OCEANOMANIA

SOUVENIRS OF MYSTERIOUS SEAS
FROM THE EXPEDITION TO THE AQUARIUM

A MARK DION PROJECT

Nouveau Musée National de Monaco
President
HRH The Princess of Hanover

Director
Marie-Claude Beaud
Assisted by Cristiano Raimondi

Curator of Heritage at the NMNM
Nathalie Rosticher-Giordano

Published on the occasion of the exhibition at the Villa Paloma / NMNM
Oceanomania: Souvenirs of Mysterious Seas—From the Expedition to the Aquarium
A concept by Mark Dion
April 12, 2011–September 30, 2011

Curators
Sarina Basta, Cristiano Raimondi, NMNM

Scientific Supervision
Nathalie Rosticher Giordano, NMNM, Patrick Piguet, Oceanographic Institute

General Supervision
Emmanuelle Capra, NMNM
Assisted by Damien L'Herbon de Lussats, Elodie Biancheri

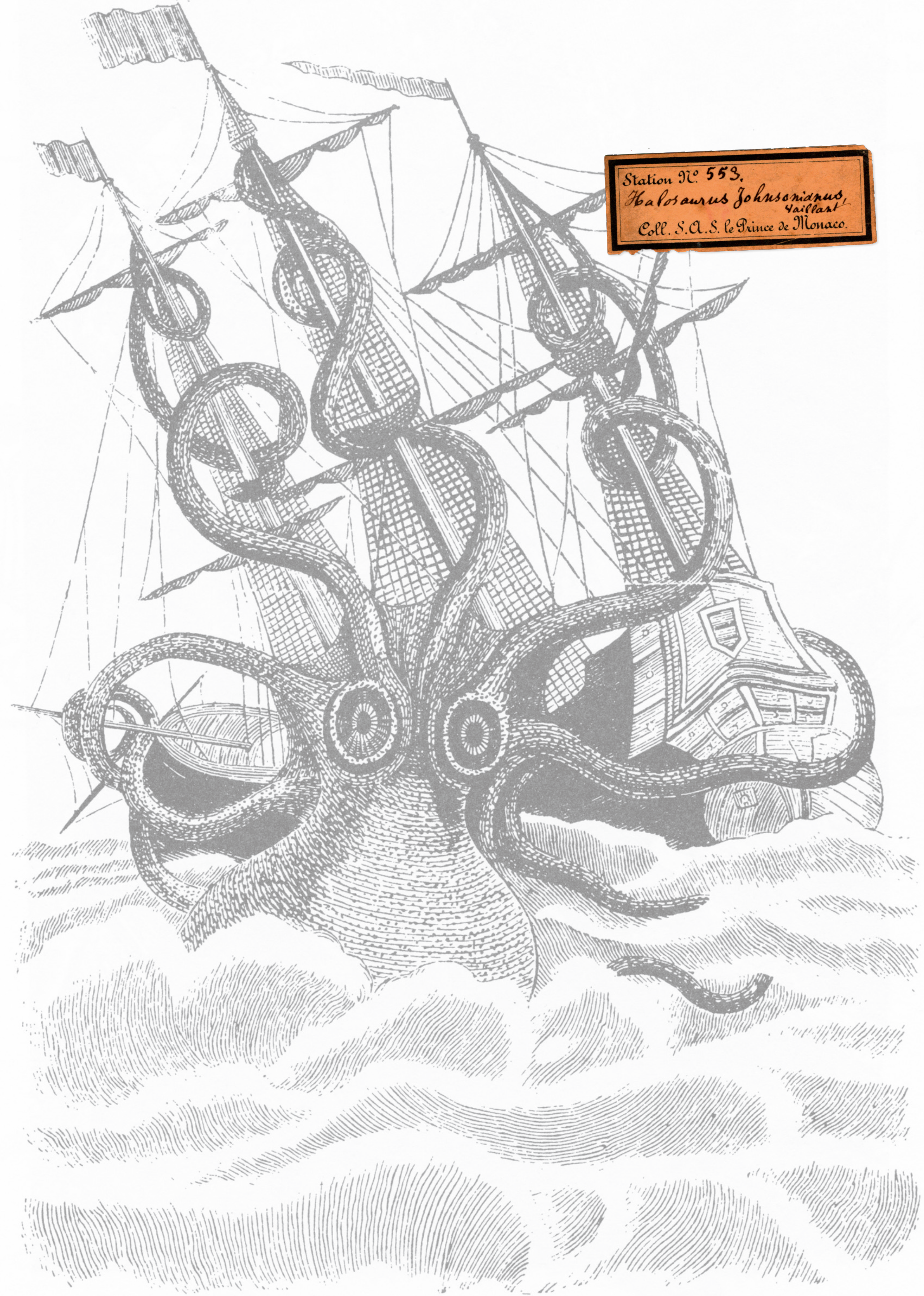
Publication
Graphic design: Jeffrey Jenkins, Jenkins & Page & Nicholas Hughes, MACK

Texts by Sarina Basta, Graham Burnett, Celine Cousteau, Mark Dion, Christiane Groeben,
Ursula Harter, Jackie McAllister, Matteo Norzi, Celeste Olalquiaga, Cristiano Raimondi
English translations: Tim Jones, Simon Pleasance
French translations: Michele Forissier, Sophia Moss, Lucy Pons
English copy-editing: Karen Archey, Martyn Oliver
French copy-editing: Hannen Sayhi, Fanny Clerissi, NMNM
Print and binding: optimal Media Production GmbH, Röbel

MACK
Michael Mack, Nicholas Hughes, Pedro Alfacinha, Martyn Oliver, Poppy Melzack

ISBN: 978-1-907946-07-3

MACK
Vale Studio, 62 Wood Vale, London SE23 3ED UK
T.+ 44 208 299 8825 F. +44 208 299 8827
www.mackbooks.co.uk



V

Self Recording Seas

by
D. Graham Burnett

How to represent the ocean? Let's roll up on this problem a few times, and break there, expecting each time to retreat, the hiss of the sand on our heels.

I. Self-Recording Seas

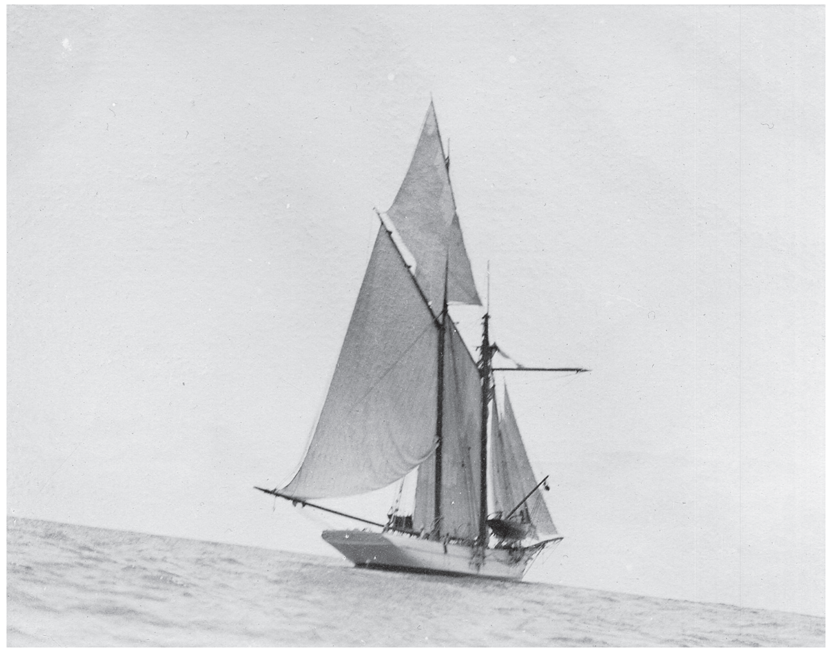
Close to midnight on the nineteenth of April 1927, about fifty miles out from Deception Island in the icy waters of the Antarctic convergence, the pious marine biologist Alister Hardy leaned out over the stern rail of the British research vessel *Discovery* to watch the men reel in a strange sea beast. The steel line cut the black water like a needle stirring ink; the sailors bent to the winches. A sudden roil, and the hulking thing broke the surface, skimming the chop for a moment before the tars hoisted it, streaming brine, to the davits. A chorus of calls—"In HB! In HB!"—to clear the way, and then the seamen executed the delicate lift and swing necessary to bring the menacing six-foot torpedo-form to rest on the rolling deck. Hardy, the scientist, skipped down to attend to his baby.

The "HB," that is: "Hardy's Baby." That was the idea, anyway—there is some evidence that the salts (ever irreverent) understood the abbreviation to stand for "Horse's Bottom." *Har har har! Shipboard life! Yo ho ho and a bottle of rum!*

Or formaldehyde, in this case. Since it was with a bottle of formaldehyde that Hardy would nurse his steel and muslin baby.

The proper name for HB was "the Continuous Plankton Recorder," and this unique machine—an improbable mash-up of drift net and movie camera, mechanical whale and weapon of war—lay on the very cutting edge of oceanography in the interwar period. Above all, the HB embodied a remarkable effort *to make the sea represent itself*, to make the sloshing and abysmal waters record their own condition. Hardy had conceived this oceanic inscription device as a robotic leviathan; he had overseen its construction with the loving care of a Frankenstein-father; and now, deep in the Drake Straits, he was giving his baby a trial at sea.[1]

A little background: The pressing question in the ocean sciences in the early twentieth century was fisheries—commercial fishing and whaling. And by the 1920s the productivity of the seas was understood to hinge on the mysterious blooming of the tiny drifting plants and animals—the *plankton*—that lay at the bottom of the oceanic food chains. At the other end of those chains lay human mouths, and, therefore, money. Follow the plankton and you get,



eventually, to the *nekton*—the big stuff, the creatures that can move under their own power, rather than simply drift on the currents.

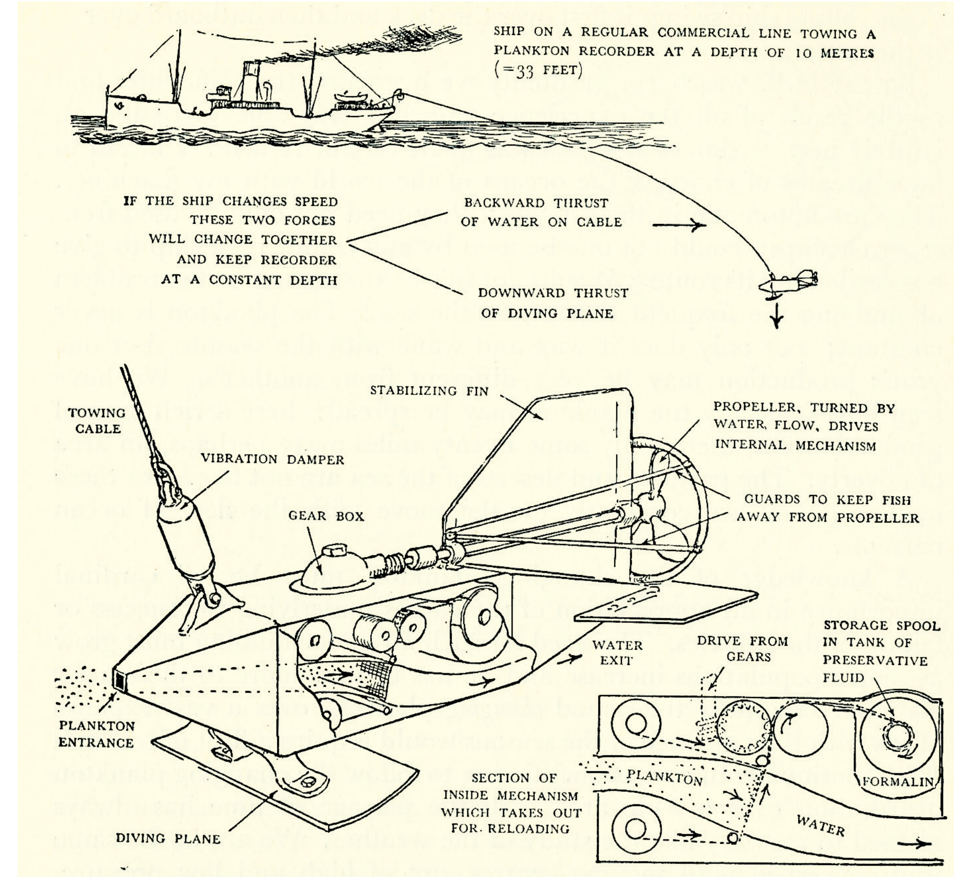
Hardy, still a young man (he had just turned thirty), had spent almost a decade working on this problem: plotting the plankton, trying to understand where it came from, and where it went; why sometimes there was more, and sometimes there was less. Practically speaking, this meant meandering around the North Sea with a bunch of little bottles and nets, dipping up water samples here and there, and looking at the slosh under a microscope: count the bugs; make dot on the chart; record number of bugs. Do that enough, correlate the scatter-plot results with physical characteristics of the water (temperature, salinity, etc.) and fishing hauls, and you might hope to begin to develop some sort of theory of the cycles of ocean richness.

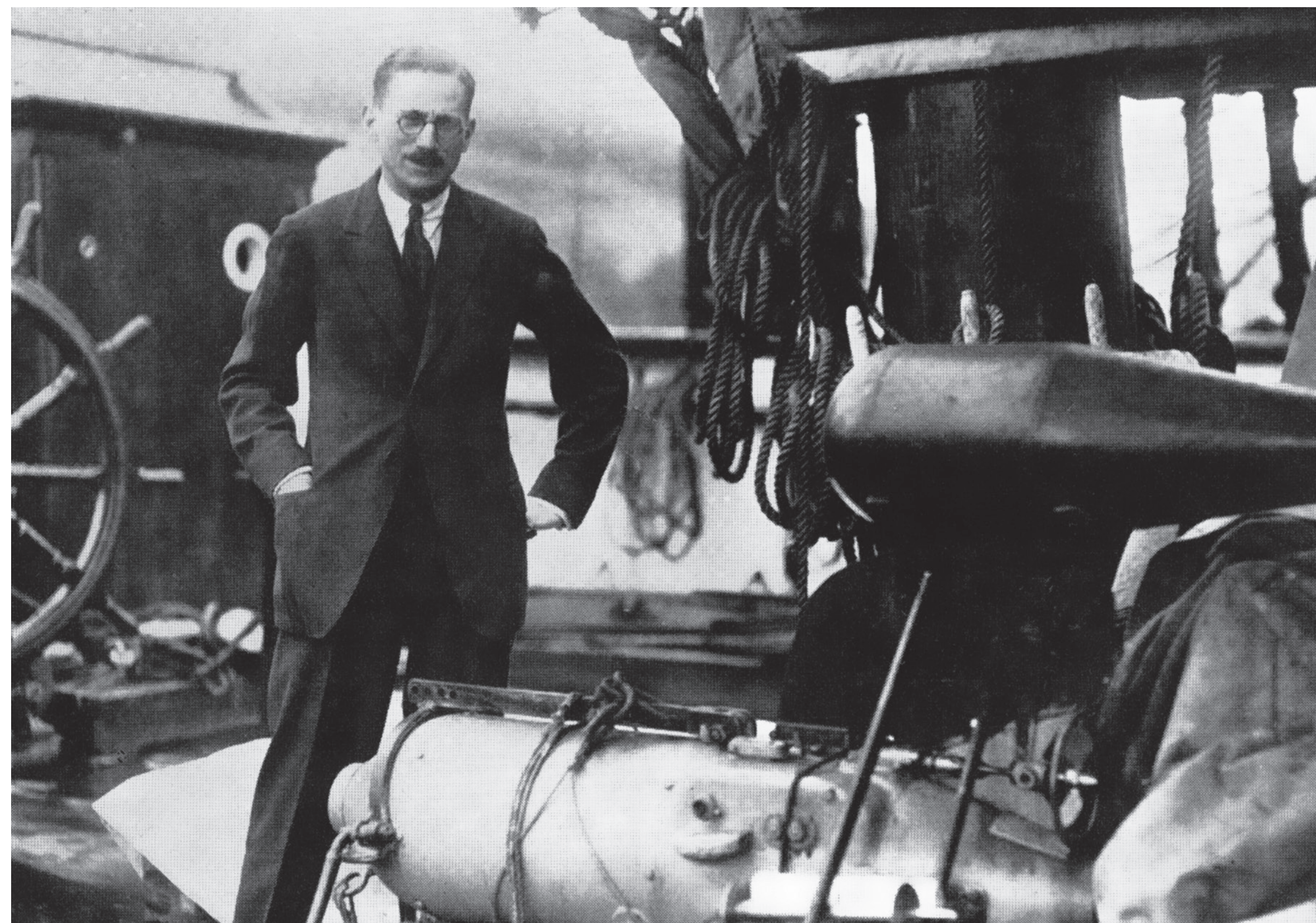
Slow process. The scatter plots were very scattered. And Hardy began to dream of a better way.

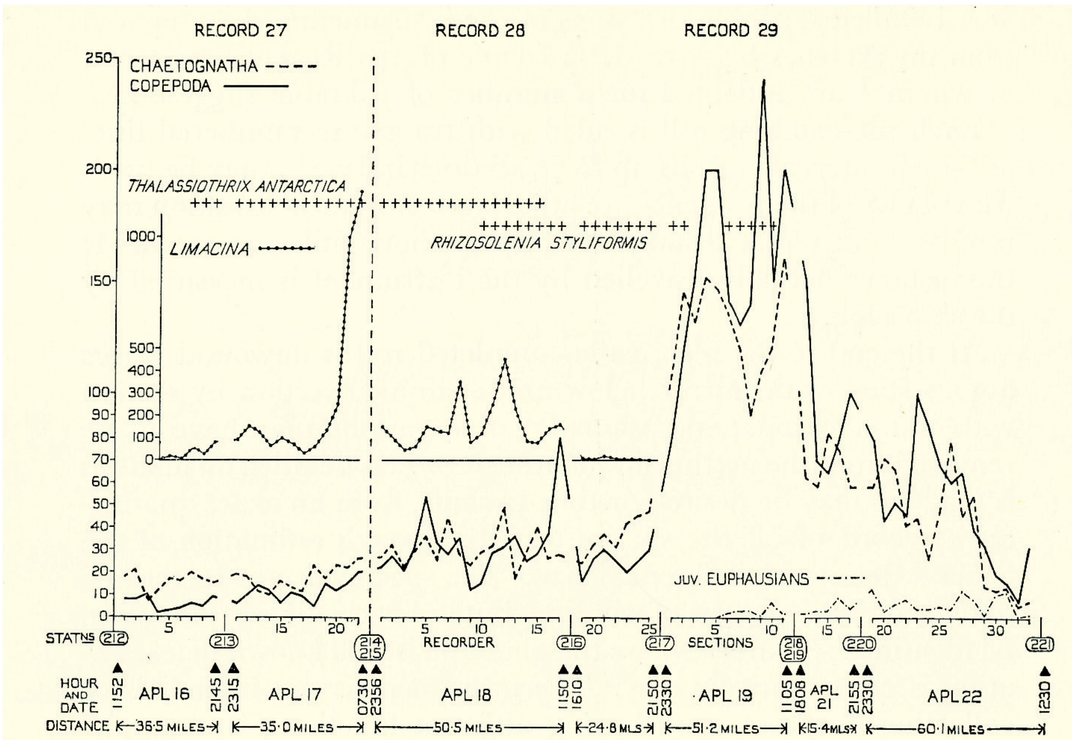
Enter the Continuous Plankton Recorder. [Figure: cross section of device] From Hardy's cutaway diagrams, we can see clearly what he hoped to achieve: instead of the piecemeal business of sieving the water every once in a while with those little jars, instead of the here-and-there point-plots of data, why not configure a device that could turn a two hundred mile voyage into a beautiful strip of ocean information—a "transect" as the surveyors call it, a continuous recording of the biotic character of the water through which the ship had passed?

Imagine, then, a movie camera in which the film canister is replaced with a long roll of fine gauze. This ribbon of mesh passes on rollers across the open "lens" of the device—really more like a "mouth"—through which the water streams continuously as the mothership tows this steel fish astern. Diving fins keep the creature at depth, straining the brine like a giant filter-feeder. A propeller on its tail synchs the speed of the net-like "film" to the waterspeed, creating (ideally) uniform volumes of flow despite shifting currents and the ship's lurch. Spooling across the flow, the strip of screening traps whatever unfortunate minuscule beasties have slipped into the mouth of the HB as it cuts through the deep. The rollers continuously advance this ribbon, winding it in with a second clean layer of gauze to protect the catch, and storing this long, two-ply plankton sandwich in a tight roll that revolves continuously in a bath of formaldehyde—to preserve the organic matter.

When you got home, you could unroll that scroll-like coil, and read thereupon a direct report from the sea itself: its changing conditions, its vitality,



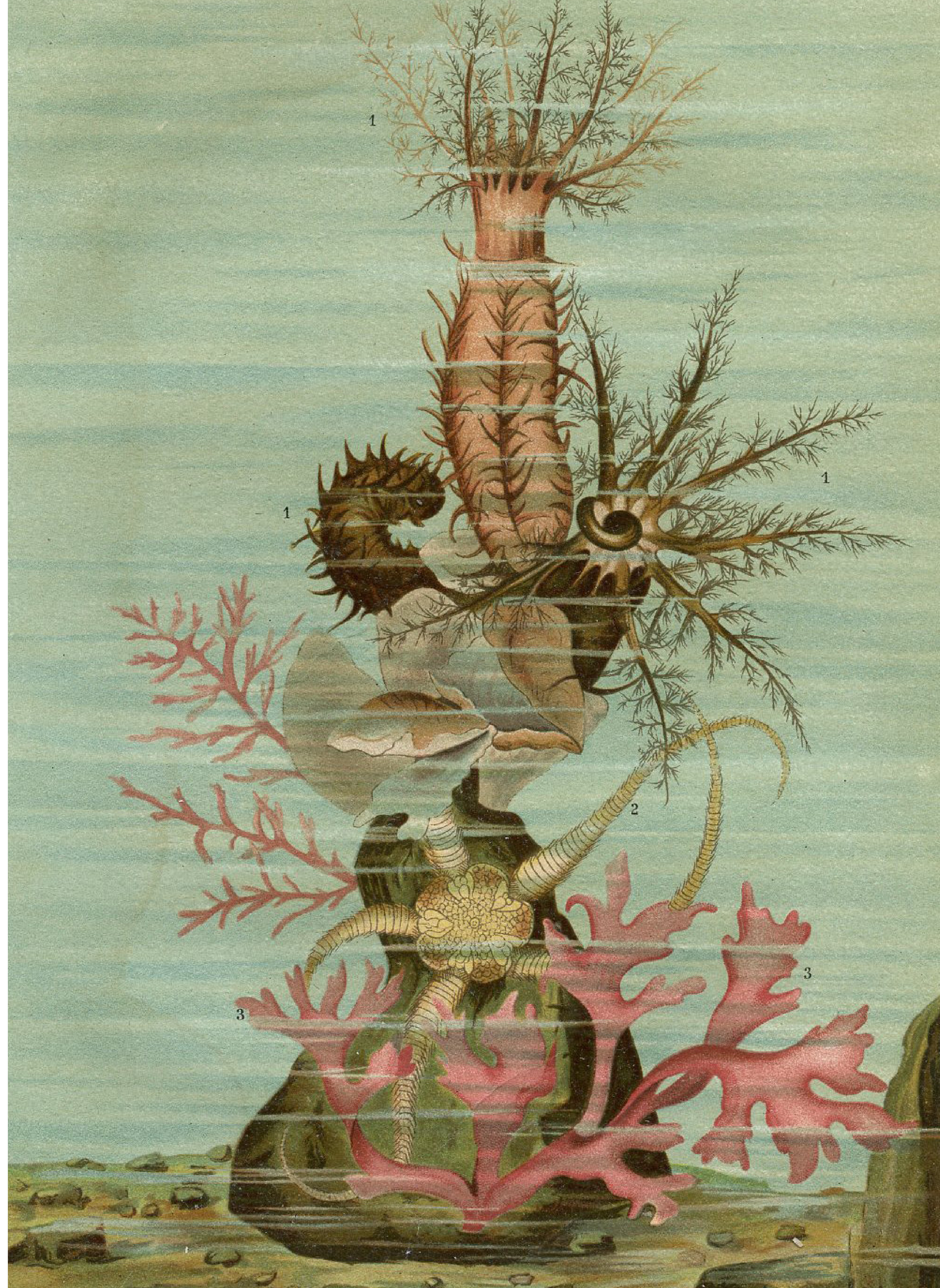




the inscription of its richness—all legible, grossly speaking, as slightly varying hues of green. And with a microscope you could peruse a flypaper chronicle of every voyage, a sample of the microfauna of the deep. Alister Hardy, later Sir Alister on account of this work, would spend many years of his life retracing his ocean travels through a microscope, those strips of gauze rolling along under his watchful eye.

In an influential article published in 1993 in *Studies in the History and Philosophy of Science*, Soraya de Chadarevian drew attention to the importance of *Aufschreibesystemme* (literally the "systems for writing down") in the history of changing ideas about nature and the body in the late nineteenth century.[2] Focusing on the use of "self-recording instruments" in physiology, Chadarevian showed how mechanical devices were used directly to transcribe a host of physical and physiological phenomena across this period. From the human pulse to the trajectory of a cannonball, the key was to make the world commit itself to paper. Such inscriptions—graphical records of change in time and space; made, at least in theory, without the intervention of hand or eye—created the conditions of possibility for disciplinary rigor in medicine and physics alike. They were comparable, portable, printable, and teachable. They permitted "graphical" methods of analysis, which sidelined nebulous qualitative judgment (a "weak" pulse; a "heavy" rain). Best of all, these devices that made nature record herself seemed to take the human element out of the business of observation. In this, they serviced the period's growing obsession with what Loraine Daston and Peter Galison have called "mechanical" objectivity—a distinctive way of pursuing fidelity to nature, one that fears, above all, the insurgent will of human subjectivity. Since it is hard to make representations without representors, many partisans of mechanical objectivity in effect attempted to enlist the very objects to be represented—making them do the work themselves.

And what about oceanography? Yes. There were classic self-recording instruments for monitoring oceans in this period: tide-gauges. Victorian tideology tried very hard to be a pure mathesis of the ocean machine, and this young science's new analog monitoring mechanisms directly translated the rise and fall of coastal waters into rising and falling lines on paper—inscriptions suitable for those hoping to work out the rational order of the sea's continuous and often idiosyncratic heaving.



Nothing could better reflect the striving for Apollonian mastery over the lurching and formless abyss than these little pen lines pricking out the rise and fall of harbor water. Those rolls of sinusoidal curves can be thought of as the exact oceanographic equivalent of the new physiological inscriptions of those same years: the scrawl of Carl Ludwig's kymograph (monitoring arterial blood pressure), the jumpy tracing of Étienne-Jules Marey's pneumatograph (tracking the work of the lungs). The tideologists were emphatically physiologists of the ocean body, monitoring its giant, rhythmic respiration.

The Continuous Plankton Recorder does not fit quite so tidily into this tale of the late-nineteenth century *Aufschreibesystemme*: instead of smooth graph paper, we have, in Hardy's Baby, that long strip of muslin, so like a painter's canvas; in place of those fine black lines tracing precise quantities, we find gentle changes in the streamer's hue, the result of the different amounts of chlorophyll-rich phytoplankton in the water; in place of nice clean rolls of dry output, ready for the desk and the calculator, the HB leaves us with a soggy winding, heavy with myriad corpses, and requiring endless scrutiny.

Here, then, we confront a self-recording instrument that got down into its subject matter in a not-wholly-Apollonian manner. Its inscriptions were convergent with its object and consubstantial with its medium, and thus it continuously wrote the body of the ocean in that body's native juices. The Continuous Plankton Recorder was a self-recording instrument that pulled its users back toward the water, even as it tailed them when they went to sea—a secret sharer, a fusiform stalking horse, a cross between bait and catch. The *Discovery* was in fact out to chase whales, those giant filter-feeders of the sea. Hardy had set sail to see them killed, and cut them open in the Antarctic—to study how they ate plankton and where. How remarkable that before setting sail he constructed a little mechanical rorqual, to tail him on his expedition: part scribe, part bad conscience. It looked, after all, exactly like a torpedo, always slipping along in the vessel's wake.

Hardy, perhaps needless to say, was an artist. Over the course of his life he filled countless notebooks with sketches and watercolors documenting every facet of his scientific work. On one famous occasion, it is said, he lashed himself to the mast of his ship in a howling storm, pen in hand, to make studies of the wind-swept water as it crashed over the bow. He was trying, of course, to represent the ocean.

II. The Self, Recording Seas

About a decade after Alister Hardy watched the HB come aboard in the Drake Strait, another gifted young scientist—the Scandinavian physiologist and arctic researcher, Per "Pete" Scholander—adopted the same position: looking down into the cold green waters off the coast of Norway from the deck of a bobbing boat, waiting for his research apparatus to surface. The umbilicus again wound around the winch, and a dark form wobbled up from the deep. Once again the men swung a sled-like contraption up over the rail. And once again the man of science scurried to attend to his ocean instrument.

And a very unhappy instrument it was. There on the deck—strapped to a padded palette, its head wedged into immobility, tubes of various sorts tapping its vital systems—lay a seventy-five pound gray seal that had just surfaced from an eighteen-minute forced dive. And the day wasn't over yet.[3]

Scholander, like Hardy, would go on to become one of the most distinguished ocean-scientists of the twentieth century. Of Swedish–Norwegian ancestry, and possessed of unnerving reserves of physical toughness and intellectual curiosity, Per Scholander lived a scientific life of considerable drama. He famously slipped away from the University of Oslo on what was said to be the last passenger boat to leave the harbor before the onset of the second world war. Making his way to the United States on a Fulbright Fellowship, he eventually found himself adopted into the cowboy world of American military researchers investigating extreme physiology—the biology of the body at the limits of its capacities. Over the next two decades he earned a nearly legendary reputation as a daredevil,


A S.A.S. Monseigneur le Prince de Monaco

and, among other things, narrowly avoided a court-martial for participating in an unauthorized (but ultimately successful) mission to rescue the crew of an army aircraft downed in the Klondike—he parachuted into the Alaskan wilderness, having never jumped out of a plane before in his life. Scholander would later go on to write scientific papers with unforgettable titles such as "The Critical Temperature in Naked Man" (he and his collaborators slept under light blankets for days at just above freezing), and "The Master Switch of Life" (don't ask). His students and colleagues were enormously devoted, and from his personal memoir one gets the sense of his tremendous vigor and vitality. He had fun doing crazy things in the name of knowledge. What's not to like? Perhaps only that musky aftertaste of *übermenschlich* sadomasochism. Was it really necessary to use rectal thermometers on those Australian Aboriginals?

So what does all this have to do with representing the ocean? Let's go back to that miserable gray seal repeatedly waterboarded in the name of dive physiology: this creature was neither the first nor the last beast Scholander and his colleagues would troll, corseted in probes, deep behind a research vessel. The second world war was a submarine conflict like never before, and those years saw the rapid growth of scientific study of the mammalian body underwater. For the mammalian body, being underwater is, of course, nearly always a matter of life and death—or of those strange states in between: hypoxia (deprivation of oxygen); apnea (the cessation of breath); bradycardia (the slowing of the heart); vasoconstriction (the reflexive closing down of the arteries, as the body works to push blood to the vital organs). These phenomena were of great importance to frogmen and those who trained and deployed them.

By the 1960s, when "Pete" Scholander strode the sea bluffs of La Jolla as an *éminence grise* of the Scripps Institution of Oceanography, he was known as one of the pioneers of the heroic age of dive physiology—an age of giants that preceded ethics-obsessed Institutional Review Boards, and pansy animal welfare types; an age of fearless self-experimentation and free-wheeling research in the bush and on the beach. The physiologists of immersion made sure to visit the island peoples famous for their breath-hold diving (the Ama of Japan, the Polynesian pearl fisherman of Tuamotu)—and they always brought their instruments.[4]

Which is to say, in the science of dive physiology we come upon a recursive folding: the self-recording technologies of the body (the toolkit of the objective physiologist) here become a new kind of ocean instrument—tide-gauges for the submerged body. Wired up to heart monitors and blood pressure cuffs, temperature probes and devices analysing the gas content of every exhalation, the subject of such research becomes, like Scholander's seal, a new way of representing the underwater world: *the self, recording seas*. Think of it as a kind of radical Kantean turn in the ocean knowledge and ocean representation alike: here we abandon the mincing distance of mechanical objectivity together with the idealist romanticism of Hardy, lashed to the mast. Here we are not after the sea as mere information, nor the sea as mere spray in the face, mere *feeling*. Here, rather, we work the terrifying seam where a human being meets the *ding an sich* of the abyss: close monitoring of this most unnatural condition produces neither sea-knowledge proper, nor knowledge of ourselves, exactly—but yields instead meticulous and metrical documentation of this fundamental immiscibility. This is epistemology as iterative self-recovery. This is existential titration.

III. The Hiss on our Heels

We find ourselves in territory Kant reconnoitered carefully: the sublime—the experiential threshold of experience; the representational threshold of representation. Little wonder. The project of representing the ocean has long been haunted by the specter of self-dissolution. Here is an object that to enter is to know, but only for a spell. A quick dip is probably best.

Or maybe just a walk on the beach….

Notes

1 For the story of Hardy and the Continuous Plankton Recorder, see his *Great Waters* (London: Harper and Row, 1967). For a more detailed account, Hardy, "The Continuous Plankton Recorder" *Discovery Reports* 11 (December 1936): 457-510. For the later history of the devices, which remain in limited use, consult the Sir Alister Hardy Foundation for Ocean Science, based in Plymouth, UK.

2 Soraya de Chadarevian, "Graphical Method and Discipline: Self-Recording Instruments in Nineteenth-Century Physiology," *Studies in the History and Philosophy of Science* 24, no. 2 (1993): 267-291.

3 For an account of this experiment, see: P. F. Scholander, "Experimental Investigations on the Respiratory Function in Diving Mammals and Birds," *Hvalrådets Skrifter* 22 (1940): 1-131.

4 Consider, for example: H. Rahn and T. Yokoyama, eds, *Physiology of Breath-Hold Diving and the Ama of Japan*, Office of Naval Research, Government Document #ADA034502, 1965.