

JAMES NESTOR

DEEP

FREEDIVING, RENEGADE
SCIENCE, AND WHAT THE OCEAN
TELLS US ABOUT OURSELVES

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Contents

0		1
-60		12
-300		27
-650		54
-800		80
-1,000		98
-2,500		124
-10,000		157
-35,850		198
Ascents		221
Epilogue		227
Acknowledgments		233
Notes		239
Bibliography		251
Index		259

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I'M A GUEST HERE, a journalist covering a sporting event that few people have heard of: the world freediving championship. I'm sitting at a cramped desk in a seaside hotel room that overlooks a boardwalk in the resort town of Kalamata, Greece. The hotel is old and shows it in the cobweb cracks along the walls, threadbare carpet, and dirt shadows of framed pictures that once hung in dim hallways.

I've been sent here by *Outside* magazine, because the 2011 Individual Depth World Championship is a milestone for competitive freediving – the largest gathering of athletes in the history of the little-known sport. Since I've lived my whole life by the ocean, still spend much of my free time in it, and often write about it, my editor thought I'd be a good fit for the assignment. What he didn't know was that I had only a superficial understanding of freediving. I hadn't done it, didn't know anyone who had, and had never seen it before.

I spend my first day in Kalamata reading up on the competition rules and the sport's rising stars. I'm not impressed. I Google through photographs of competitive freedivers in mermaid out-

DEEP

fits, flashing hang-loose signs while floating upside down in the water, and blowing intricate bubble rings from the bottom of a swimming pool. It seems like the kind of oddball hobby people take up, like badminton or Charleston dancing, so they can talk about it at cocktail parties and refer to it in their e-mail handles.

Nonetheless, I have a job to do. At five thirty the following morning, I'm at the Kalamata marina talking my way onto a twenty-seven-foot sailboat that belongs to a scruffy Québécois expat. His is the only spectator boat allowed out at the competition, which is held in the deep open waters about ten miles from the Kalamata marina. I'm the only journalist aboard. By 8:00 a.m., we've tied up to a flotilla of motorboats, platforms, and gear that serves as the competitors' jumping-off point. The divers in the first group arrive and take positions around three yellow ropes dangling off a nearby platform. An official counts down from ten. The competition begins.

What I see next will confound and terrify me.

I watch as a pencil-thin New Zealander named William Trubridge swallows a breath, upends his body, and kicks with bare feet into the crystalline water below. Trubridge struggles through the first ten feet, heaving broad strokes. Then, at about twenty feet, his body loosens, he places his arms by his sides in a skydiver pose, and he sinks steadily deeper until he vanishes. An official watching a sonar screen at the surface follows his descent, ticking off distances as he goes down: "Thirty meters . . . forty meters . . . fifty meters."

Trubridge reaches the end of the rope, some three hundred feet down, turns around, and swims back toward the surface. Three agonizing minutes later, his tiny figure rematerializes in the deep water, like a headlight cutting through fog. He pops his head up at the surface, exhales, takes a breath, flashes an okay sign to an official, then gets out of the way to make room for the next competitor. Trubridge just dove thirty stories down and back, all on one lungful of air – no scuba gear, air tube, protective vest, or even swim fins to assist him.

The pressure at three hundred feet down is more than nine

times that of the surface, strong enough to crush a Coke can. At thirty feet, the lungs collapse to half their normal size; at three hundred feet, they shrink to the size of two baseballs. And yet Trubridge and most of the other freedivers I watch on the first day resurface unscathed. The dives don't look forced either, but natural, as if they all really belong down there. As if we all do.

I'm so dazzled by what I see that I need to tell somebody immediately. I call my mother in Southern California. She doesn't believe me. "It's impossible," she says. After we talk about it, she dials some friends of hers who've been avid scuba divers for forty years and then calls me back. "There is an oxygen tank at the sea-floor or something," she says. "And I suggest you do your research before publishing any of this."

But there was no oxygen tank at the end of the rope, and if there had been, and if Trubridge and the other divers had actually breathed some of it before ascending, their lungs would have exploded when the air from the tank expanded in the shallower depths, and their blood would have bubbled with nitrogen before they reached the surface. They'd die. The human body can withstand the pressures of a fast three-hundred-foot underwater ascent only in its natural state.

Some humans handle it better than others.

Over the next four days, I watch several more competitors attempt dives to around three hundred feet. Many can't make it and turn back. They resurface with blood running down their faces from their noses, unconscious, or in cardiac arrest. The competition just keeps going on. And, somehow, this sport is legal.

For most of this group, attempting to dive deeper than anyone – even scientists – ever thought possible is worth the risk of paralysis or death. But not for all of them.

I meet a number of competitors who approach freediving with a more sane outlook. They aren't interested in the face-off with mortality. They don't care about breaking records or beating the other guy. They freedive because it's the most direct and intimate way to connect with the ocean. During that three minutes beneath the surface (the average time it takes to dive a few hun-

dred feet), the body bears only a passing resemblance to its terrestrial form and function. The ocean changes us physically, and psychically.

In a world of seven billion people, where every inch of land has been mapped, much of it developed, and too much of it destroyed, the sea remains the final unseen, untouched, and undiscovered wilderness, the planet's last great frontier. There are no mobile phones down there, no e-mails, no tweeting, no twerking, no car keys to lose, no terrorist threats, no birthdays to forget, no penalties for late credit card payments, and no dog shit to step in before a job interview. All the stress, noise, and distractions of life are left at the surface. The ocean is the last truly quiet place on Earth.

These more philosophical freedivers get a glassy look in their eyes when they describe their experiences; it's the same look one sees in the eyes of Buddhist monks or emergency room patients who have died and then been resuscitated minutes later. Those who have made it to the other side. And best of all, the divers will tell you, "It's open to everyone."

Literally everyone—no matter your weight, height, gender, or ethnicity. The competitors gathered in Greece aren't all the toned, superhuman Ryan Lochte-type swimmers you might expect. There are a few impressive physical specimens, like Tru-bridge, but also chubby American men, tiny Russian women, thick-necked Germans, and wispy Venezuelans.

Freediving flies in the face of everything I know about surviving in the ocean; you turn your back on the surface, swim away from your only source of air, and seek out the cold, pain, and danger of deep waters. Sometimes you pass out. Sometimes you bleed out of your nose and mouth. Sometimes you don't make it back alive. Other than BASE jumping—parachuting off buildings, antennas, spans (bridges), and earth (geological formations)—freediving is the most dangerous adventure sport in the world. Dozens, perhaps hundreds, of divers are injured or die every year. It seems like a death wish.

And yet, days later, after I return home to San Francisco, I can't stop thinking about it.

I BEGIN TO RESEARCH FREEDIVING and the claims made by competitors about the human body's amphibious reflexes. What I find – what my mother would never believe and what most people would doubt – is that this phenomenon is real, and it has a name. Scientists call it the mammalian dive reflex or, more lyrically, the Master Switch of Life, and they've been researching it for the past fifty years.

The term *Master Switch of Life* was coined by physiologist Per Scholander in 1963. It refers to a variety of physiological reflexes in the brain, lungs, and heart, among other organs, that are triggered the second we put our faces in water. The deeper we dive, the more pronounced the reflexes become, eventually spurring a physical transformation that protects our organs from imploding under the immense underwater pressure and turns us into efficient deep-sea-diving animals. Freedivers can anticipate these switches and exploit them to dive deeper and longer.

Ancient cultures knew all about the Master Switch and employed it for centuries to harvest sponges, pearls, coral, and food hundreds of feet below the surface of the ocean. European visitors to the Caribbean, Middle East, Indian Ocean, and South Pacific in the seventeenth century reported seeing locals dive down more than one hundred feet and stay there for up to fifteen minutes on a single breath. But most of these reports are hundreds of years old, and whatever secret knowledge of deep diving these cultures harbored has been lost to the ages.

I begin to wonder: If we've forgotten an ability as profound as deep diving, what other reflexes and skills have we lost?

I SPENT THE NEXT YEAR and a half looking for answers, traveling from Puerto Rico to Japan, Sri Lanka to Honduras. I watched people dive to one hundred feet and spear satellite transmitters onto the dorsal fins of man-eating sharks. I rode thousands of feet

DEEP

down in a homemade submarine to commune with luminous jellyfish. I talked to dolphins. Whales talked to me. I swam eye-to-eye with the world's largest predator. I stood wet and half naked inside an underwater bunker with a group of researchers strung out on nitrogen. I floated in zero gravity. I got seasick. And sunburned. And a really sore back from flying tens of thousands of miles in coach. What did I find?

I discovered that we're more closely connected to the ocean than most people would suspect. We're born of the ocean. Each of us begins life floating in amniotic fluid that has almost the same makeup as ocean water. Our earliest characteristics are fishlike. The month-old embryo grows fins first, not feet; it is one misfiring gene away from developing fins instead of hands. At the fifth week of a fetus's development, its heart has two chambers, a characteristic shared by fish.

Human blood has a chemical composition startlingly similar to seawater. An infant will reflexively breaststroke when placed underwater and can comfortably hold his breath for about forty seconds, longer than many adults. We lose this ability only when we learn how to walk.

As we grow older, we develop amphibious reflexes that enable us to dive to incredible depths. The stresses of these depths would injure or kill us on land. But not in the ocean. The ocean is a different world with different rules. It's a place that often requires a different mindset to comprehend.

And the deeper we go in it, the weirder it gets.

When you're in the first few hundred feet, the human connection to the ocean is physical—you can taste it in your salty blood, see it in the gill-like slits of an eight-week-old fetus, and sense it in the amphibious reflexes humans share with marine mammals.

Past the limit where the human body can freedive and survive, about seven hundred feet, the connection to the ocean becomes sensory. You can see it reflected in deep-diving animals.

To survive in this lightless, cold, and pressurized environment, animals such as sharks, dolphins, and whales have developed ex-

tra senses to navigate, communicate, and see. We too share these extrasensory abilities; like the Master Switch, they are remnants of our collective past in the ocean. These senses and reflexes are latent and mostly unused in humans, but they have not disappeared. And they seem to revive when we desperately need them.

It's this connection – between the ocean and us, between us and the sea creatures with whom we share a great deal of DNA – that drew me deeper and deeper still.

AT SEA LEVEL, WE ARE ourselves. Blood flows from the heart to the organs and extremities. The lungs take in air and expel carbon dioxide. Synapses in the brain fire at a frequency of around eight cycles per second. The heart pumps between sixty and a hundred times per minute. We see, touch, feel, taste, and smell. Our bodies are acclimatized to living here, at or above the water's surface.

At sixty feet down, we are not quite ourselves. The heart beats at half its normal rate. Blood starts rushing from the extremities toward the more critical areas of the body's core. The lungs shrink to a third of their usual size. The senses numb, and synapses slow. The brain enters a heavily meditative state. Most humans can make it to this depth and feel these changes within their bodies. Some choose to dive deeper.

At three hundred feet, we are profoundly changed. The pressure at these depths is nine times that of the surface. The organs collapse. The heart beats at a quarter of its normal rate, slower than the rate of a person in a coma. Senses disappear. The brain enters a dream state.

At six hundred feet down, the ocean's pressure – some eighteen times that of the surface – is too extreme for most human bodies to withstand. Few freedivers have ever attempted dives to this depth; fewer have survived. Where humans can't go, other animals can. Sharks, which can dive below six hundred and fifty feet, and much deeper, rely on senses beyond the ones we know. Among them is magnetoreception, an attunement to the magnetic pulses of the Earth's molten core. Research suggests that humans

DEEP

have this ability and likely used it to navigate across the oceans and trackless deserts for thousands of years.

Eight hundred feet down appears to be the absolute limit of the human body. Still, an Austrian freediver is willing to risk paralysis and death to go beyond that depth.

At a thousand feet down, the waters are colder and there's almost no light. Another sense clicks on: animals perceive their environment not by looking but by listening. With this extra sense, called echolocation, dolphins and other marine mammals can "see" well enough to locate a metal pellet the size of a rice grain from a distance of 230 feet, and they can distinguish between a Ping-Pong ball and a golf ball from 300 feet away. On land, a group of blind people have tapped into the ability to echolocate and use it to ride bikes through busy city streets, jog through forests, and perceive a building from a thousand feet away. This group isn't special; with the right training, we all can see without opening our eyes.

At twenty-five hundred feet below, the water is permanently black, and pressures are seventy-five times that of the surface. For the animals living at these depths, danger lurks in all directions. Electric rays have adapted by harnessing impulses inside their bodies to fatally shock prey and fend off predators. Scientists have discovered that every cell in the human body also contains an electrical charge. Tibetan Buddhist monks who practice the Bön tradition of Tum-mo meditation have learned to focus these cellular charges to warm their bodies during bitterly cold winters. Researchers in England have discovered that by controlling the output of cellular charges in our bodies, humans can not only create heat but treat many chronic diseases.

At ten thousand feet below, a black and unforgiving depth, we find sperm whales—whose behavior, surprisingly, more closely resembles our culture and intellect than any other creature's on the planet. Sperm whales may communicate with one another in ways that could be more complex than any form of human language.

At twenty thousand feet and below, the deepest waters har-

bor the world's most inhospitable environments. Pressures range from six hundred to a thousand times that of the surface; temperatures hover just above freezing. There is no light and very little food. And yet life persists there. These hellacious waters may in fact be the birthplace of all life on Earth.

TWO MILLION YEARS OF HUMAN history, two thousand years of science experiments, a few hundred years of deep-sea adventuring, one hundred thousand marine biology graduate students, countless PBS specials, Shark Week, and still, *still*, we've explored only a fraction of the ocean. Sure, humans have gone deep on occasion, but have they really seen anything? If you compare the ocean to a human body, the current exploration of the ocean is the equivalent of snapping a photograph of a finger to figure out how our bodies work. The liver, the stomach, the blood, the bones, the brain, the heart of the ocean – what's in it, how it functions, how we function within it – remain a secret, much of it hidden in the dark and sunless realms.

To be clear, this book has a downward trajectory. With each passing chapter, it will descend farther, from the surface to the bottom of the blackest sea. I'll go down as far as I physically can, then, for those depths I cannot access, I'll use a proxy – one of the many deep-diving animals with whom humans share unexpected and startling similarities.

The research and stories that follow cover only a sliver of the current research on the ocean and pertain specifically to the human connection within this realm. The scientists, adventurers, and athletes profiled here are only a handful of thousands of people now plumbing the sea's mysteries.

It's no coincidence that many of the researchers are freedivers. I learned early on that freediving was more than just a sport; it was also a quick and efficient way to access and research some of the ocean's most mysterious animals. Shark, dolphins, and whales, for instance, can dive a thousand feet or more, but there's no way of studying them at such depths. A handful of scientists have recently discovered that by waiting for these animals

to come to the surface, where they feed and breathe, and then approaching them on their own terms – by freediving – they can study them far more closely than any scuba diver, robot, or sailor.

“Scuba diving is like driving a four-by-four through the woods with your windows up, air conditioning on, music blasting,” one freediving researcher told me. “You’re not only removed from the environment, you’re disrupting it. Animals are scared of you. You’re a menace!”

The more I immersed myself in this group, the more I wanted to share the close encounters they were having with their subjects. I began freediving on my own. I became a student of the form. I went deep.

And so, my freediving training is also a part of this book’s downward spiral – a personal quest to overcome dry-land instincts (aka breathing), flip the Master Switch, and hone my body into a diving machine. Only by freediving could I get as close as physically possible to the animals who were teaching us so much about ourselves.

But freediving, I knew, had its limits. Even experienced divers usually can’t go below 150 feet comfortably, and even when they do, they can’t stay long. The average beginning freediver – me, for instance – isn’t able to get past a few dozen feet for several frustrating months. To get to these deeper depths and see deep-sea animals that never come near the surface, I followed a different kind of freediver – a subculture of do-it-yourself oceanographers who are revolutionizing and democratizing access to the ocean. While other scientists working in government and academic institutions were filling out grant requests and reeling from funding cuts, these DIY researchers were building their own submarines out of plumbing parts, tracking man-eating sharks with iPhones, and cracking the secret language of cetaceans with contraptions made of pasta strainers, broomsticks, and a few off-the-shelf Go-Pro cameras.

To be fair, many institutions don’t carry out this kind of research because they can’t. What this group of DIY researchers was doing was dangerous – and often totally illegal. No univer-