkaus, Samsel, and Villotte, “External Auditory Exostoses”; Villa et al., “Neandertals on the Beach.”

102. Dawson, *Undercurrents of Power*; Delbourgo, “Divers Things.”

103. Steinberg, *Social Construction of the Ocean*; Hau’ofa, “Our Sea of Islands”; Feinberg et al., “Drawing the Coral Heads.”

104. Ilardo et al., “Physiological and Genetic Adaptations.”

105. Worrall, “Free Diving World Record.”

present and future visions of *Homo aquaticus* will, like Seedhouse's, aim to control, colonize, and exhaustively utilize ocean resources to support the social status quo, or perhaps seek pacifist, feminist, or other hopeful ways forward that are socially inclusive, respect culturally different ways of knowing the ocean, and might perhaps even recognize the rights of other species and the ocean itself.

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References

- Adamowsky, Natascha. *The Mysterious Science of the Sea, 1775–1943*. New York: Routledge, 2014.
- Adams, Mark B. "Last Judgment: The Visionary Biology of J. B. S. Haldane." *Journal of the History of Biology* 33, no. 3 (2000): 457–91.
- Adler, Antony. *Neptune's Laboratory: Fantasy, Fear, and Science at Sea*. Cambridge, MA: Harvard University Press, 2019.
- Alaniz, Rodolfo John. "Dredging Evolutionary Theory: The Emergence of the Deep Sea as a Transatlantic Site for Evolution, 1853–1876." PhD diss., University of California, San Diego, 2014.
- Amazing Stories*. "Editorial," September 1963, 5.
- Anderson, Poul. "Homo Aquaticus." *Amazing Stories*, September 1963, 6–22.
- Appel, Toby A. *Shaping Biology: The National Science Foundation and American Biological Research, 1945–1975*. Baltimore: Johns Hopkins University Press, 2000.
- Bascom, Willard, and Roger Revelle. "Free-Diving: A New Exploratory Tool." *American Scientist* 41, no. 4 (1953): 624–25.
- Beatty, John, and Piers J. Hale. "Water Babies: An Evolutionary Parable." *Endeavour* 32, no. 4 (2008): 141–46.
- Belayev, Aleksandr. *The Amphibian*. 1928; repr., Moscow: Raduga, 1986.
- Billings, Henry. *Man under Water*. New York: Viking Press, 1954.
- Bixby, William. *Seawatchers: Oceanographers in Action*. New York: David McKay, 1967.
- Blish, James. "Surface Tension." *Galaxy*, August 1952, 4–59.
- Blum, Harold F. "Perspectives in Evolution." *American Scientist* 43, no. 4 (1955): 595–610.
- Bridges, Lloyd, with Bill Barada. *Mask and Flippers: The Story of Skin Diving*. New York: Chilton Company Publishers, 1960.
- Brin, David. *Startide Rising*. New York: Bantam Books, 1983.
- Buffalo News*. "Francis J. Falejczyk, Pilot and Sea Diver." July 16, 2000. buffalonews.com/news/francis-j-falejczyk-pilot-and-sea-diver/article_096848f9-7129-5d77-8f03-ef9da6a8cfe8.html.
- Bulmer, Kenneth. *Beyond the Silver Sky*. New York: Ace Books, 1961.
- Bulmer, Kenneth. *City under the Sea*. 1957; repr., New York: Avon, 1980.

- Carlisle, Norman. *Riches of the Sea: The New Science of Oceanology*. New York: Sterling Publishing, 1967.
- Carrington, Richard. *A Biography of the Sea: The Story of the World Ocean, Its Life, and Its Influence on Human History*. New York: Basic Books, 1960.
- Carson, Rachel. *The Sea around Us*. New York: Oxford University Press, 1989.
- Chambers, Robert W. "The Third Eye." *Hearst's Magazine*, February 1915, 182–98.
- Chandler, Don. *Undersea and Hyperbaric Medical Society 1967–2007: A History of Forty Years*. www.uhms.org/images/40th_Anniversary_Booklet.pdf (accessed September 1, 2021).
- Chapman, D. D., and Deloris Lehman Tarzan. *Red Tide*. New York: Ace Books, 1975.
- Clarke, Arthur C. *The Challenge of the Sea*. New York: Holt Rinehart Winston, 1960.
- Clarke, Arthur C. *The Ghost of the Grand Banks and the Deep Range*. New York: Warner Books, 2001.
- Clarke, John. "Liquid Breathing: It's Not as Easy as It Looks." *John Clarke Online*, June 20, 2011. johnclarkeonline.com/2011/06/20/liquid-breathing-its-not-as-easy-as-it-looks/.
- Clement, Hal. *Ocean on Top*. New York: Daw Books, 1973.
- Cloud, Wallace. "Artificial Gills: They Let You Breathe Like a Fish." *Popular Mechanics*, December 1967, 69–72, 189, 192–93.
- Corbin, Alain. *The Lure of the Sea: The Discovery of the Seaside in the Western World, 1750–1840*, translated by Jocelyn Phelps. London: Polity Press, 1994.
- Cousteau, Jacques-Yves. "Ocean-Bottom Homes for Skin Divers." *Popular Mechanics*, July 1963, 98–102, 182–83.
- Cousteau, Jacques-Yves, with James Dugan. *The Living Sea*. New York: Harper and Row, 1963.
- Cowen, Robert C. *Frontiers of the Sea: The Story of Oceanographic Exploration*. New York: Doubleday, 1960.
- Crylen, Jon. "Living in a World without Sun: Jacques Cousteau, *Homo aquaticus*, and the Dream of Dwelling Undersea." *Journal of Cinema and Media Studies* 58, no. 1 (2018): 1–23.
- Darwin, Charles. *On the Origin of Species*, edited by James Endersby. 1859; repr., Cambridge: Cambridge University Press, 2009.
- Dawson, Kevin. *Undercurrents of Power: Aquatic Culture in the African Diaspora*. Philadelphia: University of Pennsylvania Press, 2018.
- Deacon, Margaret. *Scientists and the Sea, 1650–1900: A Study of Marine Science*. 2nd ed. Aldershot, UK: Ashgate Publishing, 1997.
- Deam, Natalie. "The Great Melancholy Mother: Michelet's Evolutionary Ocean in *The Sea*." In *The Aesthetics of the Undersea*, edited by Margaret Cohen and Killian Quigley, 83–96. New York: Routledge, 2019.
- De Camp, L. Sprague. "The Merman." *Astounding*, December 1938, 435–50.
- Delbourgo, James. "Divers Things: Collecting the World under Water." *History of Science* 49, no. 2 (2011): 149–85.
- D'Entremont, Paul D. "Waterbreathers, Inc." *Analog*, December 1990, 74–87.
- Dickson, Gordon R. *Home from the Shore*. New York: Ace Books, 1978.
- Dickson, Gordon R. *The Space Swimmers*. New York: Ace Books, 1967.
- Dobzhansky, Theodosius. "Anthropology and the Natural Sciences—The Problem of Human Evolution." *Current Anthropology* 4, no. 2 (1963): 138, 146–48.
- Dugan, James. "The First of the Menfish." *Historical Diver* 12, no. 4 (2004): 16–21.
- Dugan, James. "Portrait of *Homo aquaticus*." *New York Times Magazine*, April 21, 1963, 38, 56, 58, 63, 66.
- Elias, Ann. *Coral Empire: Underwater Oceans, Colonial Tropics, Visual Modernity*. Durham, NC: Duke University Press, 2019.
- Feinberg, Richard, Ute J. Dymon, Pu Paiaki, Pu Rangituteki, Pu Nukuriaki, and Matthew Rollins. "Drawing the Coral Heads': Mental Mapping and Its Physical Representation in a Polynesian Community." *Cartographic Journal* 40, no. 3 (2003): 243–53. doi.org/10.1179/000870403225012943.
- Fezandié, Clement. "The Secret of Artificial Gills." *Science and Invention*, February 1923, 956–1027.
- Freud, Sigmund. *A General Introduction to Psychoanalysis*. New York: H. Liveright, 1920.
- Garforth, Linda. "Environmental Futures, Now and Then: Crisis, Systems Modeling, and Speculative Fiction." *Osiris* 34, no. 1 (2019): 238–57.

- Haldane, J. B. S. "Man as a Sea Beast." In *Possible Worlds and Other Essays*, 59–60. London: Chatto and Windus, 1927.
- Hardy, Alister. "Was Man More Aquatic in the Past?" *New Scientist*, March 17, 1960, 642–45.
- Hardy, Alister. "Will Man Be More Aquatic in the Future?" *New Scientist*, March 24, 1960, 730–33.
- Harris, David R. "'The Farther Reaches of Human Time': Retrospect on Carl Sauer as Prehistorian." *Geographical Review* 92, no. 4 (2002): 526–44.
- Hau'ofa, Epeli. "Our Sea of Islands." In *A New Oceania: Rediscovering Our Sea of Islands*, edited by Eric Waddell, Vijay Naidu, and Epeli Hau'ofa, 2–16. Suva, Fiji: Beake House, 1993.
- Hoare, Philip. "Homo Aquaticus: The Half-Known Life." In *Aquatopia: The Imaginary of the Ocean Deep*, edited by Alex Farquarson and Martin Clark, 13–21. Nottingham, UK: Nottingham Contemporary, 2013.
- Hughes, Monica. *Crisis on Conshelf Ten*. London: Hamish Hamilton, 1975.
- Huxley, Julian S. "Guest Editorial: Evolution, Cultural and Biological." *Yearbook of Anthropology* (1955): 2–25.
- Ildardo, Melissa A., Ida Moltke, Thorfinn S. Korneliussen, Jade Cheng, Aaron J. Stern, Fernando Racimo, Peter de Barros Damgaard, et al. "Physiological and Genetic Adaptations to Diving in Sea Nomads." *Cell* 173, no. 3 (2018): 569–80.
- IPCC (Intergovernmental Panel on Climate Change). "Summary for Policymakers." 2019. www.ipcc.ch/srocc/chapter/summary-for-policymakers/.
- Jue, Melody. *Wild Blue Media: Thinking through Seawater*. Durham, NC: Duke University Press, 2020.
- Kahrl, Andrew. *Free the Beaches: The Story of Ned Coll and the Battle for America's Most Exclusive Shoreline*. New Haven, CT: Yale University Press, 2018.
- Karinthy, Frigyes. *Voyage to Faramido Capillaria*. Budapest, Hungary: Corvina, 1965.
- Kennedy, John F. "Remarks at the America's Cup Dinner Given by the Australian Ambassador, September 14, 1962." John F. Kennedy Presidential Library. www.jfklibrary.org/archives/other-resources/john-f-kennedy-speeches/americas-cup-dinner-19620914.
- Kingsley, Charles. *Water Babies: A Fairy Tale for a Land Baby*. London: Macmillan, 1863.
- Kroll, Gary. *America's Ocean Wilderness: A Cultural History of Twentieth-Century Exploration*. Lawrence: University Press of Kansas, 2008.
- Kylstra, Johannes A. "Breathing of Pressure Oxygenated Salt Solutions." *Diseases of the Chest* 47, no. 2 (1965): 157–58.
- Kylstra, Johannes A. "Experiments in Water Breathing." *Scientific American* 219, no. 2 (1968): 66–77.
- LeBrun, David, dir. *Proteus: A Nineteenth-Century Vision*. Brooklyn, NY: Icarus Films, 2004.
- Life. "Gills for a Hamster." November 6, 1964, 55–56.
- Life. "A Mouse Breathes Liquid—and Lives. How a Man Might Learn to Do the Same." August 25, 1967, 77–78.
- Marshall, Norman Bertram. "Obituary: Alister Clavering Hardy, 10 February 1896–22 May 1985." *Biographical Memoirs of Fellows of the Royal Society* 32 (1986): 222–73.
- Martin, Jennifer A. "Protecting Underwater Scientists: The Scripps Model in the History of Scientific Diving, 1949–1985." In *Soundings and Crossings: Doing Science at Sea 1800–1970*, edited by Katharine Anderson and Helen M. Rozwadowski, 277–314. Sagamore Beach, MA: Science History Publications, 2016.
- Matsen, Brad. *Jacques Cousteau: The Sea King*. New York: Pantheon Books, 2009.
- Mazzone, Walter F. "Human Physiology Aspects of Sealab Two." In *Man's Extension into the Sea: Transactions of the Joint Symposium 11–12 January 1966*, 102–10. Washington, DC: Marine Technology Society, 1966.
- Mentz, Steven. *Ocean*. New York: Bloomsbury Academic, 2020.
- Michelet, Jules. *The Sea (La Mer)*. New York: Rudd and Carleton, 1861.
- Milam, Erika Lorraine. "Dunking the Tarzanists: Elaine Morgan and the Aquatic Ape Theory." In *Outsider Scientists: Routes to Innovation in Biology*, edited by Oren Harman and Michael R. Dietrich, 223–37. Chicago: University of Chicago Press, 2013.

- Milam, Erika Lorraine. "Elaine Morgan Obituary." *Guardian*, July 29, 2013. www.theguardian.com/books/2013/jul/29/elaine-morgan.
- Milam, Erika Lorraine. "Old Woman and the Sea: Evolution and the Feminine Aquatic." *Osiris* 34, no. 1 (2019): 198–215.
- Miles, Stanley. *Underwater Medicine*. London: Staples Press, 1962.
- Morgan, Elaine. *The Descent of Woman*. New York: Stein and Day, 1972.
- Newsweek*. "Aquanauts." October 29, 1962, 59.
- New York Times*. "Cousteau Envisions a 'Water Man.'" October 10, 1962.
- Pell, Clairborne, with Harold Leland Goodwin. *Challenge of the Seven Seas*. New York: William Morrow and Company, 1966.
- Pennington, Howard. *The New Ocean Explorers: Into the Sea in the Space Age*. Boston: Little, Brown, and Company, 1972.
- Pizer, Vernon. *The World Ocean: Man's Last Frontier*. New York: World Publishing Company, 1967.
- Pohl, Frederik, and John Williamson. *Undersea Fleet*. New York: Ballentine Books, 1956.
- Pratt, Theodore. *Mr. Limpet*. New York: Alfred A. Knopf, 1942.
- Rehbock, Philip F. "Huxley, Haeckel, and the Oceanographers: The Case of *Bathypolypus haeckelii*." *Isis* 66, no. 4 (1975): 504–33.
- Richards, Robert J. *The Tragical Sense of Life: Ernst Haeckel and the Struggle over Evolutionary Thought*. Chicago: University of Chicago Press, 2008.
- Rozwadowski, Helen M. "Arthur C. Clarke and the Limitations of the Ocean as a Frontier." *Environmental History* 17, no. 3 (2012): 578–602.
- Rozwadowski, Helen M. "Engineering, Imagination, and Industry: Scripps Island and Dreams for Ocean Science in the 1960s." In *The Machine in Neptune's Garden*, edited by Helen M. Rozwadowski and David van Keuren, 325–52. Canton, MA: Science History Publications, 2004.
- Rozwadowski, Helen M. *Fathoming the Ocean: The Discovery and Exploration of the Deep Sea*. Cambridge, MA: Harvard University Press, 2005.
- Rozwadowski, Helen M. "Playing by—and on and under—the Sea: The Importance of Play for Knowing the Ocean." In *Knowing Global Environments: New Historical Perspectives on the Field Sciences*, edited by Jeremy Vetter, 162–89. New Brunswick, NJ: Rutgers University Press, 2010.
- Rozwadowski, Helen M. *Vast Expanses: A History of the Oceans*. London: Reaktion Books, 2019.
- Sauer, Carl O. *Agricultural Origins and Dispersals*. New York: American, 1952.
- Sauer, Carl O. "Seashore—Primitive Home of Man?" *Proceedings of the American Philosophical Society* 106, no. 1 (1962): 41–47.
- Science News Letter*. "Membrane Filters Air." November 7, 1964.
- Scribner, Vaugh. "'Such Monsters Do Exist in Nature': Mermaids, Tritons, and the Science of Wonder in Eighteenth-Century Europe." *Itinerario* 41, no. 3 (2017): 507–38.
- Seedhouse, Erik. *Beyond Human: Engineering Our Future Evolution*. Berlin: Springer, 2014.
- Seedhouse, Erik. *Ocean Outpost: The Future of Humans Living Underwater*. Berlin: Springer, 2021.
- Shor, Elizabeth Nobel. *Scripps Institution of Oceanography: Probing the Oceans, 1936–1976*. San Diego, CA: Tofua Press, 1978.
- Slonczewski, Joan. *A Door into Ocean*. New York: Orb Books, 1986.
- Sponsel, Alistair. *Darwin's Evolving Identity: Adventure, Ambition, and the Sin of Speculation*. Chicago: University of Chicago Press, 2018.
- Squire, Rachel. "Companions, Zappers, and Invaders: The Animal Geopolitics of Sealab I, II, and III (1964–1969)." *Political Geography* 82 (2020): 1–11. doi.org/10.1016/j.polgeo.2020.102224.
- Starosielski, Nicole. "Beyond Fluidity: A Cultural History of Cinema under Water." In *Ecocinema Theory and Practice*, edited by Stephen Rust, Salma Monani, and Sean Cubitt, 149–68. New York: Routledge, 2013.
- Steinberg, Philip E. *The Social Construction of the Ocean*. Cambridge: Cambridge University Press, 2001.
- Sweeney, John. *Skin Diving and Exploring Underwater*. New York: McGraw-Hill, 1955.
- Time*. "Oceanography: A Home in the Deep." July 26, 1963, 30.

- Trinkaus, Erik, Mathilde Samsel, and Sébastien Villotte. "External Auditory Exostoses among Western Eurasian Late Middle and Late Pleistocene Humans." *PLOS ONE* 14, no. 8 (2019): e0220464. doi.org/10.1371/journal.pone.0220464.
- Verne, Jules. *Twenty Thousand Leagues under the Sea*. London: Sampson Low, Marston, Searle, and Rivington, 1876.
- Villa, Paola, Sylvain Soriano, Luca Pollarolo, Carlo Smriglio, Mario Gaeta, Massimo D'Orazio, Jacopo Conforti, and Carlo Tozzi. "Neandertals on the Beach: Use of Marine Resources at Grotta dei Moscerini (Latium, Italy)." *PLOS ONE* 15, no. 1 (2020): e0226690. doi.org/10.1371/journal.pone.0226690.
- Von Braun, Wernher. "Introduction." In *Challenge of the Sea*, 7–8. New York: Holt Rinehart Winston, 1960.
- Vonnegut, Kurt, Jr. *Galapagos*. New York: Delacorte, 1985.
- Williamson, John. *Twenty Years under the Sea*. Boston: Hale, Cushman, and Flint, 1936.
- Worrall, Simon. "Free Diving World Record Will Soon Be Pushed to One Thousand Feet, Author Says." *National Geographic*, August 10, 2014. www.nationalgeographic.com/news/2014/8/140810-free-diving-sperm-whales-jules-verne-reunion-booktalk/#close.
- Zubrin, Robert, and Richard Wagner. *The Case for Mars: The Plan to Settle the Red Planet and Why We Must*. New York: Simon and Schuster, 2011.
- Zuroski, Emma Josephine. "Depths of Knowledge: HMS Challenger and the Reconfiguration of Modern Science." PhD diss., University of Auckland, 2018.