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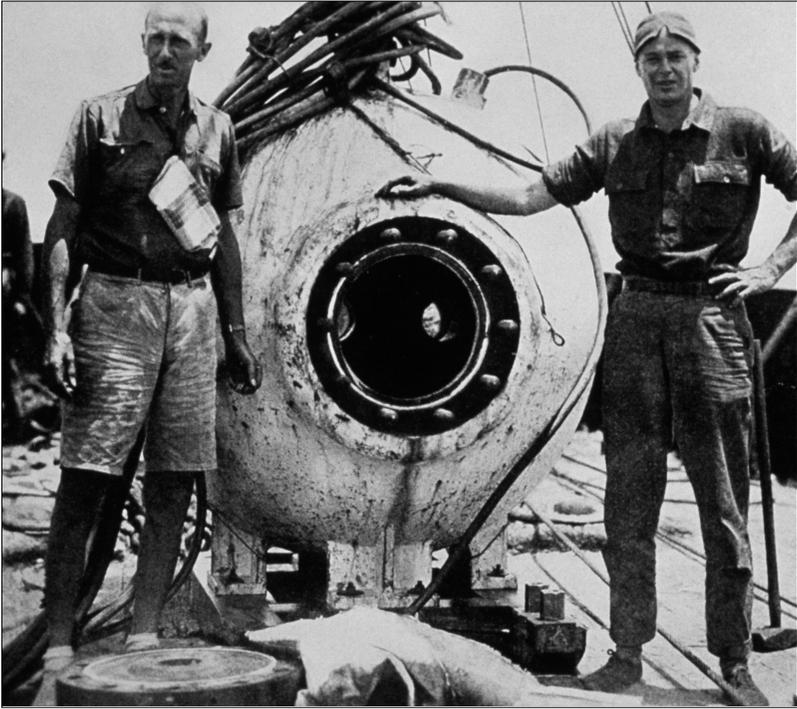
A SIMPLE TETHERED SPHERE

When once it has been seen, [the deep ocean] will remain forever the most vivid memory in life.

—*William Beebe*

On June 11, 1930, the first humans entered the world of eternal darkness and returned alive. Off the island of Bermuda, two men, Charles William Beebe and Otis Barton, descended 1,426 feet, nearly three times deeper than any previous diver. Their mode of transport resembled the stuff of legend: in the fourth century B.C., Alexander the Great had supposedly reached deep waters in a glass barrel lowered by chains. Beebe and Barton's remarkably similar craft, made of steel rather than glass, dangled just as precariously on a cable. A crew on a surface ship lowered the two men deep into the Atlantic, then hauled them back toward sunlight and air. The ancient Greeks, given access to modern industrial tools and steel, might have managed the feat in much the same way.

William Beebe was a fascinating mixture of scientist, poet, showman, and explorer. Born in Brooklyn, New York, in 1877, he seems never to have lost the curiosity of an excited child—a quality he was to combine later in life with the bravery of a confident professional. Instead of completing his final year at Columbia University, Beebe went to work full time in 1899 as assistant curator at the New York Zoological Park. He was soon tracking rare birds in Mexico, Trinidad, and Venezuela and



William Beebe and Otis Barton standing aboard ship next to the bathysphere, 1930. (Source: Corbis/Ralph White.)

studying wild pheasants in the Far East. On a trip to the Galápagos Islands, Beebe hiked up an erupting volcano. In the 1920s he began diving in the ocean, using a helmet, and he said that someday he hoped to go deeper in a new kind of diving vessel. His popular writings bubbled over with enthusiasm, encouraging readers to enter his newly discovered underwater paradise. "Don't die," he advised them, "without having borrowed, stolen, or made a helmet of sorts, to glimpse for yourself this new world."

Years before those words appeared in print, a teenage boy named Otis Barton had done precisely what Beebe suggested: he had made his own helmet, a crude wooden box with glass windows. In 1917, wearing his new headgear, he weighed him-

self down with rocks and sandbags and explored the harbor bottom at Cotuit, Massachusetts, breathing air forced down from the surface by means of a bicycle pump. Barton also dreamed of exploring the deep sea. However, unlike Beebe, he directed his passion toward the means of diving as well as the ends: he studied both engineering and natural science at Columbia. Yet Barton never held a job. Having inherited a large amount of money, he spent most of his life in pursuit of fantastic creatures—prehistoric fossils, rare wild animals, and “titans of the deep,” such as sharks, octopuses, and giant squid. He was, altogether, a mysterious individual. During the years he worked with Beebe, we must rely for information chiefly on pictures of him toiling over his diving apparatus, or occasional comments that Beebe published indicating his confidence in Barton’s engineering talents.

— The Bathysphere

In 1926 Barton read about Beebe’s quest to explore the deep ocean. He wrote to the famous scientist/author, but Beebe never replied—having been inundated, it turned out, with all kinds of suggestions from crackpot designers of deep-sea vessels. Barton finally arranged a meeting through a mutual acquaintance in December 1928. Having done the necessary calculations and drawn up blueprints, he showed Beebe his idea for a diving craft. It was little more than a hollow sphere. Barton explained that a sphere would be the shape best suited to withstand the crushing deep-ocean pressure, which bears down equally from all directions. Beebe liked the design and agreed to test such a craft. He christened their diving chamber a *bathysphere*, joining the Greek word for *deep* to *sphere*.

Barton volunteered to pay for the craft’s construction. Later, the New York Zoological Society and the National Geographic Society would fund the explorers’ diving expeditions.

Barton’s first steel chamber, cast in one piece at a foundry in New Jersey, weighed five tons—making it too heavy for the

16 DEPTH

Face of William Beebe peering out of the bathysphere. (Source: William Beebe/National Geographic Society Image Collection.)



barge, *Ready*, that would lower and raise it. The next version weighed half as much, but its small interior—only four feet nine inches in diameter—would barely accommodate two men. Had Barton made the hollow space larger, he would have needed a thicker, heavier hull. As it was, the steel wall measured one and a half inches thick—sufficient, Barton figured, to survive a descent to a depth of 4,500 feet.

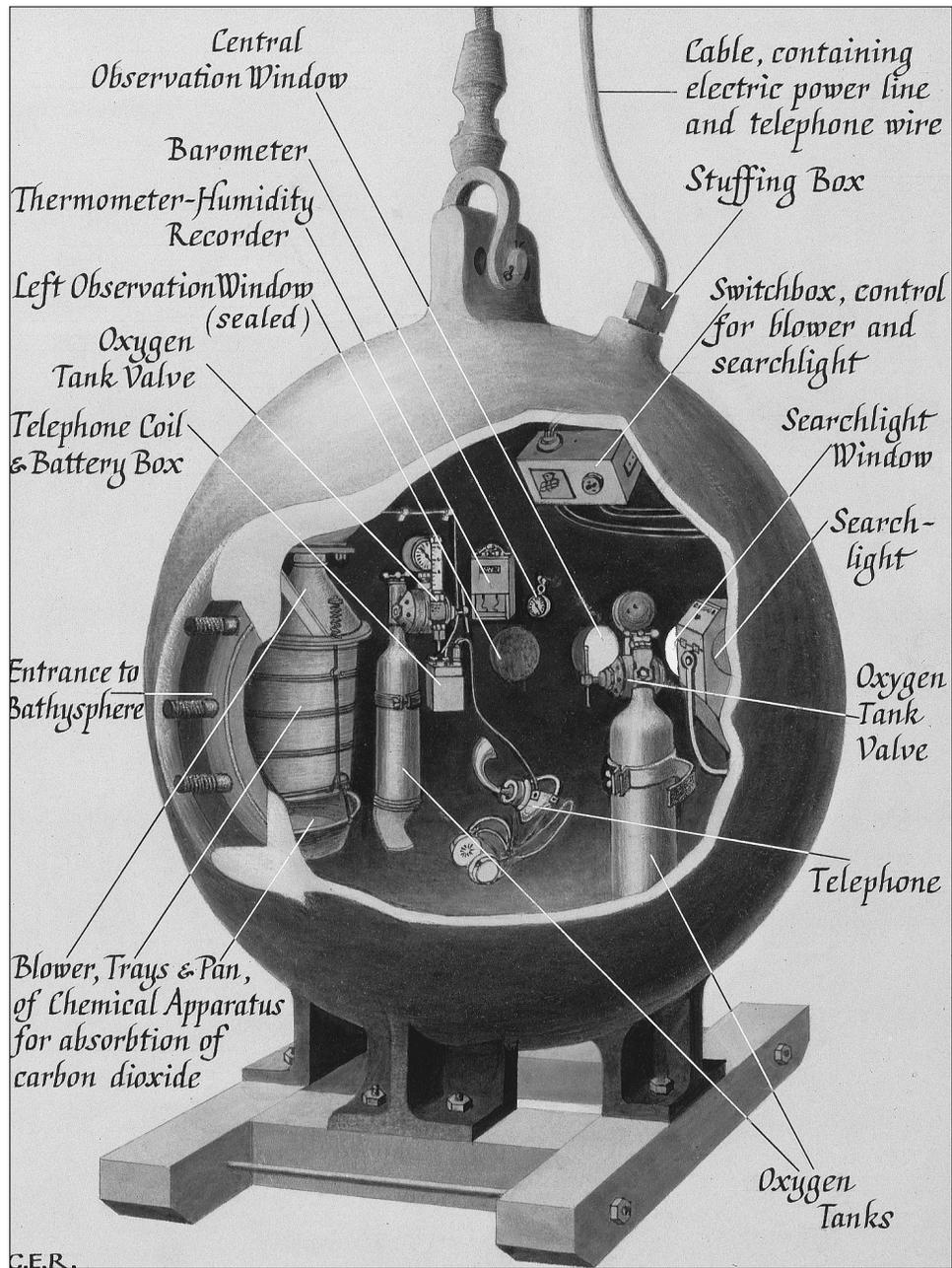
A small, fifteen-inch circular opening in one side of the sphere allowed squirming passengers to enter head first. Around this entryway—a potential weak spot—ten large steel bolts protruded from the sphere. A 400-pound door fit over the bolts. After crew members had hoisted the door up and wrestled it into position, they screwed ten huge nuts onto the bolts. Then one last large bolt, held in place by a giant wing nut, plugged a small central opening in the door. (This allowed quick access, in case of emergency, to let out water or foul air.) A crewman then pounded the wing nut tight. Beebe referred to this moment as the most painful part of a dive. Ear-shattering reverberations bounced off the steel hull. Perhaps, at such moments, Barton's earlier name for the vessel seemed more apt: he had called it, simply but unpoetically, "the tank."

On the side opposite the door, three circular windows made of fused quartz, each eight inches in diameter and three inches thick, fit into “cannon-like projections”—short tubes that stuck out from the sphere like stubby telescopes to accommodate the extra thickness of the quartz viewing panes. Pieces from any of those windows would indeed shoot through the tubes like cannonballs—straight into the sphere toward the occupants—if some unseen flaw were to cause a window to crack and yield under pressure. Of the five quartz pieces initially made, only two passed all fitting and pressure tests, so Barton had to insert a steel plug into one of the three window openings for their first dives.

The interior of the bathysphere contained only the barest of necessities. Two small oxygen tanks, placed on either side of the windows, would keep the air sweet for eight hours, Barton estimated. One wire mesh tray above the windows contained soda lime to absorb exhaled carbon dioxide; another tray contained calcium chloride to absorb moisture. Believe it or not, on their first dives Beebe and Barton used small palm-leaf fans to circulate the air.

When underwater, the bathysphere hung from a 3,500-foot-long, seven-eighths-inch steel cable, raised and lowered by a steam-powered winch. Extra strands of cable, woven around the central core, were supposed to ensure that the sphere would not rotate. As the cable descended into the ocean, a solid rubber hose snaked down alongside it. Crewmen played out this hose by hand; it contained two wire conductors for a telephone and two for an electric light. Since the advent of underwater lighting technology was still many years away, Beebe and Barton simply mounted a 250-watt spotlight inside their sphere and aimed it out through a window.

After submerging, Beebe or Barton, wearing headphones, communicated via the telephone link with Gloria Hollister, an assistant. During many of those conversations, Beebe made observations and Hollister transcribed his words. Every sec-



Detailed illustration of the bathysphere and its interior. (Source: Charles Riddiford/National Geographic Society Image Collection.)

ond counted, since the air supply was limited and observation time was short. On the positive side, the cramped occupants of the bathysphere had little to do but observe. They wasted no time fiddling with controls because there were none. They had no ability to maneuver their craft and no depth gauge. When the sphere approached the bottom, crew members on the support barge made depth measurements every few minutes, using a line attached to a small lead anchor.

— **Light First Shines in the Eternal Night**

The first series of deep-water dives took place in June 1930 near Bermuda, where Beebe had been studying marine animals. He had cast nets into the ocean and examined what they brought up, but he could not be sure how many creatures had eluded his nets. Opinions differed on this matter. Folktales suggested that strange, unknown kinds of life inhabited the deep sea. Alexander the Great, during his legendary dive, had supposedly seen a fish so large that it took three days to swim past his glass barrel, and tales of other deep-dwelling monsters had been passed down through the ages. Many contemporary researchers, on the other hand, believed that the ocean depths were too cold and dark to support any significant amount of life. Beebe had no idea what might await him below.

The first deep test of the bathysphere, conducted on June 3, nearly ended in disaster. After lowering the empty sphere to 2,000 feet, the crew could not haul it back; the steel cable and rubber hose had become so tangled that the cable would not rewind on its reel. Foot by foot, with great effort, crew members pushed the snarled hose down the length of the cable, which they gradually winched up and rewound. When they finally got the sphere back on deck, they found that the “non-twisting” steel cable had turned some forty-five times, twisting the rubber hose tightly around itself as it turned.

The rubber looked chafed and stretched—would the wires inside it be broken? Fortunately they were not, and the twist-

ing forces seemed to have played themselves out with this lowering.

Several other tests followed. Finally, on June 6, with all the problems apparently fixed, the bathysphere was ready to take human passengers down into the eternal darkness.

Beebe later described the first attempt: "I . . . crawled painfully over the steel bolts, fell inside and curled up on the cold, hard bottom of the sphere. . . . Otis Barton climbed in after me, and we disentangled our legs and got set." Crew members lifted the heavy door and carefully slid it over the projecting bolts; then they screwed on the huge nuts. Although his vision was limited, Beebe could see the launch crew scurrying about the deck. Feeling trapped inside the small capsule and wanting to calm his nerves, he followed Houdini's technique of regulating his breathing and conversing in low tones. It helped.

At precisely 1:00 in the afternoon, *Ready's* captain signaled with his hand to the crew chief. The cable attached to the top of the bathysphere suddenly went taut; the capsule rose quickly into the air and then began to drop. "I sensed the weight and sturdy resistance of the bathysphere more at this moment than at any other time," Beebe wrote. "We were lowered gently but we struck the surface with a splash which would have crushed a rowboat like an eggshell. Yet within we hardly noticed the impact, until a froth of foam and bubbles surged up over the glass."

As the bathysphere began to sink deeper, Beebe saw the familiar outline of the support ship's keel. He watched it grow smaller and fainter until it blended into the greenish glow of the surface. With its disappearance passed the last visible link to human beings in the upper world. From then on, their only reassurance that those on the surface had not lost control at their end of the tether would be the soft voice of Gloria Hollister relaying depth, speed, or information on surface weather conditions.

At 200 feet the bathysphere stopped. As it hesitated in mid-water, crewmen clamped the steel cable and rubber hose

together, giving the rubber more support so that it would not break under its own weight. (They would repeat this procedure every 200 feet.) Beebe and Barton's journey into the abyss then resumed. For long stretches, their only sense of motion was the constant movement of small organic detritus, "marine snow," falling not downward but upward as the diving craft dropped through it.

Before they reached their next scheduled pause at 400 feet, Barton startled Beebe with a sharp exclamation. Turning quickly, Beebe saw a trickle of water meandering down the wall beneath the door. For a moment they watched this little stream in horror, but then Beebe began to relax. "I knew the door was solid enough," he wrote, and he realized that higher pressure outside the sphere would only seal it more tightly. Rather than cancel the dive, he asked for a quicker descent.

At 400 feet the bathysphere plunged through the lower limit that submarines could reach in those days. Beebe and Barton soon passed 525 feet, the greatest depth any person had reached alive in an armored suit. At 600 feet the water took on a shade of blue no conscious human had ever seen. Beebe described the luminous color as pouring into the sphere through the viewports—a confusing otherworldly glow that seemed constantly bright as his eyes adjusted. "The blueness of the blue" became almost mystical: it seemed to pass "materially through the eye," Beebe remarked, "into our very beings." As the twilight deepened, "we still spoke of its brilliance," he continued. "It seemed to me that it must be like the last terrific upflare of a flame before it is quenched."

On a hunch, Beebe called for a halt of several minutes at 800 feet. The leak seemed no worse, the oxygen was flowing, and yet he decided that the dive should end. "Some mental warning," he wrote—"which I have had at half a dozen critical times in my life—spelled *bottom* for this trip." The bathysphere returned to the deck of *Ready* only an hour after it had plunged into the water. Its two occupants untangled themselves, crawled stiffly out, and noticed right away the unbelievable

yellow hue that suffuses our sunlit world. Later, Barton packed soft lead into a groove around the door's edges, hoping that it would form a watertight seal on future dives.

The expedition put to sea once again on June 10. After being lowered empty to 2,000 feet, the bathysphere returned with no evident leaks. Beebe and Barton then climbed in, ready to make another attempt to reach total darkness. At 150 feet, however, the telephone began to crackle, and at 250 feet Barton cried out that the line was dead. Beebe also felt alarmed. "The leak on our other trip," he wrote, had been "annoying but not terrifying." Suddenly he understood why. All along, he knew he could quickly relay an urgent request to anyone in the twenty-six-person surface crew—especially to the man controlling the seven-ton winch. Down below, nothing seemed more reassuring than the sound of a human voice.

Beebe blinked the spotlight for all he was worth. This caused a bulb on *Ready's* deck, wired into the same circuit, to flicker, which, by prearranged signal, meant trouble down below—bring us back! By the time the sphere resurfaced, the worried crew was showing considerable strain. Yet what they found inside was Beebe's smiling face, pressed against clear quartz. Later, they scrapped fifty fathoms of hose containing a broken wire.

The next day, June 11, seemed perfect. A fire on board *Ready* the night before had charred part of the deck, but no matter. It was only wood. This time Beebe took a chance and skipped the preliminary empty trial. He and Barton climbed into the sphere at 9:50 that morning, the bolts and nuts were screwed down by 10:00, and four minutes later they hit the water.

After the sphere splashed down, Beebe gazed up. The air-sea interface looked like a slowly waving pale-green canopy. Dancing on the puckered watery ceiling, clusters of golden sargassum reminded him of mistletoe hanging from a chandelier at Christmas. Through this translucent quilt, rays of sunlight penetrated the depths from above like shafts of light in a vast cathedral.

In his writings afterward, Beebe mixed poetic accounts of the historic dive with awed descriptions of the life he observed. “Long strings of salpa drifted past,” he wrote, “lovely as the finest lace, and schools of jellyfish throbbed on their directionless but energetic road through life.” Small “vibrating motes” passed by in clouds, “wholly mysterious.” Looking more carefully, Beebe recognized them as pteropods, or flying snails, “delicate, shield-shaped shells driven along by a pair of flapping, fleshy wings.”

They made the usual pauses at 200 and 400 feet and were now beginning to see their first true creatures of the deep: a lantern fish and bronze eels. The descent continued. At 800 feet Beebe caught his first glimpse of hatchet-fish in the distance, “heliographing their silver sides.” A little later, “shrimps and jellies drifted past.”

With the gloom growing ever darker, the pale blue glow up above seemed bright, almost skylike by comparison. The shift in color confused the senses. “Again,” Beebe wrote, “the word ‘brilliant’ slipped wholly free of its usual meaning.” Although the light seemed bright enough to read by, neither man could see print on a page. “We looked up from our effort to see a real deep-sea eel undulating close to the glass.” Beebe recognized it from his studies—“a slender-jawed *Serrivomer*, bronzy-red as I knew in the dimly-remembered upper world, but here black and white.”

At 1,000 feet the two explorers had a momentary sea-monster scare when a length of rubber hose above the sphere worked loose. It formed a black, sea-serpenty loop that swung past their viewport, backlit by a growing starfield of bioluminescent creatures too small to discern. Then a line of luminous dots suddenly appeared. Beebe turned on his spotlight, which revealed another school of hatchet-fish, from a half to two inches in length, swimming in formation. Had these denizens of the deep, with their sabertooth-like jaws, been the size of sharks, Beebe would have died of fright.

The scene outside his viewport now resembled a kaleidoscope of constellations in the night sky. These were living,

glowing creatures, their patterns constantly changing as the bathysphere fell. Every so often the spell was broken as the voice of Gloria Hollister briefly interrupted, by now as faint as if it were coming from hundreds of miles away.

At 1,100 feet Beebe and Barton carefully inspected their steel chamber. The temperature inside the sphere had plummeted, causing moisture to condense on its cold wall. Rivulets of water streaked down, forming a growing puddle beneath the floor planks. To prevent his viewport from constantly fogging, Beebe tied a handkerchief around his face just below the eyes, bandit-style, directing his breath downward. From 1,250 to 1,300 feet the bathysphere passed through an empty “transparency” of water, devoid of life, which only heightened Beebe’s discomfort as he sat, chilled to the bone, in the clammy sphere.

At 1,400 feet they paused as usual, dipped a few feet lower, and then jerked to a final stop. This time Beebe gazed down rather than upward. Although the water below him looked like “the black pit-mouth of hell itself,” he felt a longing to go deeper. Barton meanwhile, without a tinge of emotion, casually informed Beebe that the pressure on every square inch of the viewport he was looking through exceeded 650 pounds. He added that each window was now holding back a total pressure of nine tons. From then on, Beebe wiped moisture off the quartz with a softer touch.

With the bottom of the ocean still thousands of feet below them, Beebe and Barton had reached their goal. They had dropped 1,426 feet, making them the first humans to see the world of eternal darkness. Almost immediately, the surface crew began reeling them back to the world of sunlight. After what had seemed a lifetime of descending, the return trip to the surface took only forty-three minutes. Twice during their ascent, large, shadowlike forms darted around in the distant gloom—stalkers of the deep, Beebe imagined, waiting for an opportunity that never came.

— The Living Ocean Gains a Third Dimension

The bathysphere's primary mission was to observe marine life in the open ocean, while suspended between surface and bottom. This was the midwater, or pelagic, world. But Beebe also used the sphere actually to explore the bottom, particularly in shallow water during an operation he called *contour diving*. It was an activity the two explorers pursued when the weather kicked up and they couldn't venture out to the open ocean.

When contouring, the tug *Gladisfen* towed the support barge *Ready* slowly out from shore, with the bathysphere being lowered as the bottom became deeper. This procedure was not as simple as it sounds; there was always a chance that the sphere might hang up on an uncharted coral head. Should that happen, the deck crew was instructed to let out cable and drop the sphere to the bottom while the barge and tug moved back into shallower water. The crew might then be able to lift the sphere free—provided, of course, that the cable had not snapped. Fortunately, the crew never needed to try this maneuver, although on one dive Beebe did see a coral barrier looming ahead. He had just enough time to phone the surface with urgent instructions to raise the cable.

Obviously, Beebe felt that the risks were worth taking. Many previous attempts to study life near the bottom had failed: nets and dredges had torn or tangled, cables had broken, and gear had sunk. Taking the same chances with his new bathysphere—its human occupants helpless inside—Beebe succeeded where others had not. During his relatively shallow dives, he observed fish behavior not previously known, such as the systematic cleaning of parrot fish by wrasse. On one contour dive he discovered an ancient beach at a depth of sixty-five feet, formed thousands of years earlier when the giant ice sheets that covered the continents locked up enough water to lower the sea level that much and more worldwide.

Geology, however, was not Beebe's main interest. "These shore dives," he wrote, "opened up an entirely new field of

possibilities, the opportunity of tracing the change [in life forms] from the shallow-water corals and fish to those of the mid-water, with ultimately the . . . change of fish into the deep-sea forms. . . . Such things as these could never be seen except from a sphere such as ours.”

The deeper dives proved equally rewarding. For two years, Beebe had been studying the ocean off the island of Nonsuch, his laboratory base in Bermuda. Being particularly interested in the vertical distribution of life, he had chosen a circular area in the open Atlantic and probed it deeper and deeper by dragging a net back and forth from the surface. The area he was studying thus gained a third dimension: it extended downward as a cylinder. Those earlier results had made Beebe pessimistic about the amount of life he might see on his dives with the bathysphere.

Clearly his pessimism had been unfounded. Now that Beebe had immersed himself within the deep world, the thought of dragging a net through this three-dimensional space reminded him of a biologist stuck on the ground with his eyes closed, trying to catch butterflies that soared up and down through a vast field of flowers. Now the biologist had wings, enabling him to mingle with the objects of his study in their own realm. He felt like an astronomer who had rocketed to the planets and back, appreciating for the first time the great distances separating those points of light. And he knew the joy of the paleontologist who had watched time run backward and his fossils come alive.

Before diving in the bathysphere, Beebe had seen deep-dwelling fish only as lifeless forms pulled from his nets. Now he could picture them darting about his viewport, displaying modes of swimming, behaviors, and colors that no one had ever witnessed. The bizarre shapes, the globular and angular forms, had to him suggested slowness. Yet their level of activity and agility seemed far greater than he had previously imagined. He concluded that this agility might help explain why many of the organisms he saw down below had escaped his net tows.

Prior to these early dives, some researchers had questioned whether the apparent light organs on the sides of pelagic fish actually emitted light in deep water. Beebe's experience proved beyond doubt that the organs do in fact emit light. Eventually—though not right away—marine scientists came to accept that truth.

Beebe also realized that life in the midwater depths was not uniformly distributed. He had seen layers of richness and paucity, shifting and changing with time. Furthermore, he was also surprised to discover deep-dwelling fish roaming in shallower water than the depths he had probed to capture them in nets, convincing him that they were able to see the nets' entrance in the sunlit upper layers and swim out of their way. Farther down, in total darkness, they would swim blindly across the path of the sweep nets. And finally, Beebe explained the presence of even larger creatures, giants he had never caught at any depth. He felt that they avoided capture by swimming faster than the heavy nets could be towed.

— Going Deeper

Beebe and Barton continued to press the limits of their bathysphere. After the dives in 1930 they prepared for a similar series in 1932, making a number of changes to the sphere. The fact that they were now veterans of the deep also helped. In 1932, they entered the deep abyss with a new perspective, one common to the seasoned veterans of today. "The unproductive 'Oh's and Ah's' of my first few dives," Beebe confessed, "were all too vivid in my mind."

Though the men were less giddy, the thrill of exploration persisted. Before a dive on September 22, which would take him to a new record depth of 2,200 feet, Beebe described "a feeling of utter loneliness and isolation" that gripped him when dangling in midocean, "akin to a first venture upon the moon or Venus." Yet outwardly he was still the showman. Beebe and Barton not only established a new depth record that

September day, they also conducted the first live radio broadcast from the deep sea. Produced by NBC, it proved a fascinating experience for the millions who listened. At one point, Beebe announced to the spellbound world that he was looking through the viewport at a six-foot-long “sea dragon”—an unlikely beast that would in time return to haunt him.

In 1934, Beebe carried out his final series of dives with Otis Barton in their bathysphere. They achieved a depth of 3,028 feet—more than half a mile down. The crew captain allowed them to stay for all of three minutes before giving the order to haul up, fearing that the very end of the cable, which was now almost completely unwound, might not be fastened securely to the reel. Indeed, shortly after the winch started pulling, the crew heard a “terrific snap,” which traveled all the way through the telephone line to Beebe as a “metallic twang.” That ghastly sound came not from the cable, however, but from a snapping rope that helped guide it onto the reel. The cable itself held firm, and it continued winding back.

After each new dive series, Beebe continued to compare his observations from the bathysphere with the results of the more than 1,500 net tows he eventually made in the same area. He consistently saw major discrepancies, particularly the absence of larger and more active animals from the nets. Clearly, the fauna at midocean depths were far more abundant than he would ever have determined by previous methods. (In fact, some researchers now believe the ocean depths to be the dominant ecosystem on the planet, making up 97 percent of the biosphere by volume and containing more diversity of life in some areas than even the fabulous rain forests.)

Beebe himself identified many new life forms. On one dive, he observed a large fish at 1,500 feet that he had never seen before. It was at least two feet long, without lights or luminosity, and had a small eye, a large mouth, and a long, wide, filamentous pectoral fin. He called it the pallid sailfin, with the scientific name *Bathyembryx istiophasma*, which is Greek for a fish that comes from the abyss and swims with ghostly sails.

Soon after his first series of dives, and for the next several years, Beebe published numerous scientific and popular articles, followed in 1934 by a wonderful book titled *Half Mile Down*. In the book he described several “outstanding moments” that bathysphere diving had etched in his mind. Bioluminescence, that “first flash of animal light,” topped his list. Next came the perception of utter blackness, “the level of eternal darkness” that only he and Barton had ever seen. A third outstanding moment came with “the discovery and description of a new species of fish”—many times.

No other earthly environment, Beebe insisted, could match the strangeness of the dark abyss. “The only other place comparable,” he wrote, “must surely be naked space itself, out far beyond [the] atmosphere, between the stars, where sunlight has no grip upon the dust and rubbish of planetary air, where the blackness of space, the shining planets, comets, suns, and stars must really be closely akin to the world of life as it appears to the eyes of an awed human being, in the open ocean, one half mile down.”

Not everyone was awed, however. One scientist who reviewed the book, Carl Hubbs, scoffed at Beebe’s claim to have seen a six-foot sea dragon. He suspected, instead, that two fish had been swimming close together. Another animal, which Beebe had named a “Constellationfish,” struck Hubbs as even more absurd. Beebe described it as having rows of glowing yellow dots surrounded by “very small, but intensely purple lights.” That fish, Beebe continued, “will live throughout the rest of my life as one of the loveliest things I have ever seen.” It seemed more likely to Hubbs that Beebe had seen a “constellation” of less remarkable creatures—invertebrates such as jellyfish—“whose lights were beautified . . . in passing through a misty film breathed onto the quartz window by Mr. Beebe’s eagerly appressed face.” Hubbs indignantly charged that Beebe had no right “to describe and assign generic and species names ‘for animals faintly seen through the bathysphere windows.’” Another scientist, John Nichols,

a curator at the American Museum of Natural History, hinted that *Half Mile Down* should be classified as fiction rather than fact, because Beebe wrote in “dramatic fashion rather than meticulous.” To this day suspicion lingers that Beebe may have willfully invented a few species—“impossible” fish that he claimed to have seen but could not collect, and that no one has ever seen since.

In other respects, Beebe seems more assured in his status as a pioneer of ocean ecology—largely because of his systematic sampling, his many indisputable specimens, and his ability to inspire others to follow him into the abyss. John McCosker, for example, chair of Aquatic Biology at the California Academy of Sciences, dispatched this “Letter from the Field” in the fall of 1995:

At 2,000 feet, it's 39 degrees F outside and getting cold and foggy inside. It is the darkest darkness . . . and the bursts of living light outside only accentuate the blackness. As I stare out the window, my childhood fascination with a well-read 1934 copy of *National Geographic* comes crowding back. In his article, “A Half Mile Down,” William Beebe described . . . in vivid detail . . . the fascinating creatures that swam or hovered within his searchlight beam. The descriptions, complete with creative monikers like abyssal rainbow gars, sabre-toothed viperfishes, scimitar-mouths, great gulper eels, long-finned ghostfishes, gleaming-tailed serpent dragonfishes, and exploding flammenwerfer shrimps, were carried to a surface audience which included artist Else Bostelmann, who painstakingly took notes in order to illustrate the explorer's observations. Those paintings, which appeared in the *National Geographic* and in a book, also entitled *Half Mile Down*, whetted the appetite of a 10-year-old explorer-to-be. . . . Many years later, as a graduate student, I was told by my professors that much of what Beebe saw was colored by his vivid imagination. . . . Nonetheless, it was now my turn to experience firsthand what life is like in a realm so foreign to our light-dependent lives.

— A Retreat from the Deep, and a Legacy

Beebe would have welcomed more dives like McCosker's. In the heyday of his career, he was convinced that scores of bathyspheres would soon be diving throughout the world, producing a burst of knowledge about the global distribution of marine life, in three dimensions. A true picture of the ocean's habitats would require many more dives in many more areas than the Atlantic Ocean near Bermuda. But Beebe's dream never came true. Most of the deep sea has yet to be explored—which means, if Beebe was correct, that some of its largest and most agile creatures may yet await discovery.

Several decades after Beebe and Barton's historic dives, both Japan and the Soviet Union made limited attempts to learn more: they developed various tethered diving capsules to carry researchers into deep waters. In the early 1950s, reports began coming out of the Soviet Union that researchers were using bathyspheres called hydrostats to observe fish behavior, in hopes of improving commercial fishing techniques. However, the greatest depth reached by a Soviet scientist using such a hydrostat fell short of Beebe and Barton's achievement: it happened in the Atlantic Ocean in 1960, when V. P. Kitaev descended to 1,970 feet. Later in the decade, the Russians developed new tethered vehicles, capable of being towed, for the commercial fishing industry.

Japanese scientists also carried out extensive observations from their bathysphere *Kuroshio* in the mid-1950s. Like the Soviets, they studied the behavior of commercial fishes, but they also conducted basic research. In particular, they showed great interest in the nature of suspended organic matter in waters adjacent to Japan, and they published some early scientific papers on this marine snow, an important component of the deep-sea food chain.

Despite these later Russian and Japanese expeditions, no one really continued in Beebe's footsteps as he had hoped. No one explored the pelagic depths with any degree of thoroughness. In fact, a long inactive period, from 1934 to 1948, followed

Beebe and Barton's dives in their bathysphere. The reason for this fallow period is unclear. Certainly World War II tied up foundries and shipbuilders, among other huge disruptions, but that alone cannot explain the loss of momentum. Perhaps most countries concluded that deep-sea exploration would never yield commercial benefits. The task was left to dreamers like Beebe and Barton, who would risk their lives to reach their goals—dreamers who are always few in number.