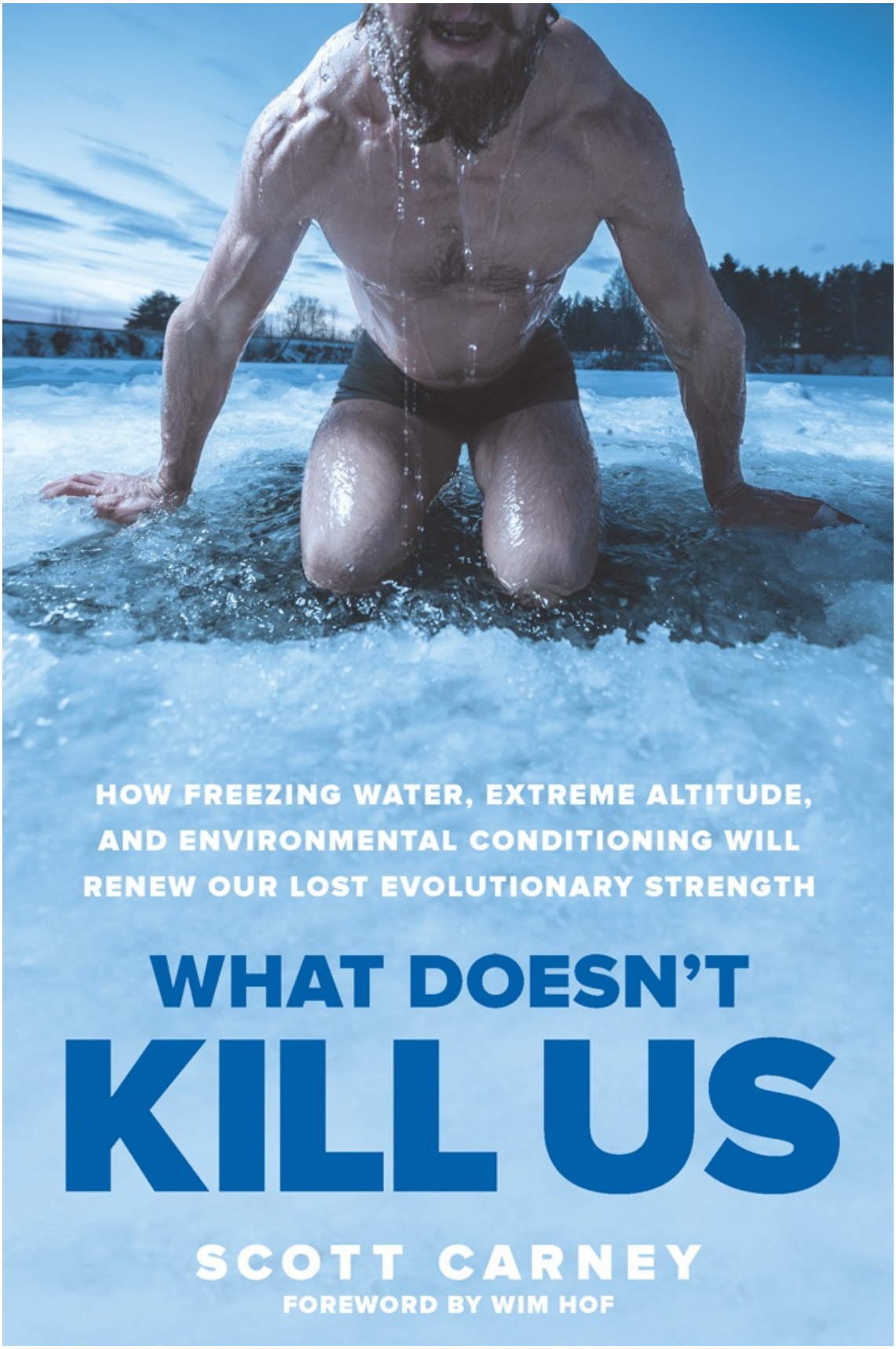
HOW FREEZING WATER, EXTREME ALTITUDE, AND ENVIRONMENTAL CONDITIONING WILL RENEW OUR LOST EVOLUTIONARY STRENGTH
WHAT DOESN'T
KILL US
SCOTT CARNEY
FOREWORD BY WIM HOF

ALSO BY SCOTT CARNEY:

THE RED MARKET

A DEATH ON DIAMOND MOUNTAIN

WHAT DOESN'T KILL US

HOW FREEZING WATER, EXTREME ALTITUDE, AND ENVIRONMENTAL CONDITIONING WILL RENEW OUR LOST EVOLUTIONARY STRENGTH

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RODALE

FOR LAURA KRANTZ

WARNING

This book is intended to be a journalistic investigation into the limits and

possibilities of the human body. No one should attempt any of these methods or

practices without appropriate experience, training, fitness level, doctor

approval, and supervision—and even then, readers must be aware that these

practices are inherently dangerous and could result in grave harm or death.

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Instead of softening their feet with shoe or sandal, his rule was to make them hardy through going barefoot. This habit, if practiced, would, as he believed, enable them to scale heights more easily and clamber down precipices with less danger. In fact, with his feet so trained the young Spartan would leap and spring and run faster unshod than another shod in the ordinary way. Instead of making them effeminate with a variety of clothes, his rule was to habituate them to a single garment the whole year through, thinking that so they would be better prepared to withstand the variations of heat and cold.

—Xenophon of Sparta, 431–354 BC

The daily cold plunge does not necessarily place a man “next to the Gods,” as he so frequently thinks it does. Such cold-plungers are often very proud of their accomplishment and sneer at those who do not take this daily

treatment, and the plunger is likely to “thank God that he is not like other men.” Very many times daily cold plunges or cold showers are harmful, especially to those who are underweight or are losing too much weight.

—Journal of the American Medical Association, 1914

FOREWORD

Nature gave us the ability to heal ourselves. Conscious breathing and environmental conditioning are two tools that everyone can use to control their immune system, better their moods, and increase their energy. I believe that anyone can tap into these unconscious processes and eventually control their autonomic nervous system. It’s a grand claim and some people rightly read my conviction and enthusiasm with incredulity. Skepticism is good and allows the truth to come out. But I wasn’t quite sure I was ready for Scott Carney, because he was the most skeptical of all. He came to Poland to prove

to the world that I was a fake.

I run a small training center in the cold Karkonosze Mountains, where I teach people to use the snow and ice to break into their deepest physiology. Most everyone comes here motivated to learn. But Scott was different. He is an anthropologist and investigative journalist who is in the habit of asking questions until he gets to the truth of things. The moment I met him at the airport terminal, I knew that it was not going to be an easy week.

I first got to know his analytical mind over a game of chess. We stayed up late probing each other's defenses and staking our claims on the board while also talking about what it means to learn to love the cold. He won the game. But he also made a pact with me to give the training a fair shot.

The next day, he began to learn the techniques for himself. This is a man who had just come from Los Angeles surf country, where the weather is always warm. But he would learn the breathing and lie almost naked in the snow with the rest of the group. I don't imagine that it was something he ever

actually *wanted* to do. Yet two days after we met he stood barefoot in the snow, no doubt feeling the primordial powers within.

The Western-lifestyle makes it all-too-easy to take nature for granted. All mammals share the same underlying physiology, but somehow humans are so

caught up thinking big thoughts with their big minds that they've come to believe that they're different from everything else around them. Sure we can build skyscrapers, fly airplanes and simply turn up the thermostat to combat the cold, but it turns out that the technologies that we believe are our greatest strengths are also our most tenacious crutches. The things we have made to keep us comfortable are making us weak.

But it only takes a handful of days to begin kicking the dependence on

comfort. Conscious breathing and mental focus can jump-start a chemical change to alkalize the body, while immersion in cold water creates a mental and physical mirror for seeing ourselves in a state of fight-or-flight. Feeling that change is powerful.

For the next few years Scott and I kept in touch through e-mail as I discovered new ways to make the method accessible to anyone. He got six pages in the July 2014 issue of *Playboy* magazine! And there I was, an almost

naked man in the pages of *Playboy,* spreading the message that breathing exercises can activate the brain stem, where freeze, fight, flight and fuck are the body's most basic instincts. Shortly after that, new studies began to appear in scientific journals containing proof that the techniques worked. Scott knew that it was time to write a book. It would be a simple and effective examination. No speculation. He just did it.

He stayed for three weeks with me in my place in the Netherlands. I believe he discovered that I'm not dogmatic, but simply determined in my goal that everybody is able to become more human.

Earlier this year he set his mind to climbing Mount Kilimanjaro with me. And I hope I'm not giving away any spoilers, but we bloody did it in record time—just 28 hours to the summit. There are no stories or fibs, just real testimonials of what people can achieve if they put their bodies and minds to

it.

It’s time to bring Mother Nature’s power back into our awareness. We are warriors seeking strength and happiness for everyone. Together we regain what we’ve lost. In other words, there’s nothing else to say other than “Breathe, motherfucker.”

Love,

Wim Hof

Stroe, Netherlands, April 28, 2016

PREFACE

BURNING UP

Our line of headlamps cuts through the inky black African night, illuminating patches of a loose rubble path. Aluminum poles and hiking boots crunch the dirt as the group moves ever northward toward a volcanic chunk of rock that claims the lives of about eight mountaineers a year. Our breathing is harsh and rhythmic, as if we are trapped in a room while the air is being sucked away. It sounds as if any given lungful might be our last. We trudge forward in focused unison until the fingers of an orange dawn light grab at the horizon to pull the night away. Now the outline of a mountain peak begins to define itself. At first it is only a dark purple absence of stars in a pinprick sky, but as

the heavens shuffle off night's embrace, sunlight sets the glacier ablaze like a beacon.

Kilimanjaro.

The tallest mountain in Africa rises up out of the sun-drenched savannah to a place high above the clouds. There, winds topping 100 miles an hour scour what is likely the only indigenous ice on the continent. It's the first time we've seen it this close, and I can't decide whether I'm excited or terrified. For the past 20 hours the peak hid behind clouds and the mountain's own towering foothills, but now the massive slab of igneous rock is no longer an idea to conjure up in our minds, but a deadly, real-life obstacle. Our gradual 15.5-mile ascent from the park gate will come to an abrupt halt in a few miles, where the base of the volcanic cone rockets upward out of the basin and into a barren and inhospitable wasteland. Devoid of life, and home to only a moonlike base camp, that point will be the start of the greatest challenge of my life—one that will push me to the very limit of human endurance. While thousands of tourists attempt to summit the mountain every

year, they tend to do it in easy stages and while wearing the most advanced mountaineering equipment. We will reach the top of the mountain at a record-bending pace with no acclimation to the altitude, on almost no food, little sleep, and, most strikingly, no cold weather gear. I'm wearing only

boots, a bathing suit, a wool cap, and a backpack containing some emergency

gear and water. My chest is bare to the frigid air.

One of the guides watches me warily from beneath his full thermal getup

until finally he can't hold his silence anymore. "Please put something on," he

says, concerned by the display of skin.

It's a sensible request. Even with the sun coming up, the temperature is

well below freezing, and it is only going to get colder as we ascend higher.

What he doesn't know is that the cold is the least of my concerns. In fact

it's kind of the point. My skin feels like armor that the temperature cannot

penetrate. Partly it's because I'm working so hard to go uphill that my body

has more heat than it knows what to do with, but on another level—one that

I'm still trying to wrap my mind around—it's because I just won't let it in.

Either way, I'm sweating, not shivering. But there's another challenge that

poses a much more pernicious problem, one that could put the whole

expedition out of commission.

Reasonable people take 5 to 10 days to reach the top of Kilimanjaro,

climbing in slow and deliberate stages along the route so that their bodies can

generate enough new red blood cells to compensate for the decrease in

oxygen as the altitude increases. But we are not reasonable people. Our rather

audacious plan is to make the summit in 2 days. At that pace there is no time for acclimatization. At just above 13,000 feet—and only about two-thirds of the way up—the air is already thin enough to send some unacclimatized people into a spiraling cascade of headaches, convulsions, and sometimes even death. The condition has already created two empty spots in our procession. One belonged to a nearly 7-foot tall Dutchman who spent 10 minutes vomiting up his breakfast this morning and then couldn't stop stumbling with every step. And then there was the owner of a string of Holland's famous marijuana vending "coffee shops," who had so little oxygen in her blood last night that her limbs simply ceased to function. Mountain sickness can cut down even the most robust athletes. The military has been so perplexed by the problem that when they send special forces units into high altitude combat zones—the type that are all too common in Afghanistan—they have to account for a predictable percentage of their soldiers being incapacitated by the lack of oxygen. So far, the only solution has been to send in additional fighters on every mission. If we are going strictly by the numbers, the prognosis for our group is grim. A day before our departure, a senior scientist at an Army research center that focuses on environmental risks calculated that three-quarters of us would fall

to a similar fate as the two we have already lost. The Army isn't alone in being certain that most of us are going to fail. Just before I left, a journalist who spends much of his time topping Colorado's 14,000-foot peaks confided to my wife that he was pretty sure that I would never make it to the top. What is hard to communicate to the rest of the world is that what we are doing on the mountain is not a stunt or a suicide mission. The lack of clothing, the altitude, and the pace are actually part of an experiment to understand one of the most pressing questions in the modern world today: Has dependence on technology made us weak? Just about every person I know, from the skeptical journalist in Colorado to the US Army scientist to the guide by my side, envelops themselves in a cocoon of technology that keeps them safe, warm, and helps them endure the natural variations of our planet. In the past six million years of human evolution our ancestors mounted expeditions across frozen mountains and parched deserts with only a whisper of technology to aid them. While they might not have aimed to get up this particular mountain, they surely crossed the Alps and the Himalayas, navigated oceans, and populated the New World. What power did they have that we have lost? More important, is it possible to get it back? The underlying hypothesis of this expedition is that when humans outsource comfort and endurance they inadvertently make their bodies weaker, and that

simply reintroducing some common environmental stresses to their daily routines can bring back some of that evolutionary vigor. Every person in this line of wobbling headlamps is potentially putting their life on the line to test the theory. We also know that along with the act of conditioning ourselves over time, there's also a simple mind-set and mental fortitude that seems to unlock a biological power to heat our bodies.

I suck in a cool breath of air and focus my eyes on the blazing orange rock in front of me. I exhale a low guttural roar, like a dragon just waking from a thousand-year slumber. I feel the energy begin to build. The rhythm of the air

quickens. My toes start to tingle inside my hiking boots. The world starts to brighten in my vision as if there are two dawns working at the same time—one tied to the rising of the sun, the other in the depths of my own mind. A coil of heat starts behind my ears like someone has lit a fuse. It arcs across my shoulders and down the curve of my spine. There's no point in checking the temperature. It's well below freezing and I'm already burning up.

INTRODUCTION

AN ODE TO A JELLYFISH

I don't like to suffer. Nor do I particularly want to be cold, wet, or hungry. If I had a spirit animal it would probably be a jellyfish floating in an ocean of perpetual comfort. Every now and then I'd snack on some passing

phytoplankton, or whatever it is that jellyfish snack on, and I'd use the tidal forces of the ocean to keep me at the optimal depth. If I were lucky enough to have come into the world as a *Turritopsis dohrnii,* the so-called "immortal jellyfish," then I wouldn't even have to worry about death. When my last days approached, I could simply shrivel into a ball of goo and reemerge a few hours later as a freshly minted juvenile version of myself. Yes, it would be awesome to be a jellyfish.

Unfortunately, as it turns out, I am not an amorphous blob of sea-goop. As a human I am merely the most recent iteration of several hundred million years of evolutionary development from the time we were all just muck in a primordial soup. Most of those previous generations had it pretty rough. There were predators to outwit, famines to endure, species-ending cataclysms to evade, and an ever-changing struggle to survive in outright hostile environments. And, let's be real, most of those would-be ancestors died along the way without passing on their genes.

Evolution is a continual battle waged through generations of minute mutations where only particularly fit or lucky creatures outperform hapless genetic dead ends. The body we have today hasn't stopped evolving, but I

still think if we peel back all the eons of changes that brought us here today that we will still find a little bit of jellyfish at the very core of our beings. This is because we have a nervous system that is almost perfectly attenuated for homeostasis: the effortless state where the environment meets every physical need. Our nervous system automatically responds to challenges in the world around us—triggering muscle contractions, releasing hormones, modulating body temperature, and performing a million other tasks that give us an edge in a particular moment.

But barring an urgent need for survival the human body is perfectly content to simply rest and do nothing. Doing things, *doing anything,* requires a certain amount of energy, and our bodies would rather save up that energy just in case they need it later. The great bulk of these bodily functions lie just beneath our conscious thoughts, but if whatever motivates our nervous system *could* express itself, it would probably maintain that the body that it is

responsible for would best tick by admirably well in a state of perpetual and stressless comfort.

But what is comfort? It's not really a feeling as much as it is an absence of things that aren't comfortable. Our species might never have survived necessary but arduous treks across scorching deserts or over frigid mountain peaks if there weren't the promise of some physical reward at the end of the

journey. We sate our thirst, don layers of clothing on cold winter days, and clean our bodies because that yearning for comfort is hardwired into our brains. It's what Freud called the "pleasure principle."

The programming that makes us gluttons for the easy life didn't emerge out of nowhere. Aside from my jellyfish spirit animal, almost every organism struggles against the environment that it inhabits. Every biological adaptation that makes life incrementally easier came through the glacial progress of natural selection, when two animals were able to pass favorable traits onto their descendants. Yet evolution requires more than a biological duty that culminates in a moment of intense passion; it needs the cumulative luck, motivations, and skill of individual creatures to use their biological abilities to the fullest. Every creature, whether it is an amoeba or a great ape, needs motivation to overcome the challenges of the world around it. Comfort and pleasure are the two most powerful and immediate rewards that exist.

Anatomically modern humans have lived on the planet for almost 200,000 years. That means your officemate who sits on a rolling chair beneath fluorescent lights all day has pretty much the same basic body as the prehistoric caveman who made spear points out of flint to hunt antelope. To get from there to here humans faced countless challenges as we fled

predators, froze in snowstorms, sought shelter from the rain, hunted and gathered our food, and continued breathing despite suffocating heat. Until very recently there was never a time when comfort could be taken for granted

—there was always a balance between the effort we expended and the downtime we earned. For the bulk of that time we managed these feats without even a shred of what anyone today would consider modern technology. Instead, we had to be strong to survive. If your pasty-skinned officemate had the ability to travel back in time and meet one of his prehistoric ancestors it would be a very bad idea for him to challenge that caveman to a footrace or a wrestling match.

Over the course of hundreds of thousands of years humans invented some things that made life easier—fire, cooking, stone tools, fur skins, and foot bindings—but we were still largely at the mercy of nature. About 5,000 years

ago, at the dawn of recorded history, things got a little easier still as we domesticated various animal species to do work for us, built better shelters, and carried more sophisticated gear. As human culture advanced at least it all

was getting incrementally easier. Even so, being a human was not exactly carefree. Each age let us depend more on our ingenuity and less on our basic biology until technological progress was poised to outpace evolution itself.

And then, sometime in the early 1900s, our technological prowess became so

powerful that it broke our fundamental biological links to the world around us. Indoor plumbing, heating systems, grocery stores, cars, and electric lighting now let us control and fine-tune our environment so thoroughly that many of us can live in what amounts to a perpetual state of homeostasis. It doesn't matter what the weather is like outside—scorching heat, blizzards, thunderstorms, or just fine summer days—a person can wake up long past when the sun rises, eat a breakfast chock-full of fruits flown in from a climate

halfway across the globe, head to work in a temperature-controlled car, spend

the day in an office, and come home without ever feeling the outside air for more than a few minutes. Modern humans are the very first species since the jellyfish that can almost completely ignore their natural obstacles to survival.

Yet comfort's golden age has a hidden dark side. While we can imagine what a difficult environment might feel like, very few of us routinely experience the stresses of our forebears. With no challenge to overcome, frontier to press, or threat to flee from, the humans of this millennium are overstuffed, overheated, and understimulated. The struggles of us privileged denizens of the developed world—getting a job, funding a retirement, getting

kids into a good school, posting the exactly right social media update—pale in comparison to the daily threats of death or deprivation that our ancestors faced. Despite this apparent victory, success over the natural world hasn't made our bodies stronger. Quite the opposite, in fact: Effortless comfort has made us fat, lazy, and increasingly in ill health.

The developed world—and, for that matter, much of the developing world—no longer suffers from diseases of deficiency. Instead we get the diseases of excess. This century has seen an explosion of obesity, diabetes, chronic pain, hypertension, and even a resurgence of gout. Countless millions of people suffer from autoimmune ailments—from arthritis to allergies, and from lupus to Crohn's and Parkinson's disease—where the body literally attacks itself. It is almost as if there are so few external threats to contend with that all our stored energy instead wreaks havoc on our insides.

There is a growing consensus among many scientists and athletes that humans were not built for eternal and effortless homeostasis. Evolution made

us seek comfort because comfort was never the norm. Human biology needs stress—not the sort of stress that damages muscle, gets us eaten by a bear, or degrades our physiques—but the sort of environmental and physical oscillations that invigorates our nervous systems. We've been honed over millennia to adapt to an ever-changing environment. Those fluctuations are

ingrained in our physiology in countless ways that are, for the most part, unconnected to our conscious minds.

Muscles, organs, nerves, fat tissue, and hormones all respond and change because of input they get from the outside world. Critically, some external signals set off a cascade of physiological responses that skip the conscious parts of our brains and connect to a place that controls a wellspring of hidden physical reactions called collectively fight-or-flight responses. For example, a plunge into ice-cold water not only triggers a number of processes to warm the body, but also tweaks insulin production, tightens the circulatory system, and heightens mental awareness. A person actually has to get uncomfortable and experience that frigid cold if they want to initiate those systems. But who wants to do that? The bulk of us don't see environmental stress in the same light as we do, say, exercise. There doesn't seem to be an obvious reason to leave our shells of environmental bliss.

Maybe that's not entirely fair. In recent years a counterculture has tried to push back against technological overzealousness to reclaim some of our animal nature. They've shucked fancy footwear for flat shoes (and some cases no shoes at all). They've turned away from climate-controlled exercise gyms in favor of rough obstacle courses and boot camps that force muscle

groups to work in unison. They're hacking their diets: eating tubers and meat and foregoing grains reminiscent of our Paleolithic ancestors. At least eight million people have bought a product called the Squatty Potty, a device for the toilet to help a person poop in a squatting stance like our pre-toileted forebears did. Millions more sign up for obstacle course races that feature electrified grids, pools of freezing water, and grueling climbs over wooden barriers. They compete until they are so bone tired that their muscles shake. They puke in the mud with tears in their eyes. It's not exhilaration they're seeking: it's suffering. Their pain is so much on the forefront of the experience that the industry of obstacle courses and boot camps are sometimes called "sufferfests." Think about that for a second: There are companies out there that literally make fortunes by selling suffering. How did

pain become a luxury good? Could it be that there is a specific sort of pain that might serve a hidden evolutionary function?

It would be wrong to call this movement a fad. To some degree there have always been people who have straddled the line between biology and technology. In ancient Sparta, soldier-scholars wore only simple red cloaks and no shoes, regardless of the weather. They believed exposure made them fiercer in battle and immune to the ravages of the outside world. For almost a

thousand years in China and Tibet, mystics and monks endured months or even years on Himalayan peaks with just their robes and daily meditations to protect them. Before Europeans arrived in North America, the natives of what is today the city of Boston wore little more than loin cloths to protect them during the icy winters. In the 1920s in Russia, a movement born from religious fervor convinced hundreds of thousands of Siberians to pour cold water on themselves every day in order to stave off infections and illnesses. Advanced technology permeates everything we do, but the people who decide to abandon some of that comfort for the rawness of nature represent an indigenous ethos that has almost been wiped out by a societal desire for comfort. They're learning that if they embrace the way their bodies respond to the natural world, they can unlock a hidden wellspring of animal strength. Today tens of thousands of people are discovering that the environment contains hidden tools for hacking the nervous system. But no matter what they might be able to accomplish, they're not superhuman. The fortitude they find comes from within the body itself. When they forego a few creature comforts and delve more deeply into their own biology they're becoming *more human.* For at least half a century the conventional wisdom about maintaining good physical health has rested on the twin pillars of diet and

exercise. While those are no doubt vital, there's an equally important, but completely ignored, third pillar. And what's more? By incorporating environmental training into your daily routine, you will achieve big results in very little time.

It only takes a matter of weeks for the human body to acclimatize to a dazzling array of conditions. Once you arrive at high altitude, your body automatically produces more red blood cells to compensate for lower oxygen saturation. Move to an oppressively hot environment and your body will sweat out fewer salts over time and produce lower volumes of urine. Heat will also stimulate your cardiovascular system to become more efficient and increase evaporation and cooling. Yet no environmental extreme induces as many changes in human physiology as the cold does.

Imagine, if you will, a native Bostonian's experience in the winter. Though beset by ice storms, sleet, blizzards, and constant overcast skies, Boston is not the coldest city in America. But the Boston winters are sufficiently miserable to motivate most of its population to head indoors and jack up the thermostat in the colder months. In Boston, the mean difference between the indoor temperature and the outside air in January is a shiver-inducing 39 degrees. When this typical Bostonian walks out the front door of her stately brownstone she probably cringes with pain as a blast of icy air quickens her

nerves and turns her face into a grimace. Beneath the surface of her skin a series of nerve and muscle responses cause the blood vessels to constrict, which can be painful if the underlying muscles haven't been strengthened from repeated prior exposures. If, in a fit of uncharacteristic madness, she decides to remove her shoes and plant her bare feet in the snow, the almost 70-degree swing in temperature would feel akin to walking across a hot bed of coals.

These unhabituated responses of the human body are not pleasant, but the physiology of the process is worth examining. The human circulatory system is made up of a series of spongy arteries and veins that carry our blood supply

(and oxygen) to every tissue. Arteries carry red, oxygen-rich blood away from the heart and lungs while blue-tinged veins carry it back. This vast and complex network of vessels would extend more than 60,000 miles if laid end to end. In a single day, the 5.6 liters of blood in a human body travels a total of almost 12,000 miles through the system, or almost four times the distance across the United States. This great blood superhighway is more than just a series of tubes; it's an active and responsive system. Lining most of the important veins is a similarly complex network of tiny muscles that constrict the flow of blood away from one particular area to boost the supply to another. These muscles are so strong that if someone were to cut off your leg

with a sword below the knee, the muscles would immediately clench shut with enough force to almost completely stem the loss of blood. That, luckily, is not the sort of muscular reflex that we need to test on a daily basis, but it's nice to know it's there just in case. However, the second our intrepid Bostonian opens the door to her house and has a brush with that near-Arctic wind, she feels a miniature version of that reaction.

Aside from its lifesaving potential following dismemberment, the circulatory system has other reasons to flex its muscles. To stave off hypothermia, the body conserves heat by shutting off blood supply to the extremities. When this happens, miles of vestibular roadways squinch closed,

keeping most of the blood in the body's core and letting the vital organs relax

in a warm blood cocoon while temperatures in the hands, feet, ears, and nose plummet. The colder it is outside, the stronger the response. For a person not regularly conditioned to temperature shifts, vasoconstriction is painful. The only way that most of us can trigger the muscle response is to actually go outside and feel the cold. And those of us who live in perpetually climate-controlled environments never exercise this part of our circulatory system. Weak circulatory muscles are a side effect of living in a very narrow band of temperature variation. The vast majority of humanity today—the entire

population that spends the bulk of its time indoors and/or whose only experience when it gets too cold or too hot is wearing state-of-the-art outdoor gear—never exercises this critical system of their body. Even people who appear physically fit, with lean muscles and chiseled abs, might be secretly hiding weak circulatory muscles. And the stakes are huge: In the long run, circulatory diseases contribute to almost 30 percent of the world's mortality.

There's an entire hidden physiology in our bodies that operates on evolutionary programming most of us make no attempt to unlock. Muscle control in the central nervous system breaks down into three distinct categories. There are muscles that we can activate consciously, in what doctors call the somatic nervous system. When you decide to walk across the room, your brain fires the nerves that activate muscles all up through the legs, back, and stomach at once. We don't need to think about every muscle involved in taking a step, we just do it. Still, with some deliberate thought we can individually fire any one of them. This is all part of the somatic system.

There are also muscles that we have almost no control over whatsoever. These include muscles that control the pace of the heart, the motion of the vascular system, the speed of digestion, and the dilation of our pupils. All of these are part of the autonomic nervous system—the body's version of

autopilot. But there's a third group of muscles and reactions that are shared between the autonomic and somatic systems. Any one of us can decide to take a breath or blink our eyes, but if we let our minds wander, some deep part of our nervous system takes over. If you want to, you can hijack control away from some automatic processes with a thought, but when your mind drifts away, they continue on their own. This is a good thing: With such a system there's no way that you can simply forget to breathe.

The division emerges from deep within our evolutionary roots. Simple life forms respond to the environment in predictable ways. For most mammals, many of these automatic responses originate in the most primitive parts of the

brain, near its stem. These relays bypass higher functioning centers in the gray matter. However, as animals encountered more complex and changing environments during the course of evolution, they needed some elements of reasoning to help navigate the world. The cerebral cortex and bigger brain structures, located toward the top of the skull, evolved to accomplish this. Motor functions migrated up into the neocortex, the gray matter areas correlated with higher-level reasoning. Even so, most of the body's millions of actions never go very high in the brain. There has never been evolutionary pressure to put the circulatory system under conscious control, so the response to cold, for example, has been uniform throughout much of our

evolution: Preserve the core at the expense of the extremities. No thought needed.

But what happened when humans gained so much technological skill that they effectively dominated their environment? All human technology originates out of the activity of our higher brain functions. In a way, our conscious minds are now so in control of the world we live in that they've left our lizard brains out of the loop. Without external signals and inputs that were designed by evolution over millennia, our bodies are simply not being called upon to perform what have always been critical functions. That internal programming lies dormant and unproductive.

Almost since the beginning of recorded history, humans have seen themselves as separate from the natural world. We divide the planet into two categories: things influenced by human action and things that are untouched. The distinction is false. On a global scale we can see that the constant progress of industry has had a dramatic effect on the climate. The humanizing

influence of our carbon footprint affects everything. The year that I'm writing

this, 2016, is set to be the hottest ever recorded, expected to top the 10 record-breaking years before it. The scale of the problem indicates that humanity and the environment are intrinsically linked. But does that mean

we’re making the world more human? Or does it mean that humanity has been part of nature all along?

The tiny muscles around your veins have one unambiguous answer to that question. Despite everything that we try to do to separate ourselves from the world around us, humans are still indisputably part of nature. As byproducts of evolution, the skyscrapers, plastics, and automobiles we manufacture are no less “natural” than a termite mound, a honeycomb, or a beaver dam. Yes, the actions that humans make may be significantly more destructive or ambitious or awe-inspiring or futile, but they are all part of a greater system of causes and effects. We are still animals. Just very smart ones.

So what does this have to do with the neocortex? Well, if our bodies have preset responses to natural conditions, then maybe it’s too simple to think about the limits of the body as stopping at the skin in the first place. Perhaps humans exist in a sort of continuum with the outside world. Our bodies are not discrete things; rather, they are reflections of the environment that they inhabit.

Let me give an example. In the past 40 years, naturalists who study ants have struggled with a similar paradigm shift. There are several distinct types of ants in any given colony. There are worker ants that search out and hunt for food and who carry out the bulk of the manual labor; there are big-headed

soldier ants that defend the colony from invaders; and there are breeding ants that constantly churn out new generations. On one level every ant is an individual entity with legs, mandibles, antennae, and an ability to navigate the world on its own. Because you can hold an ant in your hand, dissect it, and analyze its individual parts, it's logical to think of an ant as a single insect. But there is another way to think about that same ant. Instead of millions of distinct insects, today's ant biologists tend to think of the entire colony as a single living organism. When looked at in this way ants are essentially cells of a larger creature. The colony is the body. The group grows

in size in the summer and shrinks in the winter. It conquers territory, amasses resources, and gestates a new generation. The sum of all ants together is much greater than the abilities of any individual creature. The colony works as a sort of networked brain: a superorganism.

The body that you have isn't too different from an ant colony. Long before animals ever appeared on earth, in a time when life comprised mostly single-celled organisms, microscopic bean-shaped bacteria called mitochondria flourished in the wild. These single-cell life-forms ate up oxygen from the environment and expelled an energy-rich waste product called adenosine triphosphate, or ATP. Over the course of millions of years, larger single-cell critters needed more energy to perform complex functions. Rather than

develop a novel approach to creating ATP, they evolved to absorb mitochondria into their own cellular structures. Thus the first animal cells were born out of a symbiotic relationship. If you were to peer through a microscope into any random red blood cell, you would find thousands of mitochondria sucking up oxygen and excreting ATP.1 You couldn't survive without them. But that's not all. In addition to mitochondria, scientists estimate you have more than 10 trillion other microbes in your body, comprising more than 10,000 different species, and accounting for 1 to 3 percent of your body weight. Billions more live on your skin, eyes, hair, and in your blood. The realization in recent years that bacteria are vital to human health has spawned the exciting new field of medical investigation into the bacterial genome. Research is showing that the unique mix of bacteria in the human body can have a profound impact on health, and can even create personality changes.

And why shouldn't it? The human genome has 23,000 genes composed of twisted strands of amino acids called DNA. But there are an additional two million genes in our symbiotic bacterial genome. And, like our own DNA, that bacterial genome gets passed down to our descendants and evolves as we

do. In a way, we're actually more microbial than human. Even so, all those different organisms work in concert to create a single human bounded by the