

DIVERS THINGS: COLLECTING THE WORLD UNDER WATER

James Delbourgo
Rutgers University

I do not pretend to have been to the bottom of the sea.
Robert Boyle, 1670

MATTER OUT OF PLACE

Consider the following object as shown in an early eighteenth-century engraving (Figure 1). It is a piece of wood — not a highly worked thing, not ingeniously wrought, though it is an artefact of human labour rather than a natural body. Or is it? In the engraving, the piece of wood disappears: it is visible towards the bottom of the image, a sober pointed stump, but it is quickly subsumed by a second, enveloping entity that swirls about it in an embroidering corkscrew. What elements are here intertwining? The legend beneath the engraving identifies the artefact thus: “*Navis, prope Hispaniolam ann Dom 1659. Naufragium passae, asser, a clavo ferreo transfixus, corallio aspero candicante I. B. Obsitus, & a fundo maris anno 1687 expiscatus.*” It describes a stake or spar from a ship wrecked off Hispaniola in 1659, which is transfixed by both an iron bolt and rough whitish coral, fished out of the depths in 1687. This collector’s item is neither the cliché of exemplarily beautiful coral nor straightforwardly a historical relic, but an intertwining of the two: the “transfixing” of a remnant of maritime technology by an aquatic agent. It exhibits the very process of encrustation. The spar is juxtaposed with the image of a jellyfish, and more proximately, engravings of Spanish silver coins, also encrusted with coral: “*Nummus argenteus Hispanicus ... incrustatus*”, one of the labels reads.¹ Still another illustration, in a separate engraving, bears the legend “*Frustum ligni e mari atlantico erutum cui adhaerescunt conchae anatiferae margine muricata*” — a piece of “drift wood beset with bernecle [*sic*] shells”. It poses a similar puzzle. What appears of interest to the curious is neither the barnacle nor the wood as autonomous specimens but their physical relationship — the fact that they are stuck together.²

The engravings in question were commissioned by Hans Sloane for his two-volume *Natural history of Jamaica* (1707–25). Sloane had visited England’s rising sugar colony during 1687–89 as physician to its then governor, Christopher Monck, second Duke of Albemarle, during a period of intense capital investment underwritten by the acceleration of English involvement in the African slave trade, in whose profits Sloane became a direct beneficiary. Although Sloane’s voyage to Jamaica is noted for the hundreds of plant specimens he brought back to London, the origins of his Atlantic passage in fact lie under water, in that the original motivation for Monck’s acceptance of the governorship was to make a fortune through salvage projects on sunken treasure ships in the Caribbean Sea. Among Sloane’s haul of specimens

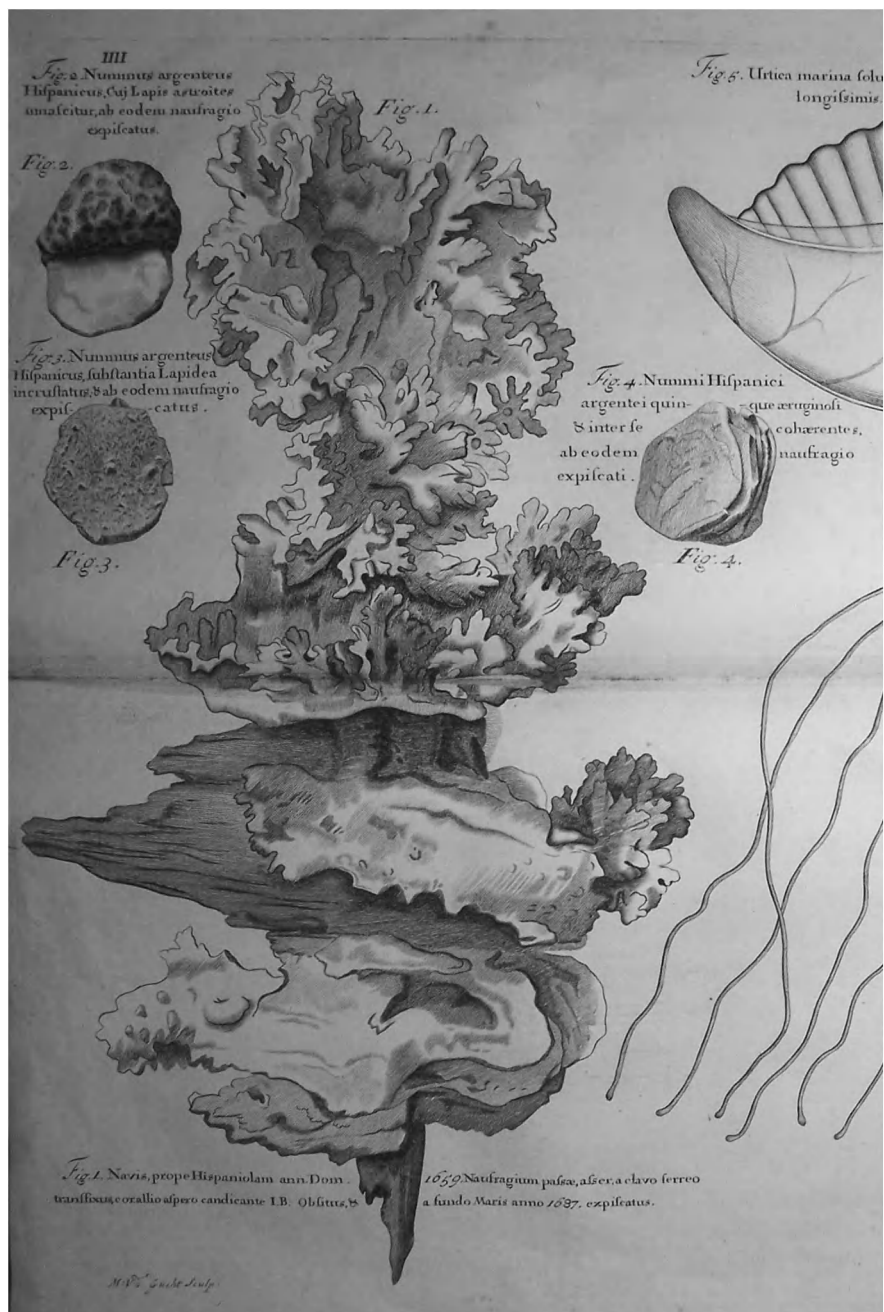


FIG. 1. A coral-encrusted spar and coins from the Caribbean Sea, engraving from Hans Sloane, *Natural history of Jamaica*, i (1707), detail. Botany Library, Natural History Museum, London (photograph by author).

were numerous curiosities, including aquatic objects, such as his coral-encrusted spar and coins. Several of these curiosities were later placed on public view in the British Museum, which opened in 1759 to house the collections Sloane had amassed. To Sloane's rival John Woodward, shipping the physical context of specimens was at best a matter of necessity. "For those pieces which are found lodged in marble or stone", he advised collectors in 1696, "and are not easily got out single, send pieces of the said marble and stone, of all sorts, with the shells so lodged in them". Sloane's engraving of the encrusted spar was neither accident nor instrumentality, however, but a display of learned attention to the processes of mutual transformation between natural and artificial forces, divine creativity and human ingenuity.³

Fusions of natural and artificial entities also suggest the relation between worlds of specimen gathering and treasure-hunting in which collectors like Sloane trafficked. This essay pursues early modern curiosity culture's fascination with things encrusted and transfixed into an intensely fetishised zone of collection and signification: the submarine. It aims to open up the history of the underwater realm in early modernity by examining what the anthropologist Michael Taussig suggestively describes as "the art of matter out of place". Taussig cites Hannah Arendt's likening of the researches of Walter Benjamin to the work of a pearl diver, who restores meaning to lost treasures by bringing them to the surface and resetting them in new contexts. This is but one version, however, of the ubiquitous construction of truth-seeking as deep diving, of which early modern philosophers were no less convinced. "'Tis the work of the experimental philosopher, not onely to dive into the deep recesses of nature", wrote Robert Boyle, "and thence fetch up her hidden Riches; but to recover to the use of man those lost inventions, that have been swallowed up by the injuries of time, and lain buried in oblivion".⁴ Boyle's was not metaphorical talk. Steven Shapin has astutely discussed how Boyle managed contradictory reports of conditions under water in such a way as to support his commitments as a mechanical philosopher.⁵ One of the striking features of Shapin's discussion, however, is the entanglement of histories to which it points, and in which natural philosophical debates about water were implicated: the execution of salvage work on sunken ships; competitions over trade and resources between colonial powers, in particular the pearl fisheries at Ceylon and Margarita Island; and the extraordinary prowess of divers from Africa, South Asia and the Americas — all of which both enabled and mediated learned attempts to know the deep. Put from a different perspective, two centuries later Jules Verne's *Twenty thousand leagues under the seas* (1869) did not merely respond to the new diving technologies and oceanographic projects of the mid-Victorian era; it refashioned a history of underwater intervention dating back at least to the Renaissance, one embroiled in technical experimentation, global capital flows, naval deployment and colonial trade.

Rather than focus on customary themes in the history of maritime knowledge such as the physics of the seas, or the classification and aesthetic arrangement of aquatic objects (particularly shells), the aim here is to examine instead the mechanics of retrieving underwater things and the social history of submarine penetration. The

question of who went under water, whose hands prized treasure from the sea floor, and how aquatic artefacts were moved from the depths to the cabinet, here becomes central, providing an opportunity to situate curiosity culture and the natural philosopher's desire to see under water in relation to issues of non-European skill as well as experimental technological innovation in an era of colonial expansion. To paraphrase Taussig, the aim is not to look (again) "at captured objects, from the outside" but to get inside the act of capture, so that the relation between Boyle's science of water pressure, for instance, and the histories of colonial trade and contest over natural resources that enabled it, are restored to visibility.⁶ The essay uses Sloane and his contemporaries at the intersection of late seventeenth-century English networks to examine both the imagination and reported exploration of the submarine, in the period when diving projects proliferated due to dramatic new fortunes in Caribbean salvage. The first section explores perceptions of the deep in a providential framework whose discussions linked the biblical Flood with contemporary disasters such as the 1692 earthquake in Port Royal, Jamaica. It argues that, in addition to exemplifying connoisseurial preoccupation with transformations between nature and art, Sloane's collection and description of aquatic curiosities constituted a providentially imperial chorography of the submarine. The second situates the collector's power to transform nature into art in relation to his ability to command the labour and expertise of divers. The submarine was not an alternative realm of freedom from conventional social relations, but one defined by the violent relation between European treasure-hunting and the extraordinary capacities of African, Asian and American divers.⁷ The third explores the shift from this self-extension through human surrogates to the construction of prosthetic devices, in particular the diving bell, linking programs of submarine knowledge at the Royal Society to entrepreneurial salvage projects, and attempts to colonize the depths by transforming the world under water into dry land.

EX AQUA OMNIA

According to Krzysztof Pomian, collections of objects signify as visible links to invisible realms, as tangible manifestations of other planes of existence, whether temporal, spiritual or cultural. This section investigates the ways in which learned naturalists like Sloane sought to read and position aquatic curiosities as clues to the agency of God and nature through the history of water, across three principal domains: theological discourse concerning the biblical account of the Flood, theories of the history of the earth, and rival geopolitical claims to the deep sea. In the seventeenth century, aquatic artefacts, and the very notion of aquatic submersion, enjoyed powerful primary associations with the Flood. The divinity of the submarine realm had long been affirmed by ancient Greek mythologies of undersea gods like Poseidon and Amphitrite, and their son Triton, a man from the waist up but with flukes for diving, who could command the waters with his conch trumpet. Legends of fantastical sea-monsters inhabiting the deep abounded as well, creatures whose existence continued to be reported even as European mariners ventured increasingly beyond the Pillars of Hercules after the late fifteenth century. Assemblies of aquatic

curiosities in early modern wonder-cabinets often derived spiritual significance by association with the Flood. When the Prince and Princess of Wales visited Sloane's Chelsea museum in 1748, one of the first occasions Sloane's enormous collection was described publicly in print, the *Gentleman's Magazine* commented that "the remains of the Antediluvian world excited [in them] the awful idea of the catastrophe, [as] so many evident testimonies of the truth of Moses' history".⁸ Links to biblical history were publicly advertised to display the virtue both of the collector and his noble patrons, and the national public interest that would pay to house a collection deemed piously demonstrative of divine omnipotence.

Such pieties notwithstanding, collectors commonly deployed Poseidon/Neptune as a self-apotheosising emblem. The soldier and natural philosopher Count Luigi Marsigli amassed a considerable number of rare red corals, owned a bust of Neptune and had him figured on the frontispiece of his *Histoire physique de la mer* (1725), a work that described a detailed series of sub-aquatic measurements Marsigli had conducted in the south of France.⁹ Sloane, meanwhile, assembled a vast array of aquatic artefacts, beginning with his Jamaica voyage of 1687–89, and continuing throughout the subsequent half century, thanks to his remarkable network of globally distributed correspondents. By his death in 1753, he claimed to possess around 6000 shells, 1500 corals and sponges, and 1500 fish.¹⁰ Many of these served as working objects for naturalists and taxonomists, contributing to richly illustrated works such as Martin Lister's *Historia conchyliorum* (1685–92). John Ray's *Synopsis methodica piscium* (1713) likewise relied on access to Sloane's "Pisces Jamaycenses".¹¹ One visitor to Sloane's museum gushed sycophantically of the pleasure he took to "admire the maker's and the owner's art" and gaze on submarine specimens while "Safe from the dangers of the deep".¹² The aquatic collector paradoxically exhibited his piety by emulating divine power, creating conditions for vision into the watery part of the creation by raising its treasures from the depths. As the Creator's power could overturn nature's lawful order and turn land into sea, the collector's manifested itself by transforming aquatic creatures into dry curiosities. The power of specimen-objects like sharks captured, dried and mounted on the ceilings of wonder-cabinets lay in the cognitive astonishment of beholding a creature from the depths raised to the heights. This was a mutually reinforcing celebration of divine and connoisseurial virtuosity.¹³ The collector's art, Sloane insisted, was not merely diverting for the learned but also tended "to the manifestation of the glory of God, [and] the confutation of atheism and its consequences".¹⁴

The deep was forbidding as a matter of traditional biblical injunction, however. It connoted divine limits to human knowledge and supernatural regulation of earthly affairs. "By the Abyss was meant a Depth, not possible to be sounded, or measured, by the Power of Art", averred the experimenter Robert Hooke, Sloane's contemporary at the Royal Society, after surveying several ancient and biblical sources. Hooke continued:

But it is more properly rendered, by our English translation of the Bible, the Deep, or the great Deep, (when the Depth of the Sea is meant) than by the Abyss

in the Vulgar; yet there are several expressions that do shew, it was understood to signify a Depth, that was beyond the Power of Man to measure; and so it seems to be meant in the first chapter of Ecclesiasticus, where 'tis said, Who hath measured the Height of Heaven, the Breadth of the Earth, or the Deep; that is, the Profundity of the Sea. And so the Expression in the 37th chapter of Job seems to intimate: the expressions in the Scripture, relating to physical matters, being accommodated generally to the most common and believ'd opinions of men, concerning them. Certain it is, that no one, yet, hath experimentally found what the greatest Depth of it is....¹⁵

The abyss was divine in its unknowability, although Hooke himself was far from deterred, designing a series of improved devices for sounding deep waters. As William Poole reminds us, savants of this era pursued increasingly naturalistic answers to divine puzzles, in which the surprising geographical distribution of aquatic objects played a prominent role. While many collectors pursued shells as objects of taste and taxonomy, the frequent discovery of shells on dry land posed serious questions about the chronological formation of the terraqueous globe and the global historical movement of water. Still current doctrines of geomorphological vicissitude, derived from Aristotle and Seneca and promoted in the work of the German geographer Bernhardus Varenius, maintained the notion of cyclical transformations of the shape of the earth, and the conversion of land into sea, and sea into land. "Where once was solid land, seas have I seen", ran George Sandys's popular 1626 translation of Ovid's *Metamorphoses*, "and solid land, where once deep seas have been./ Shells, far from seas, like quarries in the ground;/ And anchors have on mountain tops been found".¹⁶ Regarding figured stones not as the work of magical or plastic forces in the earth, but as fossilized remnants of species from earlier periods, Hooke for one read the discovery of shells lodged in the earth's strata as evidence of aquatic submersion in ages past, endorsing Varenius's cyclical theory. "There is no coin can so well inform any antiquary that there has been such or such a place subject to such a prince", he wrote, "as these will certify a natural antiquary, that such and such places have been under the water, that there have been such kind of animals, that there have been such and such preceding alterations and changes of the superficial parts of the earth". His speculations on submersion were evidently based on personal aquatic experience. Observing the tides at Freshwater Bay on his native Isle of Wight, he noticed the shore was "bare at low water so as to be walked on, but at high water a great part of it was covered by the sea".¹⁷

For providential thinkers, however, water remained a moral instrument of divine judgment in the present. Even as moderating strains of physico-theology became ascendant among the Restoration learned, ministers recurred to a catastrophist theme to signal God's intervention in human affairs. While Sloane, recently returned from Jamaica, gathered naturalistic reports of the Port Royal earthquake of 1692 for the sober *Philosophical transactions*, preachers emphasized that England's dominions remained subject to divine correction.¹⁸ That Port Royal, the notorious pirate haven, had been destroyed was an unmistakable sign. The signal physical effect of

the earthquake was its submersion of the port under water, and in a highly zealous reworking of Varenian transformation theory, its uncanny conversion of a familiar human domicile into an aquatic environment. “Troops of Warring Seas invade; / These overflow”, wrote the Puritan John Tutchin, “Where Houses stood and Grass did grow, / All sorts of Fish resort: / They had Dominions enough before, / But now unbounded by the Shoar, / They o’re the Tops of Houses sport”. Sinners were now “Fishes and Sea-Monsters Food”.¹⁹ The London bookseller Thomas Parkhurst reported how that “famous Empory and Mart Town” had had its merchants suddenly swept away by the sea, and its streets sunk into the waters, “now no longer Earth, but Sea”, awash with floating corpses and boatloads of looters. The earthquake dramatically appeared as an act of divine art that transformed the creation by turning land into water. Gullies, “tho’ before exceeding dry”, now flooded and teetered on the brink of full submersion by “the force of the Fountains of the Deep breaking up”. Such transformation in the “Sea and Land exchanging places” was a catastrophic political portent, too. “Political Societies are not immutable”, Parkhurst concluded, “the most extended Empires ... crumble into nothing.... Natures Works forsake their long established Laws”.²⁰ Confronted by such a reckoning, even the pre-eminent natural theologian John Ray struggled to maintain obeisant talk of nature’s lawful course. After discussing the deep, the Flood, and the puzzle of shells found on mountaintops, Ray linked his analysis of earthquakes in England with the Port Royal disaster. In attempting to explain Port Royal’s destruction naturalistically via sulphureous subterranean explosions, he also proffered the view that chemical phenomena were instruments of “special superintendence”. Their original cause? An “inundation of wickedness”. While England’s possessions in the Caribbean contributed to the re-ordering of taxonomies of nature by furnishing innumerable specimens — Ray published descriptions of many of Sloane’s new Jamaican plant species, for example — it also haunted post-Newtonian cosmologies with its capacity for radical convulsive action.²¹ Indeed, in a nice reversal of the customary centre-periphery distribution of rationality and supernaturalism, Matthew Mulcahy suggests that repeated earthquakes encouraged Caribbean-based commentators to regard such events as regular natural occurrences rather than divine interventions. It was, rather, remote metropolitan sermonizers who continued to fetishise the spiritual significance of these phenomena as the chastisements of an angry god.²²

Such intimations troubled a well-established tradition of invoking the submarine as a divinely designed realm, whose rational structure gloriously mirrored that of the heavens. Hooke, for his part, was unorthodox in his musings on submarine specimens, but neither openly catastrophist nor irreligious.²³ His *Micrographia* (1665) had included minute engravings of sponges, sea-weeds and corals (‘submarines’ as they were collectively known) and emphasized pious wonder at divine “contrivance”. He also penned enthralled descriptions of the nautilus fish as a natural model for the art of underwater navigation.²⁴ In the same era, the French naturalist Charles de Rochefort wrote more grandiloquently of the depths as an exquisite work of divine intelligence. De Rochefort’s account, contained in his natural history of the Caribbean islands, was

not an unknowable abyss but a collectible deep, and he exhorted the curious to gather its “spoils” for their grottoes. Sea-urchins, he noted, were particularly attractive “as presents to the curious, who for rarity hang them up in their closets”. The deep was a zone of “miraculous plenty” — fish, shells, pearls, corals, oysters, ambergris — through which God had deigned, in humble descent, to exhibit his “omnipotency in the midst of the waves”. Divine artifice under water existed in correspondence with heavenly magnificence. Sea-stars exemplified the point: “of whatever is excellent in the Heavens there is a certain resemblance in the Sea, which is as it were the others looking-glass.” Some years later, the Nevis-based naturalist William Smith reinforced this idea, citing his own conversations with divers who related “that the bottom of the sea where they had been, looked like a fine garden”.²⁵

Such resemblances were curious and noteworthy, but normal rather than miraculous or random occurrences, according to contemporary learned assumptions that nature teemed with corresponding signatures across life-forms of all kinds. Sloane also possessed extraordinary specimens of submarine anthropomorphism, in the form of a human-shaped glove made by skilled craftsmen from the silk-like filaments spun by the *Pinna Marina* (a large mussel), and the so-called “coral hand” — a spontaneous coral formation in the shape of a human hand (Figures 2–3).²⁶ Both remained sufficiently prized across the eighteenth century to be featured prominently in early



FIG. 2. Sloane's *Pinna Marina* glove. Natural History Museum, London.

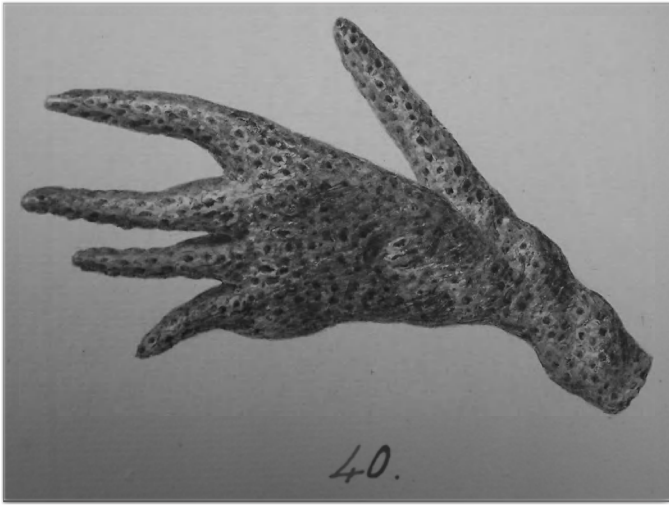


FIG. 3. Sloane's "Coral Hand", from Jan and Andreas van Rymdsdyk, *Museum Britannicum* (1778). Department of Prints and Drawings, © Trustees of the British Museum.

guides to the British Museum. Coral presented a most curious taxonomic dilemma: was it mineral, vegetable, animal, or even a missing link in the chain of being? Gazing on Sloane's specimens in the British Museum's "Coral Room", guides worried, should encourage thoughts of moral order, not random generation. Their description emphasized nature as the providential modeller ("a very curious coral, modelled by nature in the form of a hand or glove") but conceded that in general coral lacked "a symmetrical resemblance of parts", which appeared "like so many different species, growing as it were by chance".²⁷ Decades earlier, Sloane voiced few such concerns. The coral hand would have symbolized for him the very pattern of order in nature. As submarine gardens mirrored the heavens, organic signatures could regularly take the form of natural bodies appearing in human form,²⁸ as evidence for the immanence of the human (and therefore the divine) in nature, acting in effect as its moral guarantor. The rising waters of the Port Royal earthquake might compel the zealous as signs of destabilizing moral catastrophism on Europe's colonial peripheries, but back in London, the collector's art involved the steady arrangement of aquatic curiosities in reconstructing the deity's eminently reliable order of things.

In addition to displaying his virtuosity as a collector of objects that served as evidence of divine design, working scientific objects, and teasing hybrids of art and nature, Sloane's aquatic curiosities signified in relation to early modern imperial rivalries for mastery of the deep sea. Who owned the sea? Legal questions of oceanic sovereignty and territorial claims to the Atlantic Ocean had been disputed since the beginnings of American colonisation, despite the promulgations of papal bulls that sought to carve out zones of Iberian domination. Seventeenth-century controversies, as other nations contested the Atlantic, turned on the question of whether the open

seas could in theory be territorially divided at all. Most thinking on the subject denied this possibility, insisting that the sea was, as a matter of legal ontology, an entirely different entity from *terra firma*. In *De mare liberum* (1608), the Dutch jurist Hugo Grotius, writing in advocacy for the Dutch East India Company, argued that the sea, unlike land, could not be considered *res nullius*, and insisted on a natural right of equality of access to open waters and their fruits, even if this self-interestedly held out no promise of equality of property or profit. No consensus was forthcoming. Rival theorists John Selden and Seraphim de Freitas emphasized rights of national property (*mare clausum*) especially in coastal waters and, in effect, a balance emerged between deep-sea neutrality and coastal territoriality.²⁹

While legal doctrines failed to lay unequivocal claim to national mastery of deep-sea waterways, the recovery and display of aquatic objects provided an alternative means to advertise such claims. In her analysis of the relationship between curiosities and printed texts, Marjorie Swann has shown how seventeenth-century English natural historians positioned curiosities as embodiments of the dominion of the local aristocratic patrons for whom they wrote.³⁰ Sloane's miscellany of submarine curiosities fulfilled a similar function, albeit on a more dramatic scale, as a form of imperial chorography demarcating the extent of English maritime reach. Sloane's aquatic curiosities included his Caribbean spar and coins; "a piece of the keel of a ship eat by the *worms*"; a piece of dish taken up from a sunken Spanish galleon from the Armada, wrecked off western Scotland in 1588, and covered with "thin crust from the sea water"; a lump of the same with pebbles and sand stuck to it, "cemented wt. a ducatoon in the middle"; a piece of eight from the Spanish galleon found off Hispaniola, "covered wt. worm shells & *corallin* matter all over"; a bottle and bolt from a silver ship covered with "*Corallium asperzum candicans adulatorium*"; and "a large Coralline branch from the Leeward Islands with Starr fishes sticking to it".³¹ Sloane's curious hybrids of art and nature may have been Baroque puzzles for the cultivation of virtuosi and their wealthy friends; but they were also artefacts that acted as media for the expression of power, in celebratory national tales about mastery of the seas for freedom-loving Englishmen, rather than Catholic tyrants. Morsels of worm-eaten keel dramatized strategic maritime anxieties by exemplifying the damage natural agents could cause sea-going vessels. In describing the multivalve shell *Balanus major, augustus purpureus* in his natural history, Sloane observed that it occasioned "great inconvenience" to ships in the Caribbean Sea, "sticking to those parts of the ship which are under water, and retarding its motion unless scrub'd off". This, once again, was encrusted natural history: these shells signified both as natural bodies and for their physical interaction with man-made objects.³² But such objects also made reassuring vehicles for providentialist ideology, too. The relic of an Armada shipwreck could nicely suggest, for example, that nature and God were firmly aligned with English Protestants, while the coral-encrusted spar from the Hispaniola galleon could likewise ground late seventeenth-century narratives of Spanish decline and English ascendancy, in the aftermath of the military seizure of Jamaica in 1655. Published in 1707, the year of the Act of Union between England



FIG. 4. Carved nautilus shell, owned by Sloane, featuring Dutch naval exploits. Natural History Museum, London.

and Scotland, in the afterglow of the Glorious Revolution's Protestant settlement and during the War of the Spanish Succession, Sloane's dedication of his natural history set Jamaica before Queen Anne as her "largest and most considerable" plantation.³³ Before visitors to his collections and in print to his readers, Sloane's aquatic exhibitions acted as propagandistic gestures, celebrating the naval successes of an English state at war with France and Spain. The nautilus shell he acquired that bore images of the naval exploits of the Dutch admirals Maarten Tromp and Michel de Ruyter (Figure 4) embodied the inscription of imperial rivalries into the frame of nature, at once an expression of Protestant solidarity, yet also suggestive of English desires to emulate and appropriate Dutch maritime success, in the era of alliance following the Anglo-Dutch wars. The collection and display of such objects of knowledge and taste by virtuosi like Sloane was a continuation of war by other means.

IN THE SHARK'S SHADOW

Sloane's ownership of prized anthropomorphic curiosities like the coral hand and pinna marina glove points to the subject of the next two sections: the work of human hands under water. Collections like Sloane's, as we have seen, were thought to redound to the double glory of maker and collector. But who actually brought aquatic curiosities from the depths to the surface, and how did they do so? Underwater historians Bohumil Kolár and Oldrich Unger point out that one of the earliest legends involving deep-water diving is that of Gilgamesh. An alternative title of the fictional work known as the *Epic of Gilgamesh* is *He who saw the deep*. According to Kolár and Unger, the mythical Sumerian ruler dived in order to find the plant of eternal life, to bring it to the city of Uruk. As the legend suggests, diving prowess was in no way limited to Europeans or, as the storied example of the mostly female Japanese Ama pearl-divers reminds us, male swimmers.³⁴ The diving historian Robert F. Marx has

surveyed numerous such legends across a range of traditions. Long before the Greeks celebrated deities like Oceanus, Poseidon and Glaucus (god of divers for sponges, corals and pearls), the Chinese Emperor Yu was commanding divers c. 2250 B.C. to fetch corals and pearls, while by 550 B.C. Indian and Sri Lankan pearls were being regularly traded around the Mediterranean. Stories of salvage dives, meanwhile, date to at least the fifth century B.C., with accounts of Xerxes's attempt to recover treasure from submerged Persian galleys.³⁵

It was no common feat when, in 1725, the youthful Philadelphia printer Benjamin Franklin "stript and leapt into the river [Thames]", as he later put it, "& swam from near Chelsea to Blackfryars, performing on the way many feats of activity, both upon & under water". As Kevin Dawson states in a recent article on African swimmers and divers in the era of the Atlantic slave trade, most Europeans did not learn to swim in great numbers until the nineteenth century. For early modern Europeans, staying under water was a marvellous feat, and one glossed by seventeenth-century swimming manuals like Melchisédech Thenevot's *Art of swimming* (1696) as an unnatural one to be mastered only through considerable artifice. Fish, as swimming expert William Percey had noted, were "by nature assigned to this element and this is their natural place", while "man doth not altogether naturally swim as other creatures do, but immediately descends towards the bottom".³⁶ Perhaps this was why, to accentuate the absurdity of his fictional virtuoso, the playwright Thomas Shadwell depicted Sir Nicholas Gimcrack as a *theoretical* swimmer only, who learns to swim on a table under the tutelage of a master: "I content my self with the Speculative part of Swiming [*sic*]" — possibly a pun linking underwater exploration with financial speculation — "I care not for the Practick. I seldom bring any thing to use, 'tis not my way".³⁷ Human beings who could actually swim in water were superior to other animals, on the other hand, in inhabiting more than one element. While Europeans venerated diving in their mythological traditions and celebrated their own aspiration to mastery through artifice, they nevertheless regarded with a mixture of envious mistrust and racial condescension the extraordinary aquatic abilities of other peoples, whose apparent ease in accessing the depths signalled their alterity as preternaturally, even diabolically skilled beings.

By the late seventeenth century, diving was increasingly subject to learned scrutiny. John Woodward's published questionnaire for travellers not only requested the taking of soundings and the observation of what "other matter is brought up with the Plumet", but also what matter divers found at the bottom of the sea, and "at what distance from the shores the diving is made [and] to what depth and how long the dyvers can endure under water". By modern calculations, the pressure of the air on the human body is 14.7 pounds per inch, equivalent to one 'atmosphere'. Water pressure increases by one atmosphere every 33 feet or so, with human lungs generally able to function at three or at most four atmospheres, or approximately 130 feet below (around 22 fathoms). Early modern European travellers amazedly noted the capacity of other peoples to remain at considerable depths for extended periods. In 1535, for instance, the Spanish natural historian Fernández de Oviedo reported the

employment of Lucayans (Bahamian Arawaks) by the Spanish at the pearl fishery off Margarita Island, north of Venezuela, diving to a hundred feet, for fifteen minutes at a time, seven days in a row, and barely exhibiting any fatigue. A quarter of an hour was the most often quoted maximum, in locations from Japan to the Caribbean Sea, although Nathaniel Wanley's *Wonders of the little world* (1673) reported divers remaining under for forty-five minutes, while others spoke even of hour-long dives.³⁸

Observers were therefore keen to scrutinize indigenous technique. The antiquarian Sir Thomas Blount compiled a useful digest of divers' methods. Common practices involved tying a cord under the arms that connected the diver to a boat on the surface, while he or she carried a stone of some twenty pounds to facilitate descent, also attached to the boat by a lengthy rope. After the descent, the diver discarded the stone, and used "a sack made like a net, the mouth whereof is kept open with a hoop". A pull on the rope signalled that he was out of breath, upon which he'd be hauled up and given fifteen or thirty minutes respite before being sent down again. Dives could reportedly last up to twelve hours at a time. Stamina was acquired through repetition, with the length of dives increasing as the pearl fishing season wore on. Sir Robert Moray, FRS, also reported on the use of "a piece of sponge dipt in oil, which [the diver] holds in his mouth, having his nostrils stopt; believing, that by means of the oiled sponge he can suck air out of the water to serve him for divers respirations". This was apparently an ancient practice, for which the Rymsdyks a century later cited Pliny's claim that divers "do sprinkle oil abroad with their mouths" to sweeten the water in their vicinity, calm it and even provide illumination.³⁹

Such observations were not made by disinterested naturalists but by participants in commercial networks. What would come to be known as free diving was anything but. The French trader Jean-Baptiste Tavernier reported that Dutch merchants 'taxed' divers operating off the Tamil Coast in Ceylon, in return for protecting them against enslavement by Malabar pirates. Across the Atlantic, relations between divers and merchants often approximated slavery. Bartolomé de las Casas identified the Margarita fishery as a key site of "Spanish cruelty" in his infamous account of the destruction of the Indies. Oviedo noted the cruelty of Spanish masters ("Lords of the Indians") over indigenous American divers, who traditionally dived for seafood and venerated their own diving gods, but were made to fish oyster-pearls for the king in the wake of Columbus's landfall at Cubagua.⁴⁰ Sloane himself noted the tense distrust between Europeans and Americans, noting that divers did not use iron tools to "drudge" up pearl-oysters, since destroying them was considered "high treason", though (he fancied) they often managed to obtain higher prices for pearls from English traders instead.⁴¹ As native diving populations became depleted, enslaved African divers were increasingly sent below at Margarita. While some spoke of Africans being trained after transportation to the Americas, Dawson convincingly claims that such skills originated in West Africa and were deliberately expropriated, not unlike the bloc-displacement of African rice-cultivators to the Americas described by Judith Carney. According to Dawson, Africans' underwater abilities were a cultural survival of the Middle Passage. The seasoned diver suffered blood to gush from their eyes,

nose and mouth only initially. Their bodily disintegration was, rather, the product of coerced over-work. Hearing and eyesight failed prematurely, while shark attacks claimed limbs and lives outright. Like overland slaves, divers were worked to death through fatigue and disease by years of day-long labour. Those who stayed above water working the rope system by which divers were relayed were in effect overseers, their ropes chains.⁴²

Aquatic commodities and specimens were thus artefacts of a submarine realm shaped by inter-ethnic labour and contestation. Just as enslaved Africans constituted a vital resource as field-workers for naturalists bent on expanding their botanical collections in the Americas, their skills also provided rare opportunities for underwater collecting.⁴³ William Smith casually noted how live sea-urchins, prized by learned collectors like Sloane, pricked the feet of African divers who gathered them in Nevis. Such nonchalant remarks show how the skill of African divers directly furnished matter for submarine philosophers. Perhaps, Smith wondered in a letter to John Woodward back in Cambridge, the Atlantic's depths abounded not only in bushes and trees (some samples of which he had sent back) but also mountains, valleys and plains? The source of these conjectures was an episode in 1719 when an acquaintance named Moses Pinheiro, finding his fishing hook snagged at the bottom of a pond, "ordered my negro man Oxford to strip, dive, and unloose it". This the African diver did, bringing up bush, roots and branches, prompting Smith's speculations about divine submarine order as a result.⁴⁴

The similarity between divers tied by ropes and agricultural labourers shackled by chains links aquatic systems of forced commodity harvest to broader reflections on the submarine as a theatre in the history of Atlantic slavery. The Martinican theorist Édouard Glissant, the St Lucian poet Derek Walcott, and the literary scholar Ian Baucom have all offered sustained meditations on this theme. Glissant, citing the Barbadian poet-scholar Edward Kamau Brathwaite's notion that the "unity is submarine", writes of the sub-Atlantic as a repository of historical memory that connects diasporic African experience, invoking episodes such as the notorious *Zong* affair of 1781 when a cargo of Africans was thrown overboard by a Liverpool slave ship to claim insurance money for investors. "They sowed in the depths the seeds of an invisible presence", writes Glissant, emphasizing the notion of 'transversality', which signifies at once the transfixing of histories and diasporic transformation.⁴⁵ Water and slavery were linked in early modern minds, too. Even though Port Royal's destruction was widely seen as divine punishment for profligacy rather than slavery, Parkhurst identified the overturning of nature's order with a challenge to the social order of New World enslavement, remarking that "even the very Slaves thought it their time of liberty". Many reported Africans' belief that suicide by drowning would return them home via underwater transport. The mystic and antislavery critic Thomas Tryon aimed to put himself in the place of slaves answering their masters. In his discourse between "an Ethiopian or Negro-Slave and a Christian", Tryon radicalized the redemptive construction of baptismal submersion by placing the following words in the mouth of a fictional slave: "if the Sea should swell a little higher, and

wash the tops of your Sugar-Canes ... might [I] not then lawfully swim Home to me own Country?"⁴⁶

By the late eighteenth century, abolitionist purveyors of humanitarian sympathy made much of the immoral foundation on which luxury trades and consumption rested, in their campaign to end the British slave trade. Criticism of abuse fastened on the artificial mutation of human labourers into amphibian creatures. "It is lamentably true", wrote the geographer John Walker, "that in some parts of the world, even man is reduced to the miserable necessity of becoming an amphibious sort of animal". Commenting on the link between pearls and African servants — themselves exotic curiosities collected and conspicuously displayed in numerous early modern portraits⁴⁷ — Walker rued that the "gay and gaudy fair, glittering in their pearls, little consider the pain it costs some of their wretched fellow creatures, to procure the little bauble". Such abuses were literally de-humanizing. Here, the bodily alterity of non-European divers figured not as a natural marvel or quasi-divine artificial transformation but as the deformation (via "unnatural employ") wrought by European greed. The alleged ability of some to stay down fully three-quarters of an hour was perhaps the result of internal mutation: "whether from some effort the blood bursts the old passage [which] it had in the foetus, and circulates without going through the lungs, it is not easy to tell; but certain it is, that some bodies have been dissected with the canal of communication open; and these extraordinary divers may be internally formed in that manner."⁴⁸

Such expertise, no matter how abnormal, was nevertheless invaluable for salvage work. Long-distance salvage was a form of systematic parasitism: a mobilization of underwater technique to profit from the regular breakdown of mercantile capital flows that resulted from the sinking of Spanish treasure ships. Indigenous food-gatherers, turned into enslaved commodity-collectors, were pressed into service as rescuers of bullion. A community of divers for underwater hull maintenance and salvage operated from bases in Bermuda, Port Royal, Havana, Vera Cruz, Cartagena and Panama, while Spanish ships carried divers of various ethnic backgrounds for the same purpose. These divers were also deployed to recover gold and silver from sunken wrecks. Perhaps the most fabled 'wracking' episode involved the Spanish ship *Concepción*, known to the English as the Golden Lion, from which great quantities of bullion were successfully 'fished' in the mid-1680s. One of the operation's leading sponsors in the investment cartel gallantly styled the Gentleman Adventurers was Christopher Monck, second Duke of Albemarle, later Sloane's patron as Jamaica's governor, hoping to engineer further profitable dives. The operation was overseen by the New England shipwright turned treasure-seeker Sir William Phips (later governor of Massachusetts during the Salem witch trials), whose journal of the dive Sloane acquired for his manuscript collection, and whose exploits he described in the first volume of his natural history.⁴⁹

Monck, indebted thanks to his lavish spending, was joined by Sir John Narborough and Sir Richard Haddock as fellow investors, and obtained a royal patent from James II. Phips provided the divers and equipment, including some primitive diving

tubs brought from Boston. Most of the salvage work, however, seems to have been conducted by naked divers. According to Peter Earle, Phips relied on a core of four divers. Their provenance is uncertain. Sloane maintained that they were East-Indian pearl divers, but they may also have come from Bermuda or Port Royal. Two of their names, perhaps those of Christianized Native Americans, have survived: Jonas Abimleck and John Pasqua (or Sasqua). The wreck they found off the Northern coast of Hispaniola, which had been lying there since 1659, had had most of its superstructure eaten by worms, while what remained was left encased in coral, perhaps ten or fifteen feet thick, which they hacked through with “iron crows”. As John Taylor recalled in his 1687 manuscript description of Jamaica, coral had enclosed the Golden Lion in “a perfect rock,” which, “being beaten to pieces, there have bin severall thousand dollars and other plat found to be intombed within the bowells of this groweing stonny sea tree called the whitcorall”.⁵⁰ Coral, that darling fetish of the curious, was more pragmatically an obstacle to treasure that invited obliteration. Phips himself may have dived with the aid of a ‘Bermuda tub’, but the brunt of the labour appears to have been borne by his divers. Working at a depth of perhaps thirty or forty feet, on forty out of some fifty-eight days, the divers rowed out in boats braving rough winds and seas, to dive for over four hours a day, six days out of seven, stowing coins in baskets, tying ropes to raise larger pieces, and often falling ill from over-work in the process. According to Sloane, Monck made a fortune: fifty or sixty thousand pounds in recovered bullion and gems in return for an original investment of a mere eight hundred.⁵¹

The extreme difficulty of such salvage work made its relics particularly prized. In “Sir William Phips” (1830), the American novelist Nathaniel Hawthorne depicted a fictional Phips back in Massachusetts whose “sword-hilt, and the lion’s head of [whose] cane display[ed] specimens of the gold from the Spanish wreck”.⁵² The virtuosity of such exhibitions turned on the precarious status of coin between circulation and scarcity. The salvage system sought to put lost bullion back into circulation. “The current Coin here is entirely Spanish”, one commentator later quipped, “you do not see any English money, but in the Closets of the Curious”.⁵³ Especially during an era of colonial currency shortage during wars with the French and acute anxiety about the capacity of domestic recoinage to stabilize the value of the English currency, the Caribbean Sea provided an astonishingly rich contrast in specie hoarded, as it were, by nature. Since, at mercantilist insistence, bullion remained the true measure of wealth, salvage, like clipping, was a highly attractive extra-legal strategy for amassing specie put into circulation by others. If, to recall Pomian, indistinct things became objects of curiosity on removal from economic circuits of quotidian exchange, then fishing out bullion was an extraordinary act of re-circulation and de-objectification, a re-conversion of the trapped into the mobile, the curiously transfixed into once-again exchangeable currency. To celebrate this re-conversion, the Gentleman Adventurers engaged in a final transformation, casting some of their booty back into medals to objectify their triumph. On one face (Figure 5), the medals bore an image of Neptune under the banner *Ex aqua omnia*: all things from water. On another (Figure 6), the



FIG. 5. Commemorative coin struck to celebrate the salvage of the *Concepción*. © Trustees of the British Museum.

image of a salvage dive was framed by a double legend: *Naufraga reperta* (shipwreck recovered) and *Semper tibi pendeat hamus*, adapted from a line in Ovid — always let your hook be hanging.⁵⁴

Sloane not only had the spar and coins from the *Concepción* engraved, but also



FIG. 6. Commemorative coin struck to celebrate the salvage of the *Concepción*. © Trustees of the British Museum.

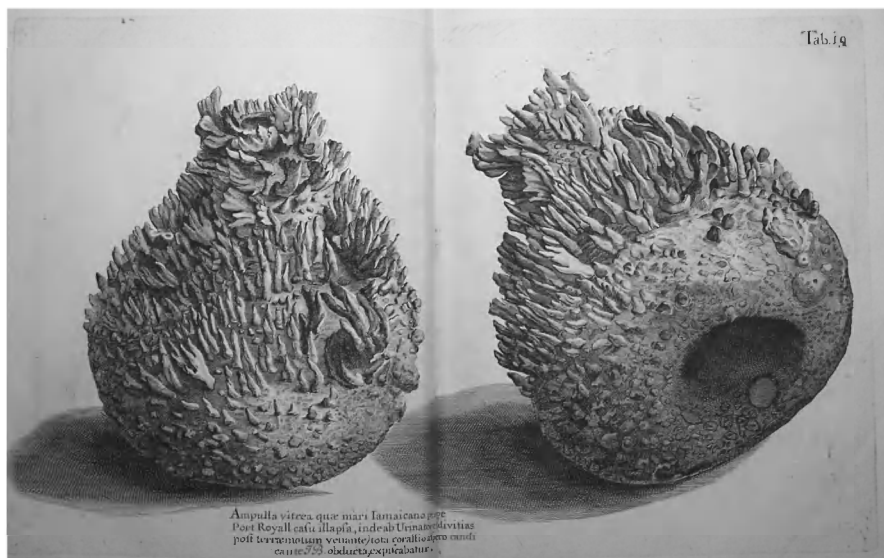


FIG. 7. Coral-encrusted bottles from the Caribbean Sea, engraving from Hans Sloane, *Natural history of Jamaica*, ii (1725). Botany Library, Natural History Museum, London (photograph by author).

coral-encrusted bottles “taken up by a Diver, whom the Reverend Mr Scambler sent to the bottom of the sea to take up money and goods he had lost” (Figure 7).⁵⁵ Trained in chemistry as well as medicine, Sloane keenly observed the processes of chemical transformation at work in his encrusted hybrids — how recovered metals bore a thick “petrification” and were often found “sticking together, the sea water having dissolved some of the alloy or copper mixt with the silver, and made it into verdigrease, which has fastened them together”. In the eyes of the iatrochemically-trained connoisseur, matter displaced was matter transmuted. These processes of homogenization, transfixing and erasure served the plunderers well. The Spanish ambassador to England hoped to “shew that he could prove by the stamps or marks that [the bullion] was once his master’s”, repeating his sovereign’s claim that “his money [might] lie as long at the bottom of the sea as he pleased”. Natural and human rivals contended for the identity of underwater matter, however. Power over the submarine expressed itself as the ability to carry off matter refashioned and re-contextualized. Phips’s cane and Monck’s medallions bore testament to the re-working of purloined metals, and the ability to erase marks of property invoked by rival claimants. Sloane’s judgement was ever that of the pragmatic assayer when it came to tricky recurrent questions about who owned the sea and its treasures. He made no comment on the right of the English to adulterate and melt down bullion against the claims of the Spanish king, merely noting instead that “now the money is divided, I believe twill be hard for him to get it”.⁵⁶

Underwater rarities flowed into Sloane’s cabinet along with the treasure that

flowed into salvage investors' coffers. Submarine curiosities were multiple fusions: specimens of transformations between nature and art, and the human and the divine; of the coercive relations between metropolitan investors, merchants, colonizers, and foreign divers; and of the imperial rivalry between England and Spain. When Walcott wrote of a sub-Atlantic unity made by the deaths of Africans in the course of the slave trade, he tellingly summoned the image of encrusted objects to emphasize the manner in which such histories were conjoined: "bone soldered by coral to bone, / mosaics / mantled by the benediction of the shark's shadow".⁵⁷

UNDER PRESSURE

The emulation of African, American and Asian diving proceeded not through attempts to acquire like corporeal skill but technological transformation through artificial means. Instead of trying to learn indigenous technique, Europeans would descend to the depths in machines.⁵⁸ The difficulty of corporeal habituation to deep diving was unquestionably important here; observers suggested such skills developed only slowly over time. But issues of epistemology and trust drove the renewed attention to artificial diving as well. This programme turned on hope for direct underwater sensory perception as an advance upon the mediating testimony of maritime informants and objects; the engineering of corporeal stability against the threat of violent disintegration; the production of narrative stability through lucid descriptions of previously inaccessible domains; the relation between commercial salvage and philosophical knowledge; and virtuosic transformation writ large in the projected goal of colonizing the submarine by converting it into dry land.

While Caribbean fortunes like those made by Phips powerfully stimulated renewed innovation, European construction of tubs and bells for deep-sea work long predated the late seventeenth century and, therefore, contact with non-European divers as well. Artificial techniques of submarine exploration fell into two main types: the transformation of the human body through direct prosthesis; and the encasing of the body in a larger prosthetic environment — the diving engine. The former technique directly modified bodily capacity to function under water. Leonardo da Vinci in the fifteenth century, for example, and Franklin in the eighteenth, both designed fins to aid swimming. Much earlier, Aristotle's *Problemata* had described a kettle filled with air sent down to replenish sponge-divers. At the turn of the fifth century, the Roman Flavius Vegetius Renatus — among the first of numerous military engineers to work on submarine technology — described the use of bladders filled with air to enable underwater breathing in *De re militari*. Several early modern writers developed this idea further. Diego Ufano and Giovanni Borelli featured designs of prosthetic headgear attached either to an air-filled leather bag, or to tubes that ran above water. These anticipated in primitive form the iconic metal-helmet diving suits later produced by Benoît Rouquayrol and Auguste Denayrouze in 1865, although they lacked the portable tanks of compressed air ("aérophores") of this subsequent apparatus, tethering divers to sources of external replenishment and constraining their movements. Whether any early prosthetic devices worked effectively is open to question. This

was precisely the danger investors in salvage projects using artificial technologies faced when examining seductive new designs. Most such prototypes were probably not effective; evidence that they worked is notably scarce.⁵⁹

In what appears to be the earliest extant image of an artificial dive, Alexander the Great is depicted in several places descending in a glass bell at Tyre, Lebanon, in the fourth century B.C., to observe a campaign of underwater military strikes against his enemies, as well as monsters of the deep.⁶⁰ The most striking feature of such images is the absence of any modification of Alexander's person while under water, as if he were on dry land. This is doubtless the result of visual conventions, but it also suggests an important theme: that the credibility of such apparatus rested on the image of stabilizing the diver in a technology that adapted his aquatic environment to approximate the conditions of dry land.

Interest in diving bells intensified in the sixteenth century. Many salvage operations took place in European waters: attempts to recover guns, goods and treasure. But the revival was almost certainly triggered by prospects of securing fortunes from the Spanish treasure fleets wrecked en route from the Americas.⁶¹ As with prosthetic headgear, numerous early modern technologists designed bells and published illustrations (Nicolò Tartaglia, Franz Kessler and Gaspar Schott among them).⁶² The case of the Rotterdam-based French engineer known by the name of de Son also seems instructive. When his clockwork 72-ft submarine, which he claimed could reach the East Indies in six weeks, turned out to be a failure, de Son improvised by selling tickets to those wishing to inspect his defunct invention. Fantastical machines might garner investors, or if they failed, at least the attention of the curious. In Spain, Giuseppe Bono and Jerónimo de Ayanz clashed in litigation for the exclusive right to employ new apparatus at the Margarita pearl fishery, while in England, surviving petitions similarly show how mariners aimed to secure legal protection for the risk they incurred in running salvage operations. Inventors sought patrons at the apex of the social hierarchy, as when the Dutch technologist Cornelis Drebbel navigated his 'invisible eel' under the Thames in the 1620s, with King James I allegedly on board.⁶³

Interest in underwater knowledge and its prosthetic pursuit at the early Royal Society related to England's geopolitical position as a naval power challenging the Dutch for commercial supremacy through navigation acts and trade wars between the 1650s and 1670s. Recent research points increasingly to the Society's engagement with non-European worlds, war, colonization and the pursuit of global power. Several early presidents and fellows of the Society were involved in the governance of England's Caribbean colonies, including John Vaughan, Earl of Carbery, the Jamaica governor who later became President of the Royal Society. Sloane built his fortune, reputation and network in part through his Jamaica voyage, on returning from which he assumed the Society's secretaryship, and married Elizabeth Langley Rose, widow of one of the colony's major early planters.⁶⁴ In the 1660s, the soldier and natural philosopher Sir Robert Moray took the lead in presenting intelligence on naked diving to the fellowship, as well as reporting trials with primitive bells used to raise cannon. Hooke, meanwhile, busily developed new sounding devices; built "diving

boxes” and breathing pipes; proposed “a pair of deep convex spectacles” for seeing under water; and constructed an instrument for underwater collecting by “a couple of springs shutting and catching as soon as the instrument touches the ground”.⁶⁵ Rejecting opinions to the contrary, he insisted that the seafloor was not a dead void but teemed with unknown life-forms, which could yet be made discoverable through the invention of “*Nuntii* or Messengers, to send thither or bring us back Information”. Thus it was that Hooke was irresistibly drawn to the nautilus’s remarkable faculty of raising and lowering itself at will in the depths. This wonderful contrivance was the ideal model for the experimental art of subaquatic navigation. Hooke conducted experiments to demonstrate how it moved by “converting the water into [artificial] air” in its internal chambers, and produced a specimen brought to London by a West India merchant before the Society. “If we could make a hollow body and drive out the air of it soe as to make it lighter than the ambient”, he reflected, envisioning submersible navigation as a model also of flight, “it would rise up in the air as the nautilus shell does in water”.⁶⁶

For others, submarine navigation was an avowedly imperial goal. Writing of a projected “Ark for submarine Navigations”, the Royal Society founder John Wilkins extolled its potential for invisible movement untroubled by tempests or pirates, its usefulness in blowing up enemy navies and surprise attacks, and its experimental applications. Wilkins envisaged the submarine as an autonomous alternative to dry-land societies, in which “severall Colonies” could be established and inhabited, the colonists’ children being “born and bred up without the knowledge of the land, who could not chuse but be amazed with strange conceits upon the discovery of this upper world”.⁶⁷ Underwater navigation, however, was typically the promotion of individual economic projectors rather than the state. It is worth asking explicitly at this juncture just what was at stake in the use of artificial rather than naked diving. Three themes emerge in the preference for diving bells at this time. The first was the desire to substitute foreign divers with more reliable observers, who might communicate a more accurate picture of life under water. Second was the desirability of making this substitution not simply for epistemological reasons, but for reasons of trust when it came to the recovery of valuable artefacts. While most writers did not explicitly compare the desirability of artificial as opposed to natural diving, William Smith provides a rare glimpse into this issue. Smith reported the arrival in Nevis of salvage divers from Rotterdam who went to the unusual trouble of bringing their own diving bell all the way to the Caribbean. “When one went to the bottom”, Smith observed, “his companion staid on board to pull him up as occasion offered; for they would trust no foreigner”. At the same time, Europeans also appear to have employed indigenous fishermen to descend in their own diving engines. This at least is the intriguing suggestion of a sketch included with a paper submitted to the Royal Society by a Reverend Barlow, which depicts an unidentified diver, possibly of North African origin, collecting from the seafloor while encased in an underwater submersible (Figure 8). Third, the preference for artificial rather than naked diving had nevertheless to contend with suspicion of projects involving experimental apparatus

as fraudulent investment schemes. Sloane noted that many fortunes were lost on patenting machines and selling shares on non-existent wrecks after Phips's dive. Reprising Drebbel's transformation of the Thames into an aquatic demonstration theatre, numerous projectors took to the river to showcase their devices and attract investors, including the apostle of projection himself Daniel Defoe, who lost £200 on one firm engaged in salvage.⁶⁸

One of the few writers to directly contrast artificial and natural diving was the author of a tract entitled *Angliae tutamen: or, the safety of England* (1695), whose title appeared to play on the legend *decus et tutamen* (ornament and safety), inscribed on the edges of milled English coins since 1662 as a deterrent to clipping.⁶⁹ In the context of the new credit regime consolidated with the founding of the Bank of England, yet also speculative misadventures like the Darien Project, diving was lumped together with banking, lotteries, mining and draining as a pernicious scheme fatal to the nation's health. The very introduction of diving bells provoked suspicion, and cut-tingly inverted the notion that artificial diving would be more trustworthy than naked diving. Hadn't the fabled Caribbean wracker Phips had "vast quantities of pieces of eight taken up by naked divers, both white and black, without the least help or want of any such engine?", he asked. This was indeed true. To sceptics, artificial engines portended artful deception. While *terra firma* became a key metaphor for good credit in this era of stock-jobbing and speculative bubbles, the depths came to connote, not philosophical truth or divine redemption, but a murky moral abyss. "The tradesman often-times drowns", Defoe warned of speculation, "as I may call it, even within his depth — that is, he sinks when he has really the substance at bottom to keep him up — and all this is owing to an adventurous bold spirit in trade, joined with too great a gust of gain". Where did bubbles come from, after all, if not from machinations



FIG. 8. A non-European collecting from the sea-floor in a diving apparatus, as described for the Royal Society by the Reverend Barlow in 1736. © Royal Society (photograph by author).

below the surface of things? In the *Angliae tutamen*, safety lay above water where investors could see, not underwater where they couldn't. Its warning was a "buoy or mark to the nation, to beware how they are wheedled", and diving engines should be left to "lie by the walls" that they may "never more disturb the world with their Noise and Nonsense". The historian of early Jamaica James Robertson has shown how rumours of treasure swirled through West Indian talk at this time, tickling investors' ears. Sloane eagerly added to the din, embellishing his natural history with tales that spiced up his botanical work and advertised his own connections to the exotic romance of New World treasure-hunting, while also being seen to inculcate a sober lesson. One such wreck, he reported, was even said "to be in the possession of the devil, and they told stories how he kept it. I do not find", he concluded, that "the people, who spent their money, on this, or any of these projects, excepting the first, got any thing by them".⁷⁰

Natural philosophers nonetheless persisted. What lay below was truth not lies, a truth that required the collection and careful handling of evidence. Boyle longed for knowledge of the deep, obsessed by his inability to produce first-hand submarine accounts to support his hypotheses concerning the physical behaviour of water. Instead, he was forced to rely on mediated knowledge from a network of observers. This frustrating conjunction was in fact a logical inescapability: a global distribution of informants — from the Ceylon pearl fishery to West Africa and New France — could *only* be comprised of second-hand reports. "Historicall pieces", he nevertheless grumbled, based on "the information of others" did not constitute philosophical knowledge of the submarine; he himself had not "been to the bottom of the sea".⁷¹ He therefore took pains to parse a range of mediated evidences to assess the temperature, pressure and behaviour of water at depth in terms amenable to his commitments as a mechanical philosopher. Shapin has shown how Boyle worked to establish that African divers lacked the proper self-detachment to observe accurately the effects of water on their own bodies (they seemed not to register the intensification of pressure with depth), while salvage workers were thought too financially self-interested to contribute neutral reports.⁷² Relying on the intelligence of gentlemanly naval officers and "persons of quality", he pointed wherever possible instead to physical objects as de-personalized indicators of aquatic conditions, as putatively less mediated, hence more trustworthy signifiers. He dreamed of arming navigators with precision instruments such as "Hermetically seal'd Weatherglasses". In reality, he described the use of vernacular objects used by maritime officers as makeshift recording devices, paying opportunistic attention, for instance, to reports of the coldness of sounding lines taken up from the depths, as well as the depth to which ship-captains sank their wine bottles by night to keep them cool off the African coast (reportedly up to thirty fathoms), or for those in the Torrid Zone even 100 fathoms. An "Aeolipille of Metall" that had been sunk sixty fathoms showed "that the great pressure of the water, had in divers places crusht it inwards". Diving engines themselves also functioned as objects that usefully registered temperature change and air compression, as "water ascended above the lip, or brim of the engin into the cavity of it". Trust in objects

helped in the disavowal of non-gentlemanly, non-European expertise, as though the accounts generated in diving bells were devoid of epistemological error and financial self-interest. But while interest in making submarine maps of temperature, pressure and topography steadily grew in philosophical circles (their early systematic expression came with the work of Marsigli decades later), reliance on the improvised use of quotidian objects as instruments shows the limits of imperial techno-scientific deployment in late seventeenth-century English networks. This was weak deployment, not strong. In discussing tidal activity in the depths, Boyle lamented, for example, that navigators “did not seem to have so much as dreamd of” such a question.⁷³

Knowledge of the depths was thus often mediated, productively if controversially, by objects. The solution to the problem of what Marsigli later described as “l'impossibilité qu'il y a de pouvoir, avec les yeux et avec les mains, prendre connoissance sous l'eau”, would be to send down a natural philosopher. Although the Dutch physician Hermann Boerhaave later praised Marsigli's findings as those of a “un philosophe non pas dans le cabinet, mais en mer”, it was the astronomer Edmond Halley who first merited this description.⁷⁴ Halley is credited with devising the first effectively replenishable air supply system for a diving bell, which he used in a series of dives he conducted in the 1690s. This marked a decisive advance in the amount of time divers could spend under water, as Halley himself insisted. What concerns us here, however, is not so much the place of his work in the history of diving *per se*, as much as the technique of the dive, and in particular the setting and manner of its narration, in relation both to salvage work and the cultural history of the submarine imaginary. Repeatedly with Halley, the pathways of colonial commodities created philosophical opportunities. The son of a wealthy soap boiler and yeoman warder of the Tower of London, the adventurous Halley had studied at Oxford before making a name for himself by carrying out observations of the positions of the stars from St Helena in the southern hemisphere, thanks to a berth on an East Indiaman secured through family connections. As is well known, he also brokered the publication of Newton's *Principia*, and had worked on charting the Thames approaches for the Royal Society. In 1691, the court of the Royal Africa Company asked him to undertake the salvage of a valuable cargo of gold and ivory from a company frigate called the *Guynie*, which had been lost off the Sussex coast on its return from West Africa. This allowed him to deploy what was, according to the description Sloane appended to his account of Phips in the *Natural history of Jamaica*, a bell of Halley's own devising with a respiration system he had been contemplating since 1689. His interest was evidently triggered by the recent Caribbean salvage fortunes. Halley cited these explicitly in his initial manuscript proposal, probably with Phips in mind. He was also pursuing his own fortunes as an underwater projector, drawing up a patent with several company members on his apparatus, possibly setting up his own joint-stock company, and working on the site for as long as five years. Although Boyle had rejected wrackers' testimony as unreliable because self-interested, Halley's philosophical dives were indeed those of a wracker and projector.⁷⁵

Though he furnished numerous coastal observations to the Society as a result of the

salvage dive, Halley's goals were primarily technological: to work at greater depths and for longer durations than previously possible via naked diving (he claimed to have witnessed Florida Indians diving at Bermuda) or the crude tubs then in use. He also sought to place the body of the diver in a protected underwater space that would provide unprecedented freedom and comfort by comparison with the heavy suits of leather armour then common, which proved particularly cumbersome under increased water pressure. In his published article in the *Philosophical transactions*, he described how an inhabitable environment could be sustained in a conic wooden bell, five foot tall, five in diameter at its base, three at its apex, and coated with lead so that it would sink perpendicularly when lowered from the mast of a ship, thus retaining a body of air inside an internal area of sixty cubic feet (Figure 9). Halley's innovation was to realize that the increased water pressure at depth would compress the amount of breathable air in the bell once it went below, so he designed a system of pulleys to send lead-weighted barrels (capacity thirty-six gallons) with air for re-supply down to replenish the atmosphere inside the bell via a leather hose. This could, in principle, be repeated indefinitely. The bell had a small bench inside it where divers could sit, and a small metal stage directly beneath it attached by ropes to allow for movement under the bell, while its apex possessed a window of "strong but clear glass" to allow light in and a small stopper for releasing stale air. Divers could also leave the bell and work outside, drawing air through a hose. Halley insisted that the apparatus enabled dives to a depth of nine or ten fathoms and potentially for as long as the divers' heavy clothing insulated them from the effects of cold, enabling a range of applications: "fishing for pearl, diving for coral, sponges, and the like", as well as "cleaning and scrubbing of ships bottoms when foul". Such abilities were a constant strategic preoccupation for maritime adventurers.⁷⁶

According to Sloane, the salvage of the *Guynie* was frustrated: no fortune was made by Halley or anyone else. A note by Secretary of the Navy Samuel Pepys suggests Halley may have fallen foul of pirates. No doubt such disappointment would have been grist for the mill of anti-projectors like the author of the *Angliae tutamen*. Yet, Sloane maintained, in another sense, the dive had been a remarkable success, since the divers had enjoyed "a perfect view of the ship, and all about it". While it failed to make a profit, Halley's system had, so it was claimed, afforded unparalleled sensory access to the watery element for philosophers. Strikingly, Halley's published account did not convert the diver through direct prosthesis but instead envisaged the conversion of the depths into a dry land atmosphere inhabitable and manipulable by human beings: he had achieved his objective "to walk on the bottom at a considerable depth of water, and to be there at liberty to act, or manage one's self to the best advantage as if one stood upon drie ground".⁷⁷ The underwater world could be known and managed insofar as it could be made to resemble dry land, and made amenable to sight and manipulation. Halley noted how water pressure on the vessels of the eyes made them bloodshot; how the circulation of the blood decreased with pressure; how divers often spit blood; how the pain of descent registered "as if a quill were forcibly thrust into the hole of the ear"; and how even the least defect in a diving suit could

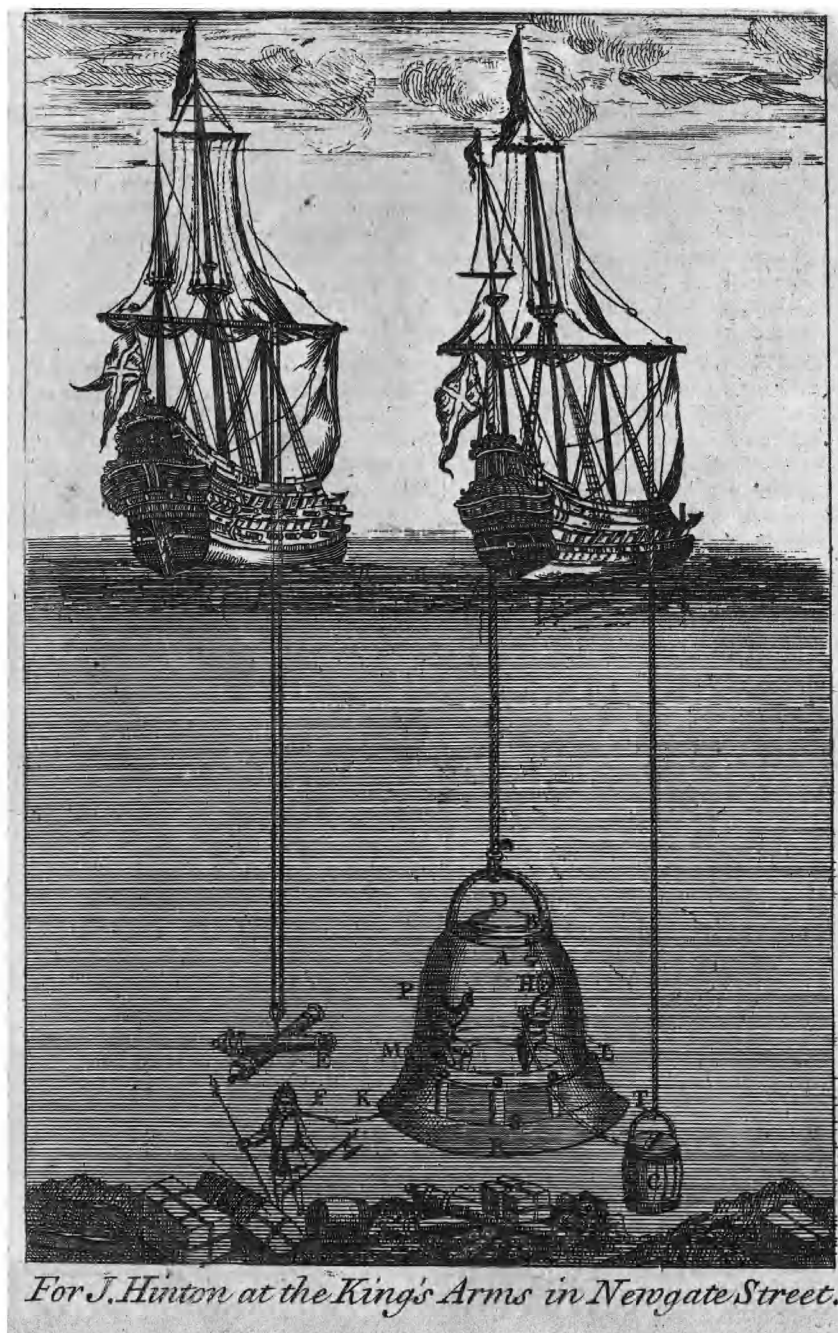


FIG. 9. An unattributed representation of Edmond Halley's late seventeenth-century diving bell system. National Maritime Museum, London.

allow water to “rush in with so much violence” as to kill a man. Suffocation and cold hedged the diver’s every move. The dangers of bodily disintegration due to extreme pressure meant that the rhetorical authority of Halley’s narration thus depended on maintaining the image of an experimental self fortified by a stabilized environment, rather than one transformed by the extraordinary physical conditions in which it was placed. This self was simultaneously under rhetorical pressure to maintain the image of its own integrity, while it participated in a virtuosic technological approximation of the watery element as a dry-land environment.⁷⁸

Two contrasts are worth noting here. First, these violations, or potential violations, of bodily integrity were the experimental equivalent of the hardships routinely imposed on indigenous divers at sites like the pearl fishery at Margarita Island. Here, however, such trials were performed via self-coercion as a form of experimental discipline, rather than the financially driven exploitation of foreign divers. It is surely not coincidental either that Halley, who in his 1689 manuscript had explicitly discussed the use of such techniques in salvage operations inspired by the recent Caribbean fortunes, removed all mention of plundering treasure such as gold and ivory from his published account in the *Philosophical transactions*, which presented his work not as a private project but a technological one for the collection of natural objects like corals, and the performance of hull maintenance. From the interested and situated salvage project that enabled it, Halley had crafted a de-contextualized narrative concerned primarily with epistemology and technical innovation, which conformed to norms of disinterest in gentlemanly natural philosophy.⁷⁹

Second, against such images of sensory incapacity, Halley laid in countless images of sensory stability to convey the image of a system “whereby a man might have his bell as a house over his head, and stand on the bottom almost drie”.⁸⁰ The aim was not simply to offset the image of potential physical catastrophe in readers’ minds, but to produce an heroic experimental image by their nonchalant counteraction. Halley’s strategy for doing so was highly specific: the recounting of quotidian acts such as seeing, sitting, reading, and writing *under water*. His narrative derived its rhetorical force, in other words, by repositioning everyday acts to appear as extraordinary ones because of their displacement from land to water. Fetishising the quotidian powerfully made the point that the submarine could be domesticated for human use, by performing the commonest, most mundane acts inside the watery element. His rhetorical thrust was precisely to deny that moving from dry land to underwater made a substantial difference for the natural philosopher or his capacity for vision and understanding. “I my self have been one of five who have been together at the bottom, in nine or ten fathoms water, for above an hour and a half at a time”, he reported, seated “on a bench . . . wholly drest with all my cloaths on”. None of this cramped company suffered any ill consequence. With re-supplied air, he claimed, they could have stayed down indefinitely. He described the elements of his replenishment system in terms that once again exemplified the artful transformation of wet into dry: the air barrels lowered into the deep by pulley, he wrote, were conveyed “after the manner of two buckets in a well”. With consummate inversion, he described how air could be sunk

to the bottom of the sea as efficiently as raising water above ground. The objective of this artificially inhabitable environment was productive labour: not just seeing but reading, writing, collecting and communicating. Halley thus described the effect of the sun shining through the glass window in the roof of the bell on days when the water was calm, allowing him to “see perfectly well to write or read, [and] much more to fasten or lay hold on any thing under us, that was to be taken up”, an episode that later proved of use to Isaac Newton in a passage where he described the different colours produced by refracted light rays under water in the *Opticks* (1704). Halley could instruct his crew overhead to move the bell by sending up messages written with an iron pen on small lead plates, and even read and work by candlelight when the water was murky, happy proof of his abundant air supply.⁸¹

Halley’s response to the underwater worlds in which Europeans typically relied on Asian, American and African divers to extract various forms of treasure was thus one in which artificial diving technologies could be deployed to create the image of waters cleared of servants and slaves, where ingenious Englishmen would begin the colonization of the submarine. In chasing down the objects scattered by breakdowns in global capital flows, jobbers’ co-ordinated projects for private profit might also realize enlightenment under water.

EPILOGUE: TREASURE BRINGS TROUBLE⁸²

Naufraga reperta was the legend on the medals the Duke of Albemarle had struck to commemorate the success of his salvage operations in the 1680s: shipwreck recovered. Along with Albemarle’s purloined bullion, Wilkins’s projected submarine ark and Halley’s ingenious bell show how English savants lent their energies to realizing dominion over the submarine in an era of ferocious imperial competition. This essay has aimed to show how both early modern collectors’ assemblies of aquatic curiosities, and philosophers’ experimental desire to see under water, were linked with histories of inter-cultural encounter, colonial trade, and plunder. Physically encrusted curiosities, like Sloane’s spar and coins fused with coral, alert us to the multiple histories literally conjoined in the more peculiar things fished out of the seas with pearls, gold and silver plate. At one level, encrusted things fascinated virtuosi like Sloane for their exhibition of how natural chemical processes could transform matter, changing its identity by fusing different bodies together. Therein lay the singular ‘thingness’ and sense of alterity about such objects — the sense that non-human agents had produced, in Peter Pels’s phrase, curious petrifications whose “untranscended materiality” could not be reduced to their constituent elements, and defied classification.⁸³ Thus it was that Sloane ended up classing several coral-encrusted objects in his catalogues both of corals and “miscellaneous things”. Fascination with encrustation is enduring. In one of his many books, the underwater archaeologist and diving historian Robert Marx reproduces an x-ray photograph of an amalgam retrieved from the depths, revealing numerous objects joined together by coral.⁸⁴ Walcott’s imagined fusion of bone and coral similarly reflects upon the conjoining of human histories in the course of the Atlantic slave trade, which intensified the penetration of the Caribbean theatre, and

in turn, the experimental project to know and possess the underwater world. Below, this project is further explored in an epilogue that suggests the surprising longevity of key elements of early modern submarine history.⁸⁵

Between 1964 and 1968, Robert Marx undertook the underwater archaeology of Port Royal, 'the Pompeii of the deep', restfully submerged since the 1690s. Marx's narrative of his work strikingly echoes several features of early modern salvage operations. He describes, for example, the plans of an international cartel known as the Port Royal Company of Merchants to manage the excavation, control the destiny of recovered artefacts, and develop Port Royal as a tourist Mecca complete with large hotels, condominiums, a marina, and cruise-ship pier. These developments were to be funded by selling shares to the public. In return, the Port Royal Merchants were to have the freedom to excavate the site and house their finds in a new museum. Marx, on the other hand, was employed by the government of Jamaica to excavate Port Royal as a purely archaeological site, in rivalry with the Merchants' project (he is at one point warned off the site by a "British gentleman" named Sir Anthony Jenkinson). Braving poor visibility, careless water-skiers, looting from underwater interlopers, cave-ins, and hammerhead sharks, Marx dived using an aqualung tank and aquanaut system, allowing him to stay down for many hours at a depth of twenty feet. He successfully retrieved many fascinating artefacts, using a simple metal detector, an eight-foot metal rod, and a suction pump. These objects, many encrusted with coral, included an Arawak bowl; clay pipes; pistols; pewter plates; glass bottles; Chinese porcelain figurines; coins of all nationalities; and a slave collar made of brass.⁸⁶

Marx's operation was not an individual venture reliant solely on modern technology, however. His work also depended on human assistants. In his account, he discusses and pictures himself with several black teenage boys from Jamaica who, he declared, cost "one tenth of what I would have had to pay a diver in the States". Trust broke down regularly, however, between the man referred to jokingly as the "slave driver" and his assistants. One of them, who went by the name "Money", stole many artefacts, according to Marx, and threatened to kill him while drunk on rum. After raising thousands of objects from Port Royal with his team, Marx's mission finally ended in frustration. Lamenting what he called "the Jamaican attitude toward historical artefacts", when local authorities impeded his work, he professed his amazement on learning that a number of objects had apparently been dumped back into the water:

I was ... dismayed to find that ... no preservation had been done, was being done, or was planned for the near future on the thousands of artefacts we had recovered from the underwater excavation. Many of the larger items, such as the cannon, mortar balls, and large iron conglomerates, had been thrown back into the sea, and one of the laboratory assistants confidentially informed me that all the rest of the iron and wood we had recovered were also going to be thrown into the sea.... Several months previously, thieves were reported to have broken into the silver house, or Port Royal Museum, at Devon House, the major tourist attraction in Kingston, and had cleaned the place out.... All the most important items we had

recovered — the Chinese porcelain figurine, the silver pocket watch, all the gold items, a large number of coins, and hundreds of other priceless and irreplaceable items — were gone.... I left the following morning, hoping I would never have to return to Jamaica again.⁸⁷

If one essential aspect of early modern underwater collecting was the art of taking things out of the depths to make wealth, Marx's tale of Jamaican subterfuge many years later shows how labourers could sometimes resist foreign demands to collect their treasures, by simply throwing them back into the sea.

ACKNOWLEDGEMENTS

The author thanks Kristen Keerma, Laura Kopp, Simon Schaffer, Isola di Ponza, Kim Sloan, Natalie Kaoukji, Nicholas Dew, Iwan Morus, D. Graham Burnett, Daniel Carey and James Robertson; audiences at the HSS annual meeting, Princeton and Rutgers; and the Social Sciences and Humanities Research Council of Canada.

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 45. Édouard Glissant, *Caribbean discourse: Selected essays*, transl. by J. Michael Dash (Charlottesville, 1989), 66–7; Derek Walcott, "The sea is history", in *The star-apple kingdom* (New York, 1979), 25–8; Ian Baucom, *Specters of the Atlantic: Finance capital, slavery, and the philosophy of history* (Durham, NC, 2005), esp. chap. 12. Dawson notes that some interior Africans, unlike coastal Africans, were not adept at swimming. Olaudah Equiano, an Ibo from what is now Nigeria, could

- not swim, while some African-Americans warily referred to the unfamiliar Atlantic Ocean as the “Big Water”: see Dawson, “Enslaved swimmers” (ref. 36), 1337, and Philip D. Morgan, *Slave counterpoint: Black culture in the eighteenth-century Chesapeake and low country* (Chapel Hill, 1998), 445.
46. Parkhurst, *Late earthquake* (ref. 20), 5; Philotheos Physiologus [Thomas Tryon], *Friendly advice to the gentleman-planters of the East and West Indies* (London, 1684), 149. On Tryon, see Philippe Rosenberg, “Thomas Tryon and the seventeenth-century dimensions of antislavery”, *William and Mary quarterly*, lxi (2004), 609–42, and Daniel Carey, “Sugar, colonialism and the critique of slavery: Thomas Tryon in Barbados”, in Byron R. Wells and Philip Stewart (eds), *Interpreting colonialism* (Oxford, 2004), 303–21.
 47. Pierre Mignard’s double portrait entitled *Louise de Kéroualle, Duchess of Portsmouth* (1682) shows an African servant girl presenting the most prized underwater objects to her aristocratic mistress: red coral and pearls flowing out of a cornucopian nautilus shell. See Susan D. Amussen, *Caribbean exchanges: Slavery and the transformation of English society, 1640–1700* (Chapel Hill, 2007), 194–5, 202. See also David Dabydeen, *Hogarth’s blacks: Images of blacks in eighteenth-century English art* (Athens, GA, 1987).
 48. John Walker, *Elements of geography* (London, 1788), 76–7. There is an interesting similarity between late eighteenth-century accounts of African diving prowess and descriptions of the heightened sensory capacities of Jamaican Maroons. In both cases, admiration for non-European skill produced a distancing effect. Bryan Edwards, for example, depicted Maroons’ sensory superiority as atypical among Africans and less than wholly natural: Edwards, *The proceedings of the governor and assembly of Jamaica, in regard to the maroon negroes* (London, 1796), p. xxxix. On abolitionism, see Christopher L. Brown, *Moral capital: Foundations of British abolitionism* (Chapel Hill, 2006).
 49. Marx, *Underwater exploration* (ref. 8), 22–3; Michael Pawson and David Buisseret, *Port Royal, Jamaica* (Oxford, 1975), 56–7; Ward, *Christopher Monck* (ref. 3), 266; John Oldmixon, *The British empire in America* (2 vols, London, 1708), ii, 285. Albemarle was also a mineralogical prospector and patentee of England’s Royal Mines in the West Indies: Sloane, *Natural history of Jamaica* (ref. 1), i, 33. See also Henry Barham, “Civil history of Jamaica to 1722”, British Library MS Add. 12422, fols 164–5.
 50. David Buisseret (ed.), *Jamaica in 1687: The Taylor manuscript at the National Library of Jamaica* (Kingston, 2008), 181. The British also traded coral in West Africa to purchase slaves: David Hancock, *Citizens of the world: London merchants and the integration of the British Atlantic community, 1735–1785* (Cambridge, 1995), 190.
 51. Peter Earle, *The wreck of the Almiranta: Sir William Phips and the search for the Hispaniola treasure* (London, 1979), 112–27, 161–2, 167, 175, 182–4, 222; Sloane to Arthur Rawdon, 21 May 1687, in *The Rawdon papers* (London, 1819), 388, 390; Sloane, *Natural history of Jamaica* (ref. 1), i, pp. lxxx–lxxxi.
 52. Nathaniel Hawthorne, “Sir William Phips” (1830), in *Selected tales and sketches* (Harmondsworth, 1987), 9.
 53. Charles Leslie, *A new history of Jamaica, from the earliest accounts to the taking of Porto Bello by Vice-admiral Vernon* (London, 1740), 37; Kriz, “Curiosities, commodities and transplanted bodies” (ref. 1), 56. On Spanish gold and silver’s importance to Jamaican economic formation via illegal regional trade, see Nuala Zahedieh, “The merchants of Port Royal, Jamaica, and the Spanish contraband trade, 1655–1692”, *William and Mary quarterly*, xliii (1986), 570–93, pp. 583–4, and “Trade, plunder, and economic development in early English Jamaica, 1655–89”, *Economic history review*, xxxix (1986), 205–22.
 54. The original phrase, a conceit borrowed from amatory fishing, concludes, “quo minime credas gurgite, piscis erit”, “where you least expect it, there will be fish”: Ovid, *Ars amatoria, Book*

- 3, ed. by Roy K. Gibson (Cambridge, 2003), lines 425–6, p. 65; see also p. 273. My thanks to John Tresch on this point.
55. Sloane, *Natural history of Jamaica* (ref. 1), i, 51.
 56. Sloane to Rawdon, 21 May 1687, *Rawdon papers* (ref. 51), 389–90. On Sloane's chemical training, see de Beer, *Sir Hans Sloane* (ref. 10), 16–17.
 57. Walcott, "Sea is history" (ref. 45), 25; see also the highly-evocative description of diving in Walcott's epic *Omeros* (London, 1990), 43–7.
 58. For the unusual case of a seafarer in America who "learned to dive of the Indians", see Boyle, "Relations about the bottom of the sea" (1670), in Hunter and Davis (eds), *Works of Robert Boyle* (ref. 4), vi, 362.
 59. Giancarlo Costa, *Storia dell'immersione subacquea* (Formello, 2002), 32–3, 36–40, 42, 45, 54, 56; Marx, *Underwater exploration* (ref. 8), 164.
 60. Marx, *Underwater exploration* (ref. 8), 30–1; Ulrich von Etzenbach, *Alexander*, Cod. Guelf (late 14th century), 1.2.5, fol. 128r, Herzog August Bibliothek, Wolfenbüttel, reproduced in Daston and Park, *Wonders and the order of nature* (ref. 4), 96; Costa, *Immersione subacquea* (ref. 59), 26.
 61. Nicolás García Tapia, "The repercussions of Spanish technology in the discovery of the American continent", *Icon*, v (1999), 113–27, p. 116; Marx, *Underwater exploration* (ref. 8), 31–2, 35–6.
 62. Marten Triewald's *The art of living under water* (1734), transl. by C. J. L. Croft, Lars Gustafsson and Michael Kahan (London, 2004), 35–6, whose title paid homage to Halley (see below), provides one early genealogy of the history of the diving bell, which dismisses most of Triewald's bell-designing predecessors because they allegedly lacked understanding of the "laws of nature" as they applied to water pressure.
 63. García Tapia, "Repercussions of Spanish technology" (ref. 61); Marx, *Underwater exploration* (ref. 8), 115–16.
 64. Mark Govier, "The Royal Society, slavery, and the island of Jamaica: 1660–1700", *Notes and records of the Royal Society of London*, liii (1999), 203–17; Simon Schaffer, "Golden means: Assay instruments and the geography of precision in the Guinea trade", in Christian Licoppe, Heinz Otto Sibum and Marie-Noëlle Bourguet (eds), *Instruments, travel and science: Itineraries of precision from the seventeenth to the twentieth century* (London, 2002), 20–50; Delbourgo, "Slavery in the cabinet of curiosities" (ref. 3); John Gascoigne, "The Royal Society, natural history, and the peoples of the 'New World(s)', 1660–1800", *The British journal for the history of science*, xlii (2009), 539–62.
 65. For Moray's reports, see, for example, Birch, *History of the Royal Society*, entries for 9, 16, 23 March 1663/4, i, 392, 396, 399–401; for Hooke's experiments, *ibid.*, 9 March 1663/4, i, 392; and *ibid.*, 17 February 1664, i, 385. See also Margaret 'Espinasse, *Robert Hooke* (London, 1956), 52–3, 73; Margaret Deacon, *Scientists and the sea, 1650–1900: A study of marine science* (London, 1971), chaps. 4, 8; Michael Hunter, *Science and society in Restoration England* (Cambridge, 1981), 94–5. On angelic assistance in salvage work conducted in this period, see J. Kent Clarke, *Goodwin Wharton* (Oxford, 1984), 223–6, 271–5.
 66. *Philosophical works of Robert Hooke* (ref. 24), 313; Hans Sloane, minutes of Royal Society meetings, 1696–7, British Library MS Sloane 3341, 16 and 29 December 1696, fols 27, 28. For Hooke's anatomical interest in and drawings of the nautilus, see Drake, *Restless genius* (ref. 17), 165–7. On scientific models, see Nick Hopwood and Soraya de Chadarevian (eds), *Models: The third dimension of science* (Stanford, 2004).
 67. John Wilkins, *Mathematicall magick* (London, 1648), 178–90, quotation p. 190. George Sinclair, *Natural philosophy improven by new experiments* (Edinburgh, 1683), 154, also conjured biblical echoes in referring to a "Diving Ark", explaining its name thus: "because it is of Timber, and next, because it saves a man from being overwhelmed with the Waters." Sinclair, a mathematician

- and surveyor, conducted salvage work off the Scottish coast in Tobermory harbour, searching for remnants of the Spanish Armada. See also John L. Phillips, *The bends: Compressed air in the history of science, diving, and engineering* (New Haven, 1998), 42.
68. Smith, *Natural history of Nevis* (ref. 25), 13–14; Reverend Barlow, “The submarine, an engine for conveying air under water”, 27 May 1736, Record Book xix, 442–6, Royal Society Archives; *Angliae tutamen: or, the safety of England* (London, 1695), 20; Malcolm Balen, *A very English deceit: The secret history of the South Sea bubble and the first great financial scandal* (London, 2002), 31. Defoe himself identified diving bells as particularly risky schemes: see Daniel Defoe, *Essays upon several projects* (London, 1702), 12–13, and F. Bastian, *Defoe’s early life* (New York, 1981), 167–71. On projecting and natural philosophy, see Larry Stewart, *The rise of public science: Rhetoric, technology and natural philosophy in Newtonian Britain, 1660–1750* (Cambridge, 1992). On seventeenth-century uses of primitive tubs in the Americas, see Marx, *Underwater exploration* (ref. 8), 32. The design of Barlow’s horn-like submersible had earlier been pioneered by John Lethbridge and Jacob Rowe for salvaging East India Company wrecks during 1715–21: see Jacob Rowe, *A demonstration of the diving engine* (London, 2000). On Drebbel, see Vera Keller, “Cornelis Drebbel: Fame and the making of modernity”, Ph.D. thesis, Princeton University, 2008.
 69. I owe this point to Daniel Carey.
 70. Daniel Defoe, *The complete English tradesman* (1726; Gloucester, 1987), 46; *Angliae tutamen* (ref. 68), 20–1, 4; Sloane, *Natural history of Jamaica* (ref. 1), i, p. lxxxi; James Robertson, “Re-writing the English conquest of Jamaica in the late seventeenth century”, *English historical review*, cxvii (2002), 813–39, p. 815. On credit and its languages in this period, see Simon Schaffer, “Defoe’s natural philosophy and the worlds of credit”, in John Christie and Sally Shuttleworth (eds), *Nature transfigured: Science and literature, 1700–1900* (Manchester, 1989), 13–44.
 71. Boyle, “Of the systematicall or cosmicall qualities of things” (1670), in Hunter and Davis (eds), *Works of Robert Boyle* (ref. 4), vi, 319.
 72. Shapin, *Social history of truth* (ref. 5), 258–66.
 73. Boyle, “Of the systematicall or cosmicall qualities of things”, in Hunter and Davis (eds), *Works of Robert Boyle* (ref. 4), vi, 349, 352, 360, 363; see also Deacon, *Scientists and the sea* (ref. 65), chap. 6. For contrasting views of the strength and weakness of state deployment in long-distance scientific work in this era, see, respectively, Schaffer, “Golden means” (ref. 64), and Nicholas Dew, “Vers la ligne: Circulating measurements around the French Atlantic”, in Delbourgo and Dew (eds), *Science and empire in the Atlantic world* (ref. 6), 53–72.
 74. Marsigli, *Histoire physique de la mer* (ref. 9), pp. 2, x. Marsigli was an avid collector of red coral, and involved in mining as well as underwater surveying projects, as was Marten Triewald. The link between underwater exploration and mining deserves analysis in its own right. See John Stoye, *Marsigli’s Europe, 1680–1730: Life and times of Luigi Fernando Marsigli, soldier and virtuoso* (New Haven, 1994).
 75. Sloane, *Natural history of Jamaica* (ref. 1), i, p. lxxxi; Edmond Halley, “To walk on the bottom at a considerable depth of water ...”, 6 March 1689, Classified Papers 21/28, Royal Society Archives; Alan Cook, *Edmond Halley: Charting the heavens and the seas* (Oxford, 1997), 236–43; Marx, *Underwater exploration* (ref. 8), 34–5. On the embeddedness of early modern epistemic projects in technical endeavours, see Lissa Roberts, Simon Schaffer and Peter Dear (eds), *The mindful hand: Inquiry and invention from the late Renaissance to early industrialization* (Amsterdam, 2007).
 76. Halley, “Art of living under water” (ref. 39), 499.
 77. Sloane, *Natural history of Jamaica* (ref. 1) i, p. lxxxi; Cook, *Edmond Halley* (ref. 75), 240; Halley, “To walk on the bottom...” (ref. 75).
 78. Halley, “Art of living under water” (ref. 39), quotation p. 495. Contrast this late seventeenth-century attempt to maintain the image of a stable experimenting self under water with the

- experimental selves modified by nitrous oxide and electricity, as expressed through romantic-era autobiographical reportage: Simon Schaffer, "Self evidence", *Critical inquiry*, xviii (1992), 327–62.
79. Shapin, *A social history of truth* (ref. 5); see also Jan V. Golinski, *Science as public culture: Chemistry and enlightenment in Britain, 1760–1820* (Cambridge, 1992). There is no evidence that Halley went under water in 1689. In this respect, his underwater narrative was not the result of his earlier 'research agenda' but the product of the practical commercial project he commenced in 1691.
 80. Journal Book 8 (1689), Royal Society Archives, 248.
 81. Halley, "Art of living under water" (ref. 39), quotations pp. 497–9; Isaac Newton, *Opticks* (London, 1704), 139.
 82. An old saying.
 83. Peter Pels, "The spirit of matter: On fetish, rarity, fact, and fancy", in Patricia Spyer (ed.), *Border fetishisms: Material objects in unstable spaces* (London, 1998), 91–121.
 84. Robert F. Marx, *Shipwrecks in the Americas* (Toronto, 1987), 78–9.
 85. On this theme, see also Taussig, *Cocaine museum* (ref. 4), 77–84.
 86. Robert F. Marx, *Port Royal: The sunken city*, 2nd edn (Southend-on-Sea, 2003), 105, 107, 104, and photographs after 128.
 87. Marx, *Port Royal* (ref. 86), 101–28, 152–3, 278.

