Lesson Three

When we open up to such questions, we open ourselves up to our higher nature. It was asking questions, making connections and trying new things that brought us down from the trees, and took us to the moon.

WHO ARE WE?

The mountainous interior of New Guinea offers some of the most treacherous hiking challenges in the world. It is as rough and steep as any other mountain range, but then it is blanketed with a thick wet rainforest teeming with painful fire ants, sharp stones, and slick mud. My colleague Dan Jorgensen who did fieldwork just a few valleys away calls it "vertical rainforest."

In preparation for this, I bought the best boots I could afford – stiff and strong with mean looking teeth promising plenty of traction. But they were no match for these mountains. My friends skittered up and down mountains with ease in their bare feet while I clobbered and hobbled along. Every step of mine seemed so heavy and clumsy compared to the graceful and light dance they did as they bounced from

stone to stone. We all spent a lot of time on the ground – me crawling on all fours gazing down in terror over the mountain ledges that would surely end my life, them sitting casually up-mountain taking in the good view and enjoying a smoke.

Going down was much worse than going up. I usually took a "sit and slide" approach, seeing no plausible way to stay on 2 feet and get down safely. Meanwhile they bounded down the same precipice with ease, usually carrying heavy bags full of garden produce, firewood, or even babies.

One day about 8 months into my time there, my wife and I were gathering bamboo for a new chicken pen. Fresh bamboo is very heavy, and the 14 foot bundles we put together were especially unwieldy. Our shoulders shrieked with pain as we lumbered along the slick trail home. After struggling for some time an 8 year old girl who could not have weighed more than 60 pounds swooped alongside my wife, swung her load of bamboo onto her back and walked off as quickly as she had arrived, leaving us trailing far behind. Though my wife felt a little ashamed that she had been rescued by an 8 year old, she was happy to be rid of the load, and walked on toward home as I continued to struggle, heaving the load 30 feet, then 20 feet, then just 10 feet at a time, then stopping to rest and rub my aching shoulder, letting the tall and imposing load stand beside me. I didn't dare let it fall, for I knew I would never be able to stand it up again.

Before long an old woman caught up, carrying a bag full of sweet potatoes on her head. Watching me struggle with the load, she offered to help. She appeared frail and weighed no more than 100 pounds. I was sure she would simply collapse under the weight, so I refused. But she was insistent. She wedged her shoulder into the standing bundle, found the balance point, let the weight sway on to her shoulder, and

skittered off toward the house with that quick and light New Guinea step I had come to admire. I had to walk-run-walk like a child keeping up with his parents just trying to keep up, but she scurried further and further ahead as I struggled with the uneven terrain. By the time I arrived home she had already dropped off the bamboo and was on her way.

My wife stood on the veranda, laughing. "Haha!" She teased, "I was feeling really bad until I saw you trailing behind that old woman carrying your bundle!" We marveled at the display of strength we had just seen. Here were two very strong, fit, young Americans shown up by a small child and a frail old grandmother.

I had always seen myself as a fit guy with great balance and athleticism, but the things that ordinary New Guineans of all ages could do simply astonished me. They crossed raging rivers of certain death on small wet logs without breaking stride. They would come to what I would consider a cliff, the end of the trail, and bound straight down it without hesitation or comment. They climbed trees I would consider unclimbable, and then walk out on a thin branch 30 feet above the ground as if it were the earth itself, and slash branches above them with a machete while not holding on to anything to secure themselves.

Yet there were some things we could do that they could not. A 20 foot steal pole, part of an old radio tower, had been abandoned in the village for some 30 years from an unfinished colonial project. It probably weighed about 150 pounds. My wife and I could both dead-lift it. Nobody else in the village, even the strongest looking men, could do so. So at least we had that on them. We could do the relatively useless task of dead-lifting a uniform and unnatural perfectly balanced steal bar off of the ground.

But we couldn't carry a bundle of heavy, unwieldy, slippery, and bumpy bamboo. We could not navigate their paths and make-shift "bridges" without sometimes reverting to crawling. We could not harvest our own tree fruit. We could not carry large bundles of firewood on our heads. In short, we may be "strong" and "fit" by American standards, but we simply could not do any of the basic tasks required for survival in New Guinea.

Watching such feats was a continuous reminder of another question that brought me there. Who are we as human beings? What are we capable of? On a deeper level, the question is not just about physical abilities, but also about our intellectual abilities as well as our moral capacities and inclinations. What is our nature? When my friends stopped and cried with me on the mountain, were they tapping into some deep aspect of our human nature, or was that an aspect of their culture? Are we inherently good or bad? Are empathy and compassion natural inclinations, or are we more prone to be jealous and judgmental?

To explore these questions, we need to expand our view beyond humans today and look to our evolutionary past. We have to look at our closest animal relatives, as well as the fossil record, to explore what we can learn about our ancestors.

Evolution has always been a touchy and controversial topic since the idea was first introduced by Charles Darwin in 1859. Darwin himself waited 23 years before publishing The Origin of Species because he knew it would contradict the account of creation in Genesis and set off a broad public debate. Around the same time, Charles Lyell published evidence that the earth was much older than the Biblical 6,000 year old timeline. Ever since, those of us who grow up in cultures with a Biblical tradition have had to wrestle with

difficult questions about how to square scientific knowledge with our religious faith.

While evolution is still strongly debated in public, it has long been firmly accepted in science. While critics like to point out that it is "just a theory," the phrase misunderstands the definition of scientific theory. A scientific theory is not an unproven hypothesis. The National Academy of Sciences defines a theory as "a well-substantiated explanation of some aspect of the natural world." Theories are not tentative guesses or even well-reasoned hypotheses. They take in a wide range of well-established facts and laws and make sense of them. "Theories," the Academy notes, "are the end points of science."

So evolution, like any scientific theory, is not something to be simply believed or disbelieved. It is to be understood and continuously reassessed based on the evidence. As Stephen Gould points out, evolution is not only a theory, it is also an established scientific fact due to the mountains of data and observations supporting it. Nothing is absolutely certain in science, so "scientific fact" does not mean "absolute certainty." Rather, a scientific fact is something that is "confirmed to such a degree that it would be perverse to withhold provisional assent."

Does this mean that God does not exist and that the Bible is wrong? This is a difficult question that each of us has to answer for ourselves. Most Americans who become college-educated end up accepting evolution (73%) and many of them see God as guiding the process or having planned the process out from the beginning of time (41%). Many professional evolutionary scientists hold this view as well, and it affords them the great joy of exploring the vastness of our world and its history. As my friend and colleague Keith Miller, who is

both an evangelical Christian and an evolutionary scientist, wrote in a now famous article on the theological implications of evolution, "Our continually developing scientific understanding of cosmic history should produce great awe at God's incalculable power and wisdom ... He instructed Job to contemplate the created universe. When we contemplate the universe today should we not, even more than Job, be overwhelmed by God's greatness?"

So one reason to study evolution is to simply stand in awe of the unfolding cosmos that has ultimately led to this moment right now. But there are other, more practical reasons as well. Studying evolution helps us understand who we are at the biological level. It helps explain how and why we get stressed, why we are prone to getting fat, and why we are prone to fall into bad habits. Most of us will die of a disease that is caused by a mismatch between the environments that we evolved to survive in, and those that we live in today. Understanding our evolutionary past can help you stay alive. It can also explain why we are prone to fall in love, feel jealous, or rage with hate or fear. Our biology is always a part of our lives. We tend to deny this fact, but the more we acknowledge it and learn about it, the better we will be able to handle the ups and downs of everyday life, stay healthy, and perhaps even do some things that we never thought possible.

As a small town kid from Nebraska, I also had to wrestle with these questions. It was a constant source of discussion and debate in the college dorm, often taking us deep into the early hours of the morning. While my own conclusions are irrelevant to your own, I simply want to note that I am grateful that my conclusions allowed me to open up to the wealth of research and information emerging out of evolutionary science today, as they have greatly enriched my life. They have helped

me understand who we are, our human potential, and most importantly, helped me regain much of the human potential I had lost through years of unhealthy habits. While this chapter cannot possibly tell the entirety of the human story or pass on all of the wisdom to be gathered from an understanding of human evolution, I hope that it can serve as an invitation for you to explore more.

20 MILLION YEARS AGO: THE MONKEY ALLIANCE

Step into the Tai Forest of Africa and you will hear a wild cacophony of calls, sounds, and melodies that would have been familiar to our ancient ancestors. Birds singing, monkeys hooting, bugs chirping, frogs croaking, and a multitude of other sounds fill the air. Listen closely enough, you can start to tune into the conversation.

Klaus Zuberbuhler has spent years studying the calls of the primates in this forest. In one study he started by playing leopard sounds and then listened for the response. Diana monkeys sitting in the forest canopy always responded with the same recognizable alarm call. He played the shrieks of an eagle and heard what he thought was the same call. But back in his lab he created a spectogram of the calls and discovered that they were actually different calls. The Diana Monkeys were distinguishing threats from above, like eagles, from threats from below, like leopards, with subtle variations in pitch. They were singing, and using their songs for survival.

One day, Klaus was walking through this forest when suddenly his abilities to tune into this conversation became a matter of life or death. Diana Monkeys were sounding an

alarm from high in the trees above him. A leopard was in the area. As he moves through the forest the calls moved closer and seem to follow his every move. The leopard is stalking him. He keeps his ears tuned into the Diana Monkeys overhead and quickens his pace, walking with anxious deliberation toward the safety of his camp.

Inside of Klaus's body, an ancient stress response kicks in. He is filled with a rush of adrenaline. Without making any conscious decisions, he cashes in on the fat he has stored up for just such an occasion. They are transformed into glycogen which now races through his bloodstream, powered by his racing heart. His awareness heightens. Meanwhile, all of his body's long-term projects cease. The body shuts down repair, growth, and reproduction. His body is fully primed and in the moment. No time for long-term goals now.

This basic biological stress response is one that he shares with the monkeys, as well as the leopard and all other creatures of the animal kingdom. Everyone in that life or death drama is completely in the moment as their fight or flight response kicks in.

The monkeys above swarm the leopard. They do not run away. Their calls can be heard across monkey species, allowing monkeys of different types to form a sort of monkey alliance, constantly calling out and staring down at the leopard from multiple angles to let the leopard know that they have him in their sights. Leopards like to attack by ambush. As the monkeys swarm overhead, the leopard knows his cover is blown, and he gives up the hunt. Klaus made it safely back to camp, saved by his distant brothers and sisters, exhilarated by the experience of hearing, and actually understanding, the language of these distant relatives, separated by over 20 million

years of evolution. For a moment, he remembers that he too is part of that great monkey alliance.

Though the Diana monkeys of today are not the Diana monkeys of 20 million years ago, fossil evidence shows that creatures that looked very much like Diana monkeys existed 20 million years ago and are likely the common ancestor of ourselves and those monkeys who were sounding the alarm from those trees.

How did we split and become separate species? In order for new species to occur, there has to be some form of reproductive isolation. This usually happens as populations become geographically isolated from one another and end up occupying different environments. Slowly, generation after generation, some genes are passed on while others are not, and given the different environments the two populations become so different that they can no longer reproduce with one another. They are now permanently isolated reproductively and they have become separate species.

The past 25 million years in East Africa have been an especially prime space for speciation among primates. Climate changes along with high levels of volcanic activity dramatically reshaped the earth creating numerous environmental niches within a fairly small geographic region. Populations that found themselves in lush jungle rainforests adapted very differently from those who found themselves in more sparsely vegetated woodlands or open savannahs. By 13 million years ago, our ancestors split from orangutans, and by 8 million years ago, from gorillas. We split from chimpanzees and bonobos by about six million years ago.

WHY WE SING

The ability to sing is shared widely among birds and mammals. And while our closest ancestors are quite good at communicating through singing, the most complex use of a "singing" language among mammals might not belong to them, but to prairie dogs. While they may not share as much DNA with us, they do share a similar challenge. Much like early humans who first came down from the trees, prairie dogs are easily spotted in the wide open grasslands by a vast range of predators. Singing is a survival strategy.

Prairie dogs have created different calls for coyotes, badgers, and hawks, all of which require different defense responses. In experimental situations, biologist Con Slobodchikoff has demonstrated that prairie dogs can sing different chirps to indicate the shape, color, speed, size, as well as the mode of travel of a potential incoming threat.

While not as sophisticated as the songs of prairie dogs, most birds and mammals have at least some rudimentary singing abilities that allow them to communicate. The simplest singing systems in the animal kingdom involve two sounds, a low pitched growl often used as a threat, and a higher pitched melody used to indicate friendliness, submission, or vulnerability. A dog growls deeply as a threat, and yelps or squeals meekly when threatened. A dog might also use a high-pitched wimper as he cuddles into a human, a clear request for a pet or cuddle. Weaver birds, crows, guinea pigs, rats, Tasmanian devils, elephants, and monkeys use low and high tones in similar fashion. "Simply stated," noted Eugene Morton of the National Zoo after a review of over 70 species, "birds and mammals use harsh, relatively low-frequency sounds when hostile and higher-frequency, more pure tonelike

sounds when frightened, appeasing, or approaching in a friendly manner." Linguist John Ohala notes that these pitch variations are part of a universal "frequency code" that extends across species, in which low, deep, full sounds indicate dominance and aggression while high thin sounds indicate harmlessness, submission, or a plea for connection. You tap into it every time you lower your voice to admonish your dog, and raise your voice to ask for a snuggle.

There is significant evidence that our ancestors were using a much more complex singing system to connect and collaborate. Thousands of miles from the cacophony of the Tai forest or the chirping of prairie dogs on the North American Plains, Ann Fernald was sitting in an obstetrics unit in Germany listening to some interesting songs as well, those coming from the mothers of newborn humans. The hospital attracted mothers from all over the world; many languages, and many cultures. But when they spoke to their babies it was as if they were all tapping into that same evolutionary heritage that Klaus was trying to uncover in the Tai Forest. They raised their pitch, exaggerated their emotional tone, slowed down, shortened their sentences, and often repeated themselves. They were using that ancient singing language, and though they were coming from many different cultures and speaking many different languages, Ann knew the tunes. It was there that she discovered four universal songs of baby-talk:

1. the approval song with its rising and then falling pitch (GOOD girl!),
2. the warning and prohibition song with its short, sharp staccato (No! Stop!),
3. the lingering and smooth, low frequency comfort song ("oh …. poor little baby …") and

4. the song she calls "The Attention Bid," a high, rising melody, often used for asking questions and calling attention to objects ("Where's the BALL?").

To explore just how universal these songs might be, Greg Bryant and Clark Barrett of UCLA recorded English-speaking mothers talking to their babies and went into the Amazon rainforest to see if the Shuar, a group of remote hunter-horticulturalists, also knew the tunes. They did.

The universality of the songs indicates that they are very old. Our first ancestors probably knew similar tunes. We hear similar tunes among our closest relatives, gorillas and chimpanzees. When lowland gorillas hear strange sounds or spot obscured observers, they sound a mild alert that Dian Fossey calls the "question bark." The bark, with a rising intonation that falls at the end is described by Fossey as sounding like "Who are you?" Jane Goodall describes "inquiring pant-hoots" that rise in pitch like human questions used by chimpanzees. After the pant-hoot a chimp will listen quietly for a response from another chimp, and in getting one, learns the whereabouts and identities of other chimps nearby.

Long before full human languages developed 100,000 years ago we were probably sending messages through simple songs like these. And the songs we sang say a great deal about who we are. We asked questions. We showed compassion for one another. We helped each other avoid dangers, and we offered each other encouragement. Taken together they represent four key capacities: teaching, learning, cooperation, and compassion. All would have been great assets as we walked off into the dangerous open grasslands.

6 MILLION YEARS AGO:
WE WALK

As you think about just how vulnerable Klaus was as he walked through a forest full of dangerous predators like that leopard, consider just how astounding it is that we ever evolved to come down from the trees at all. Yet we did. About six or seven million years ago we start to see the tell-tale signs of bipedalism (walking on two legs) emerging. Bones found from that time show a pelvis starting to tilt sideways, an s-shaped spine, and a stiffened foot with upward curving toes, all of which would help us walk without waddling but reduce our capacities to climb trees.

But why? Why would we come down from the safety of the trees where fruit was plentiful and predators were not? How could we even begin to escape or compete with the big cats who could run 43 to 60 mph and had powerful jaws and ferocious fangs and claws? We had no weapons – natural or man-made – and were not even as tall or large as we are today. We were just 4 feet tall and weighed about 110 pounds, about the size of a husky third grader. *How did we do it? Why did we do it?*

We probably had no choice. The earth was cooling and forests were shrinking, especially in East Africa where our ancestors lived. Dense rain forests were giving way to woodlands and open grasslands. Fruit dwindled along with the dwindling forests. What fruit was left was being eaten up by monkeys who had developed abilities to eat unripened fruit, picking over the trees before we could even get to them.

As fruit sources dwindled, one strategy for survival was to simply get better at obtaining fruit. The ancestors of chimpanzees did this, using their remarkable agility to swing

through trees in order to get at hard to reach fruit, and to occasionally pick off some unsuspecting prey. Another strategy was to adapt to a fruitless diet where there was less competition. The ancestors of gorillas did this, moving to a diet of leaves and growing to large sizes that slowed their metabolism, requiring fewer calories.

But while these strategies could work in dense forested environments it would not work in lightly forested woodlands and grasslands where our ancestors lived. Leaves and fruit were not as plentiful. Instead of focusing on just one food source, we developed abilities to move more efficiently on land so that we could cover more ground and thereby gather more food. We also retained some of our climbing abilities so that could exploit a wide range of foods in the trees, on the ground, and under the ground (roots and tubers).

In other words, we did not give up on tree-climbing and become bipedal overnight. One of the best preserved skeletons from 4 million years ago, nicknamed 'Ardi,'shows that our ancestors at this time retained grasping toes and other features that would still allow them to climb remarkably well by modern human standards, but they were also not as efficient at walking as we are.

Many people assume that we became bipedal so that we could use tools, but we would not start using tools for at least one million years after we first started walking. The original advantage of walking on two legs was efficiency. While chimps only walk about 1.5 miles a day, a human can walk about 6 miles a day using the same amount of energy. Our earliest ancestors were probably not as efficient at walking as we are today, but even a slight increase in efficiency would have allowed them to travel and gather foods over a wider range and

still maintain the calorie balance they needed to survive and reproduce.

Over time, the more efficient walkers were more likely to reproduce, and so generation after generation we became more and more adapted to walking, able to cover more and more territory.

While standing up made us more visible to predators, it also allowed us to spot them and take away the element of surprise, just as those Diana monkeys did for Klaus. This is where our ancient ability to sing would be so important.

Singing, collaborating, and walking on two legs would set off a cascade of changes that would make us who we are today. With our hands free we could carry food back to our young and elderly, broadening our abilities to share, and eventually develop more sophisticated tools and technologies. Each technology not only improved our abilities to acquire food, but would also change how we worked and lived together. Our brains grew as we were able to obtain more calories to fuel its growth, and it needed to grow in order to deal with the increasing demands of cooperation and navigating increasingly complex social relationships.

By 2.5 million years ago we were fully committed to life on the land. Our capacities to climb and live in the trees had dwindled along with the size of our arms, fingers, and toes. We could no longer grab a branch with our feet or swing effortlessly from tree to tree. But our legs were now long, straight, and efficient. We were no longer just walking. We were running, but before we could run efficiently we would have to develop yet another key adaptation.

2.5 MILLION YEARS AGO: WE GOT FAT AND SWEATY

Our growing brains required a constant source of energy which would have been difficult to maintain if this also required a constant source of food in sometimes unpredictable and sparse environments. Fortunately, we got fat. Fat is rich in energy, storing nine calories in each gram (vs. just 4 calories per gram of carbohydrate or protein). When food was scarce, we could call upon the fat reserves we stored on our bodies to sustain us. Those who could survive through the leanest of times would be those who would reproduce to create the next generation. And generation after generation, we got fat.

The average monkey is born with about 3 percent body fat, while we are born with fifteen percent. And a healthy human child will blossom to an energy-potent 25 percent body fat before settling back down into the teens in adulthood. A typical female hunter-gatherer has a body fat of about 15 percent, while a male weighs in at about 10 percent – thin by American standards, yet still much fatter than chimpanzees.

Getting fat was essential to our survival, and to this day we maintain a remarkable ability to pack it on when the feeding is good. Our tastes evolved to help us gorge on high calorie foods whenever they were available, so we have natural cravings for fatty or sweet foods, both of which are especially high in calories.

As we gained the capacity to store fat, we also lost our fur and covered our skin with sweat glands, allowing us to stay cool even in the heat of the African equatorial sun. While other animals have to rely on circulating air through their bodies as quickly as possible by panting. We can simply let the air move

around us as we sweat, making us the most efficient air-cooled bio-engine on the planet.

2 MILLION YEARS AGO:
WE RAN.

By 2 million years ago our ancestors started to look very different from chimpanzees. Our bodies became more adapted for life on the ground, not in the trees. Our legs grew longer and thinner near the ends, giving us a longer and lighter step. Our toes got shorter, our butts got bigger, and our arms grew shorter, allowing us to be more stable and efficient while running. Our heads became more separated from the shoulders, creating the need for the nuchal ligament, used to stabilize the head. Our joint surfaces expanded to reduce the shock of each footfall. And the plantar arch and achilles tendon gave us more elastic energy. Our legs became biological springs. The springy arch of our foot increases our efficiency by 17%. And the combination of running adaptations makes running only 30 to 50% less efficient than walking. By 2004, the research team of Daniel Lieberman, Dennis Bramble, and David Carrier had identified 26 adaptations in the human body that were necessary for running that are not required for walking. As Chris MacDougal famously summarized, we were "Born to Run."

Despite all of these remarkable adaptations for running, we are not very fast compared to other animals. The fastest land animals have four legs, allowing them to thrust themselves to speeds well over 40 mph and sometimes, as in the case of the Cheetah, to over 60 mph. The fastest humans can only run about 27 mph.

But despite being slow, we had several key advantages. Our ability to sweat would allow us to move around in the heat of the day while the most dangerous predators and scavengers rested in the shade. Though we did not yet have spear-tipped projectiles for hunting, we would have been able to gather plant foods and scavenge for meat across great distances in the heat of the day. Walking on two legs also freed our hands and allowed us to enter potentially dangerous situations to find or scavenge whatever we could, grab it, and then quickly carry it back to safer ground.

These abilities might also help explain a peculiar mystery in the archaeological record. By 1.9 million years ago there is evidence that we were successfully hunting wild game such as kudu and wildebeest. But stone spear heads do not appear until 300,000 years ago, and it is nearly impossible to kill a large animal with a wooden tipped spear unless you are very close to the animal, which is impossible if the animal is not in some kind of distress. So if we were successfully hunting large game 1.9 million years ago, long before the invention of adequate weapons – how did we do it?

In short, being fat, sweaty, and able to cooperate turned out to be a deadly weapon. Lieberman's research team found that our running abilities combined with our ability to burn fat reserves and cool ourselves with sweat allowed us to jog faster and farther than most quadrupeds can sustain, especially in the hot midday sun. All we had to do was flush an animal like a kudu or wildebeest out of the herd and scare it into a gallop. It would need to pant to cool down, but they cannot pant while running. If we could keep it on the run over a long period of time, it would collapse of heat exhaustion. We could literally run our prey to death. They called it "persistence hunting."

Lieberman and his team had the biological markers and the mathematical evidence to support their claim. But while there were several stories of persistence hunting in cultures around the world, there had not been a confirmed observation that such a feat was possible.

The evidence they needed would come from a college dropout driven by a very big question. In the early 80s, Louis Liebenberg was taking a philosophy of science class at the University of Cape Town when he started asking the big question of how humans ever came to contemplate big questions in the first place. He had a hunch that the first complicated thinking might have come from the challenge of tracking wild game, which would have forced early humans to use a great deal of imagination and reasoning to decode the path and whereabouts of an animal based on a few tracks in the earth. Like all great questions, the question took him further than he ever thought possible, and before long he was trekking out into the desert to find one of the last bands of the Kalahari Bushmen still living a more or less traditional way of life. After finally finding them, he settled in and lived with them for four years.

One day they invited him on a hunt. They walked for nearly twenty miles before finally coming upon a herd of kudu. They started running. The herd scattered, allowing them to separate one from the herd. Each time the kudu ran under a tree to rest they would flush it out into the sun while corralling it away from the herd, keeping it isolated. After a few hours of being chased the kudu started to falter and then fell to the ground. The Bushmen had their prey, and Louis had unequivocal evidence that a persistence hunt is not only possible, but still happening today.

This means that for the past two million years our ancestors were routinely walking and running over 20 miles to chase down wild animals. The traits that allowed them to do this are the same traits we have today. Yet few of us can run even a few miles at a time, let alone 20.

The Raramuri of the Copper Canyons of Mexico also engage in persistence hunting, running deer and wild turkeys to death. By frightening large turkeys into a series of take-offs they eventually tire and lack the strength to get away from the hunters.

The Raramuri give us an enticing glimpse into the full potential of our endurance running bodies. Reports of their astounding running abilities reached bestselling author and sports journalist Chris MacDougal, who eventually found his way to their homeland to see them in action and write the bestselling book, Born to Run. He reports that the Raramuri (also known as the Tarahumara) regularly run over 100 miles at a single go.

Most remarkably, Raramuri of all ages can run like this. In fact, it is often the elders – over 50 years old – who are the fastest. In 1992, a few Raramuri came to the US to race in the Leadville 100, an ultra marathon of 100 miles over the Colorado Rockies. They wanted to bring their best, so they brought Victoriano Churro, a 55 year old Raramuri grandfather.

Historian Francisco Almada reports that a Raramuri man once ran 435 miles without stopping, and reports of others running over 300 miles are not uncommon.

What allows the Raramuri to run so far, over such tough terrain, and for so long (well into old age), is that they run with that same gentle skitter step I had come to admire among my friends in New Guinea. Like our ancestors, they are running

barefoot or with very thin homemade sandals. This forces them to stay light on their feet, taking short quick strides and landing on the ball of their forefoot in order to absorb the impact, rather than striding out and striking their heel, the style preferred by most runners shod in thick-soled running shoes.

Noting the low injury rate among barefoot runners around the world, Dan Lieberman did a study of the Harvard track team, comparing athletes who were forefoot strikers (barefoot style) versus those who were heel strikers. The injury rate for heel strikers was 2.6x that of forefoot strikers.

But perhaps the most striking feature of the running style that Chris MacDougal and others found among the Raramuri, and that I witnessed among my friends in New Guinea, is the pure joy they take in running. It is not a penance for indulging in too much food. It is not "exercise" or "working out." It is fun. "Such a sense of joy!" legendary track coach Joe Vigil exclaimed as he watched the Raramuri laugh as they scrambled up a steep mountain-side 50 miles in to the Leadville 100.

When Ken Choubler, the race's founder saw the Raramuri running after over 50 miles on his grueling mountain course, he would tell MacDougal that they looked ... normal ... "freakishly ... normal." They didn't have their heads down, face grimacing with pain just trying to tough it out. They were enjoying themselves. "That old guy?" MacDougal writes, "Victoriano? Totally cool. Like he just woke up from a nap, scratched his belly, and decided to show the kids how the big boys play the game."

Victoriano, age 55, won the race that day, edging out a younger Raramuri runner for the win. The top non-Raramuri competitor was six miles back.

MODEERN HUMANS AND THE CREATIVE EXPLOSION

Taken all together, the evidence suggests that starting approximately two million years ago we were still relying on the gathering of fruits, nuts, and tubers over a wide area as our primary means of subsistence. We scavenged and hunted when opportunities arose, and we were starting to develop some basic stone tools to cut and process our food.

A positive feedback loop started to emerge. The better we got at obtaining food, the more calories we had to grow our brains. As our brains grew, we got better at obtaining food. By 500,000 years ago we had enough intelligence to invent a stone-tipped spear capable of penetrating thick animal hides at great distance and our upright running bodies were adapted to throw them with a force and accuracy unmatched among all other animals. A chimpanzee can be trained to throw, but they can only throw about 20 mph. A human can wind their upright body up like a rubberband and let the rotational force of their full body along with the rotation of their shoulder to generate speeds of up to 9,000 degrees of rotation per second. Even a mediocre human athlete can throw up to 70 mph with remarkable accuracy.

Most impressively, we could not only throw accurately enough to hit a rabbit. We could hit a *moving* rabbit. And our ability to hit a moving rabbit requires yet another key human skill: imagination.

Neil Roach, anthropologist at George Washington University, told MacDougal that "this ability to produce powerful throws is crucial to the intensification of hunting." And once we could obtain a steadier high-quality source of

meat, "this dietary change led to seismic shifts in our ancestors biology, allowing them to grow larger bodies, larger brains, and to have more children."

The positive feedback loop would continue as we domesticated fire approximately 400,000 years ago, allowing us to obtain more and more high-quality calories from our foods by cooking them. We could also stay warm in colder climates, expanding into new territories, and share stories and information as we sat around the fire well into the night, having artificially extended the day for the first time.

By 200,000 years ago the first modern humans, *homo sapiens*, had arrived. Genetically they were one of us. If you could transport a newborn from 200,000 years ago into the present they would learn our language, go to school, and fit right in. Every human on the planet today can trace their roots back to these African ancestors, 200,000 years ago. We had dark skin to protect us from harsh ultra-violet rays of the sun. Compared to the animals we evolved from, we were fat and sweaty. But we could run long distances, throw, make tools, use our imaginations, and perhaps most importantly, communicate and collaborate, better than any other creatures in the world.

Communication and collaboration allowed us to develop even more sophisticated technologies, including clothing, that would allow us to spread out of Africa and settle all over the world. Our trade networks expanded, allowing innovations to be shared over greater and greater distances. The archaeological record shows an explosion of creativity starting around 50,000 years ago, sometimes called the creative explosion. A technique for the mass manufacture of thin stone blades was discovered. Tools became more sophisticated and versatile. Nets and fishhooks allowed us to expand our diets

to more seafood, while new methods of food preparation such as grinding and boiling allowed us to use and process more and more of the calories available to us. We told stories, painted pictures, made jewelry, and developed a rich symbolic world that would tie us together into larger more complex groups.

In short, we invented *culture*. We asked questions, made connections, and tried new things. From that moment forward, the pace of our cultural innovation would far outstrip our bodies ability to adapt to the new environments we created.

THE (UN)MAKING OF THE MODERN BODY
RE-CLAIMING OUR HUMAN POTENTIAL

Our adaptations developed over millions of years in woodlands and open grasslands where food was often low in calories and sometimes hard to find, not calorie-dense, plentiful and sitting on supermarket shelves, a place where cats were large and a constant threat to your life, not domesticated house pets, a place where you had to walk or run to get your food, not drive your car or submit an order on Amazon. Most importantly, it was a place where a strong desire for calorie-rich foods and an ability to store them as fat were useful strategies for surviving and passing on your genes, a place where a stress reaction that sends adrenaline rushing through your body could save your life, and a place where you would not have to think about how to sneak in your exercise for the

day. As such, we now struggle against our most basic instincts and impulses to maintain our minds and bodies in good health.

MISMATCH DISEASES

The ailments that come about from the mismatch between how we have evolved and the environments we now inhabit are called mismatch diseases. Mismatch diseases result from one of three conditions: (1) too much of something, (2) too little of something, or (3) new things or behaviors we have not yet adapted to. For example, compared to the environments of our ancestors, we have (1) too much fat and sugar, (2) too little movement and exercise in nature and (3) we are not biologically adapted to the complexities of modern life such as complex social networks, economic pressures, media, social media, and many others.

As a result, we suffer from several mismatch diseases related to overeating, lack of exercise, and high stress. Obesity, type 2 diabetes, cavities, anxiety, depression, high blood pressure and other stress-related ailments that lead to strokes, heart attacks and other illnesses are just a few of the mismatch diseases that might result.

Remember Klaus's stress reaction as he fled from the leopard? The problem is that modern life can potentially induce a series of similar reactions but while Klaus's situation was brief (a few minutes) with simple decisions and actions (evade the leopard) and a clear ending point (safety back at camp), many of our modern stressors are long-lasting (What am I going to do with my life? 30 year mortgages), involve complex decisions, may not require any action (and therefore no outlet for all that extra energy and adrenaline), and have no

clear ending point. Many people today live with a constant feeling of stress, and the health implications are tremendous. Long-term stress wreaks havoc on our cardiovascular system, which can lead to adult-onset diabetes. Our amygdala, which controls our fear response, grows and becomes hyper-reactive, leading to anxiety disorders. Our dopamine, which controls emotion, is depleted, leading to depression. And our frontal cortex, the place where we make decisions, atrophies, leading to poor judgment. Ultimately, Robert Sapolsky notes, "Most of us will have the profound Westnernized luxury of dropping dead someday of a stress-related disease."

A large number of addictions might also be considered mismatch diseases. We evolved to crave calories, sex, love, friendship, security, comfort, and novelty. Technology provides what are known as "supernormal stimuli" in all of these areas. A supernormal stimulus takes key features from the natural objects we have evolved to crave and magnifies those aspects that are most stimulating, while offering very little or none of the actual reward we need.

In the 1950s, birds were tricked into preferring fake eggs with more vibrant colors over their own. In the human domain, a glazed donut is a cheap calorie bomb loaded with a perfect ratio of fat and sugar stimuli encased in a soft form that is as easy to digest as it is to hold in your hand. It gives us all of the pleasure of eating a rich meal with none of the nourishment. We evolved to crave fat and high-calorie foods, and to gorge on them when we could, but those abilities to pack on the fat did not evolve in the context of cheap and plentiful donuts, greasy cheeseburgers and sugary high-calorie drinks. Our tastes and ability to store fat are a mismatch for

today's environment of abundance, so we now face health risks from being too fat.

But we have "junk food" in other domains as well. Pornography offers sexual supernormal stimuli while providing none of the love, connection, and offspring that may result from real sex. Movies, shows, and video games offer us a constant onslaught of novelty, excitement, and drama without any need to get out of our chairs. These supernormal stimuli not only exaggerate those things that we have evolved to crave (sex, love, novelty, excitement), but do so without us having to put ourselves at any risk, socially or physically.

In short, there is a "junk food diet" available in virtually every domain of our needs and desires. When we feel stressed, lonely, hungry, or any of the other evolutionary triggers that would normally spring us into action to go out into the world to find food or a mate, we can instead gorge on pizza, donuts, porn, and movies. While none of these things will make us "sick" or addicted in moderation, they are dangerous in excess, and it is worth considering how we might experience life differently without them.

Junk food, porn and Netflix have become so common in our culture as to become the norm. 74% of American men and 64% of American women are overweight. Americans watch over five hours of TV every day. And while few people admit to watching porn, a recent study by the Max Planck Institute estimated that 50% of all internet traffic is sex-related.

Most people would probably not even consider the idea that we can be "addicted" to something as mundane and normalized as junk food, porn, or Netflix. We tend to reserve the word "addiction" for hard drugs and alcohol. But recent studies in the science of addiction are demonstrating that there are deep and important changes inside the brain of those who

have behavioral addictions that are similar to those with drug addictions.

At a biological level, our cravings are driven by dopamine, a neurotransmitter in the reward circuitry of the brain that plays a key role in elevating our motivation to take action. Dopamine levels rise in anticipation of a reward or when under high stress, encouraging us to act. Supernormal stimuli make dopamine levels spike, which is why they are so difficult to resist. However, when we indulge in these supernormal stimuli too often we become desensitized to dopamine. Everyday pleasures seem bland and unsatisfying. We lack motivation, and when normal stimuli are no longer enough we are forced to seek out supernormal stimuli to give us that rush of dopamine, and key brain changes emerge that are similar to those we see in substance addicts. There is reduced activity in the areas of the brain that control willpower and reduced abilities to handle everyday stresses, which often trigger more relapses into the addictive behavior. This can lead to a vicious cycle in which we feel very little pleasure and lack the willpower to avoid our "junk food diet" when we face even a minor stress. We take the edge off with a little indulgence, which only makes us want more while reducing our willpower and stress-resistance. Most importantly, we become more and more numb to the pleasures of everyday life.

DISEASES OF CAPTIVITY

The dorsal fin of a killer whale in the wild stands strong and straight, an awe-inspiring symbol of their power as it crests over the water. But if you have ever seen a killer whale at

SeaWorld, you will notice that their fins curl lazily over to one side, a condition sometimes referred to as "floppy fin syndrome." Scientists hypothesize that lack of movement, constant turning in tight spaces, dietary changes, and other aspects of captivity cause the condition. Though it is not life-threatening, it is a powerful symbol of how artificial environments can shape a biological body.

Our bodies are no different. We have crafted an artificial environment with soft chairs, beds, and pillows where the ground is always firm and perfectly flat, complete with transport devices that allow us to sit in comfort as we transport ourselves from one artificial comfort pod to the next, and it is always about 72 degrees. We prepare food on counters, not squatting on the ground. We sit on toilets rather than squatting in the woods. We walk on sidewalks while wearing padded shoes with raised heals.

As a result, our bodies are like the floppy fins of SeaWorld. Katy Bowman, an expert in biomechanics and author of several bestselling books on natural human movement, refers to the floppy fin as a "disease of captivity," and claims that so are our "bum knees, collapsed arches, eroded hips, tight hamstrings, leaky pelvic floors, collapsed ankles" and many more modern ailments. These diseases of captivity are a special subclass of mismatch diseases that affect the alignment and function of our bodies.

A quick test of just how much of your own basic ability to move like our ancestors has been lost, try to sit in a deep squat with your feet flat on the ground. This is a natural rest position for humans. You will see children playing in this position for long periods without experiencing any discomfort. And people all over the world who live in environments with few chairs can rest in this position well into old age. Most Americans

have lost the ability to get into this position by age 20 and only a very small percentage find the position comfortable and restful. In a survey of resting positions worldwide, anthropologist Gordon Hewes found that deep squatting "has a very wide distribution except for European and European-derived cultures."

While this may seem like an unimportant skill, it is a quick demonstration of our lost potential and has serious implications for our health, abilities, and longevity. An inability to squat may indicate weak glutes or a weak core which are essential to balance and basic human movements like running, walking, and jumping. Your hips might lack the flexibility and mobility they once had. Hip mobility is essential for stability and balance, so tight hips put you at risk for serious injury. And the movements we make to adjust for tight hips often lead to back pain and other ailments. As you age, these conditions become a matter of life and death. As Katy Bowman points out, "the more you need to use your hands and knees to get up from the floor, the greater your risk of dying from all causes." Perhaps it is a telling sign of just how damaging our comforts might be that Katy Bowman chooses to live in a house with almost no furniture.

Another test: try walking or running barefoot. But go easy on this one. Don't try to go out and run 100 miles like a Raramuri. Or even one mile if it is your first try in a while. The muscles and tendons that hold up your arch and give you the spring you need to run barefoot are probably weak with underuse. You might seriously injure yourself because of your dependence on shoes. You probably won't get very far anyway because of the pain on your skin. Without the natural callouses of barefoot humans, every little pebble and stick will deliver piercing pain, and you may find many surfaces either too hot

or too cold. Your feet are like prisoners trapped in the dark sensory-deprived caves of comfortable shoes coming out into the light for the first time. It will take a while to adjust to the light.

It's worth it though. Over time your feet will adapt and regain much of their lost potential. Your skin contacting the earth will deliver key signals to your brain to make you more sure-footed and balanced. Your posture and flexibility will improve as you stand flat-footed without an artificially raised heel or supported arch. And over 100 muscles and 33 joints that have weakened in their captive state will be set free to strengthen and unleash their full potential, helping you become stronger, faster, injury-resistant and more agile. Harvard anthropologist Dan Lieberman notes that in the Kenyan villages where he works most people grow up barefoot and he has yet to encounter a fallen arch or many of the other foot ailments that plague many Americans.

"We aren't really sick," sayd Katy Bowman, "we are just starved." We are missing key nutrients, "movement nutrients." Our bodies are made up of cells. When cells get activated they get fed with oxygen, which flushes out cellular waste and revitalizes them. We feed our cells by using them, by putting them under load. Those muscles and tissues we put under more load grow and stay healthy, while those we do not use wither and die. When it comes to body tissues, you either use it or lose it. Your body changes shape as some parts grow stronger and others wither. The alignment of your body parts shifts as some muscles pull more strongly on your joints than others. Ultimately, the shape and alignment of your body is the result of how you move.

Instead of "exercise," Katy Bowman suggests that we need a more steady and balanced diet of movement. Someone

who exercises regularly will work out for about 300 minutes per week. But our ancestors were moving 3,000 minutes per week. And their movements fed all of their body tissues, not just a few select spots. Bowman suggests moving away from modern comforts that restrict movement and reduce muscle load such as shoes, chairs, desks and sidewalks. She recommends incorporating as much natural movement into your everyday life as possible. Replace that short drive with a nice walk or run. Even better, run it barefoot. Even better, get off the sidewalk and let your feet and legs receive the rich movement nutrients of balancing along uneven surfaces with small surprises at every step.

Recent headlines point out that "sitting is the new smoking," with consequences for your health that are worse than smoking. The problem is that many people are replacing sitting with standing by using standing desks, but this is only slightly better than sitting. "Standing is the new sitting," Bowman says. We need to move.

A steady diet of rich and varied movements will strengthen your full body and bring your body into alignment. When your body is in alignment your muscles can work together with your joints and the elastic power of your tendons to get the most out of every movement. Tom Myers, an expert in human anatomy, suggests that it might be worth considering the entire human body not as a collection of 600 muscles, but just one, held together by a stretchy rubbery tissue connected throughout your body known as the fascia. The fascia is "a crisscross of fibers and cables, an endless circulatory system of strength," he told Chris MacDougal. "Your body is rigged like a compound archery bow ... left foot to the right hip, right hip

to the left shoulder, and it's tougher than any muscle." Such power is the result of millions of years of evolution. Our bodies are exquisitely crafted for complex, precise, and powerful movements such as running long distances, throwing with great precision, and fine tool making. Yet few humans ever utilize even a fraction of this potential, and the potential withers before it can be materialized.

RECLAIMING OUR HUMAN POTENTIAL

French Naval Officer Georges Hebert traveled the world and noticed that he found the fittest and most capable people in the most remote French colonies. Of the indigenous people of Africa and the mountain tribes of Vietnam, he famously noted that "Their bodies were splendid, flexible, nimble, skillful, enduring, resistant, and yet they had no other tutor in Gymanstics but their lives in Nature." He found strong fit women in such places that assured him that gendered differences in strength were largely cultural.

In 1902 he was stationed at Martinique when a violent volcano eruption turned the normally idyllic island retreat into a living hell. A black cloud moved out from the volcano at 420 mph, superheated steam of over 1,000 degrees shot into the nearby city of Saint-Pierre, killing 30,000, the entire population of the city, in a matter of minutes. There were only 2 survivors in the main city. Thousands continued to fight for their lives where the initial blast had spared them. It was a living hell of hot steam, scorched earth, and fire rain with pit vipers slithering violently about as they were chased off the mountain by the coming heat.

Hebert's job was to go into that hell and rescue as many people as possible. He coordinated the rescue of over 700 people. Afterwards he would reflect on what allowed some people to survive while others perished. Those who survived had a remarkable capacity to move spontaneously and creatively to avoid danger, while those who perished simply froze in fear and hopelessness.

Driven by a desire to train people for future calamities, he dedicated himself to understanding human movement. He watched children play and identified "10 natural utilities" (walking, running, crawling, climbing, balancing, jumping, swimming, throwing, lifting, and fighting), and he created outdoor training facilities where people could practice these basic skills. They looked like playgrounds for adults. He had one firm rule. No competing. He felt that competition would encourage people away from true fitness. Once people start competing they start focusing on specializing some movements over others, and end up out of balance and unable to perform with the spontaneity and creativity of our full human potential.

He called his method, "methode naturelle," the natural method, and it was based on one simple mantra, "be fit to be useful." Hebert saw no use in "appearing" physically fit with large biceps and large chest muscles. He simply wanted his navy recruits and anyone else who used the method to be able to perform when it mattered. Though he was averse to competition, he wanted to prove the worth of his methods so he put a bunch of ordinary navy recruits through the program and soon had them performing as well as world class decathletes.

He also released a short film demonstrating his own talents. In the film he leaps out of his dining room chair runs

outside and scales a 30 foot tree in seconds, leaping down from branch to branch and then proceeds to climb up the side of buildings with equal speed, first by himself and then with a child on his back, He then races to catch a moving train and leaps off of the moving train from a towering bridge into the water below.

Unfortunately, all of his recruits died, along with his method, in the grim and deadly days of World War One. By the end of the second world war, the methods were all but forgotten.

As Europe and America rebuilt into increasingly post-industrial economies with more and more jobs that required sitting for long hours, people sought the most efficient ways possible to exercise, trying to squeeze their daily dose of movement into smaller time frames and smaller spaces. Specialized weight machines, treadmills, and stationary bikes transformed gyms into big business where steroid-injected hardbodied men and impossibly skinny women were the icons of good health.

The machines are not designed to make us useful. They are designed to shape our bodies toward cultural ideals which are displays of superficial fitness rather than true health and wellbeing. Women are encouraged to lose weight, so they tend to focus on fat burning aerobic exercises rather than strength and agility. Men are encouraged to build broad shoulders and large chests so they focus on lifting heavy weights with their upper-bodies, often losing mobility in their shoulders and making them more prone to injury and less able to do basic human movements.

Many of our gym exercises pull our bodies more and more out of alignment, like the floppy fins of SeaWorld. Overwork your chest and your shoulders shift forward. Artificially isolate

your quads and you create imbalances in your leg that can lead to knee problems. A healthy, functional body is a body that is aligned through a healthy mix of diverse movements.

The worst effect of this focus on appearances is that the body itself becomes alienated from our being. It becomes an object to be manipulated and shaped to fit this ideal, rather than an integral part of our being. We focus on how we look rather than the simple joy of moving.

Recently, Hebert's methods are being rediscovered and reinvented in a number of different movements. Freerunning parkour groups are spreading all over the world and look to Hebert as one of their founding fathers, taking his mantra of "be fit to be useful" as a core gospel. Erwan Le Corre, founder of movant, is perhaps the most dedicated student of the method. He tried to track down any remaining ancestors of Hebert's method and then set about immersing himself in studying those who had inspired Hebert.

Ido Portal, who studies movement practices all over the world – from Afro-Brazilian Copoeira to the many martial arts of Asia – incorporates a vast range of movements into his everyday life to explore the boundaries of human movement potential. Portal sees this as a deeply human pursuit, tied to our evolution. "Movement complexity is by far the reason why we became human," he says, "The reason for our brain development is related to movement complexity."

Today there is a new emergence of natural training methods around the world often going under the name "functional fitness." Cross Fit, the world's most successful and fastest growing fitness movement, encourages their trainers to eliminate mirrors and focus on helping people be more functional rather than just looking good. Others, like the BarStarrz and other "body weight warriors" are finding ways

to use nothing but their own bodyweight and the objects in their environment for their training.

By 2015, America's fastest growing sport was obstacle racing. American Ninja Warrior became one of America's most popular TV shows and hundreds of thousands tested themselves in Tough Mudders, Warrior Dashes, and Spartan Races, intense obstacle races that require a diverse array of human movements and endurance. Though there is a competition element to many of these events, most people are simply there to see if they can complete the course, and cooperation is often essential. Many of the obstacles cannot be overcome without the aid of others. And once someone receives aid, they usually pay it forward. And as they do, they seek to find that same joy in moving through the world that Hebert witnessed around in remote African villages, that Coach Vigil saw as the Raramari ran, and that I saw among my friends in New Guinea.

THE POWER TO CHANGE OUR HABITS

By my mid-30s I was well on my way to falling victim to any one of the many mismatch diseases that plague our time, and I had already developed several diseases of captivity. I could not sit in a squat. I could not even run. At age 29 I had torn my meniscus and developed a mysterious hip pain that no doctor could explain. Every time I tried to go for a run I would wake up the next day with a swollen knee and an immovable leg. So I gave it up. I became mostly sedentary, dedicating myself to my work. By age 35 my body had adapted to life in a chair. My weight was creeping upward. I could not touch my toes. A couple flights of stairs started to feel like a chore.

And I started developing a number of other health issues such as high cholesterol and high blood pressure. Our bodies not only evolved to run, throw, and squat. We had to conserve energy every chance we could, so we evolved to rest and seek comfort. I found comfort in abundance and gorged on it.

Fortunately, we not only developed adaptations to seek comfort, store fat, and feel stress. We also developed the power to intentionally reflect on our activities and change them. The very core of our humanity, the ability to ask questions, make connections, and try new things offers a way out.

These abilities are reflected in the evolution of the brain. The oldest part of the brain lies at the core of the brain at the stem, the basal ganglia. Named the "reptilian complex" by neuroscientist Paul MacLean, it evolved hundreds of millions of years ago and guides our basic autonomic body processes and is responsible for instinctual cravings and behaviors. On top of this is what MacLean calls the "paleomammalian complex," sometimes simplified as the "mammal" brain. It evolved along with the first mammals and is responsible for emotions, long-term memory, and more complex behaviors. Surrounding all of this is the newest part of the brain, the neocortex. It is responsible for higher order cognition, complex reflexive behaviors, language, and spatial reasoning. In humans, the neocortex has grown to become 76% of the brain.

As our neocortex expanded we became less and less controlled by nature, and more by culture, less by impulse and more by reason, less by instinct and more by habit.

Habit is the compromise between being completely controlled by our instinct and being completely free to make intentional decisions about whatever we want to do. It is the

trade-off we have made between instinct and reason in order to maintain speed and efficiency. Though we have become more and more adept at making complex decisions, it would be too slow and inefficient to have to make decisions about every single thing we ever did on a day to day basis. To improve speed and efficiency, our brains developed the ability to do our most repetitive routines without making any decisions at all. We could do them by habit.

Habit formation works by passing control over the most routine behaviors to the more primitive basal ganglia. As we do a routine over and over again our brain can determine what prompts the routine to begin ("the cue") and what prompts it to end ("the reward") and creates a "chunk" of automatic behavior. Brushing your teeth is a "chunk." You get the cue (time for bed) and without wrestling with any complex decisions simply go through the motions of putting the toothpaste on the brush, brushing your teeth, and rinsing the brush. "Chunking" allows complex activities to be controlled by the super-efficient "lizard brain" of the basil ganglia.

Habits were essential to our evolutionary success, but as we know, not all habits are good. Because habits are controlled by the same region of the brain as our instincts and impulses, some habits can feel like unchangeable urges that are out of our control, but we can change them.

In "The Power of Habit" Charles Duhigg tells the story of a woman named Lisa, an overweight smoker who struggled to hold a job and pay off her debts. When her husband left her for another woman, she hit rock bottom. Alone, depressed and without any feeling of self-worth, she decided she needed some kind of goal to straighten out her life. She set the goal of trekking across the deserts of Egypt. She had no idea if such a trip were even possible, but she did know that the only way

to make such an arduous journey would be to quit smoking. She gave herself one year to prepare.

The only significant intentional decision she made was to quit smoking, and she did so by going for a jog each time she felt the urge to light up. As Duhigg points out though, this one simple change changed everything. It "changed how she ate, worked, slept, saved money, scheduled her workays, planned for the future, and so on." She made that trip to Egypt. And within four years she was a happily engaged home-owner with a steady job as a graphic designer and a marathon runner.

The key to changing our habits is understanding how they work. A habit is made up of three parts which together make up what Duhigg calls "the habit loop." First, there is a cue – a trigger that tells your brain to follow a chunk of automatic routine behavior. The second piece is the routine itself. The final piece is the reward. If the reward is strong, the habit is reinforced and becomes more and more engrained and automatic.

What allowed Lisa to change is that she did not attempt to change the cue (the urge to light up). Cues come from outside of our control. They are in our environment or deeply embedded in our brain. After years of smoking she could not remove the urge, or sit idle and simply resist it. Her brain was telling her that she had to act, so she did. But she changed *how* she acted. She replaced the "chunk" or routine of smoking with running. Importantly, running offered her brain a sufficient reward – a runner's high, a feeling of good health, and a sense of accomplishment – so the new routine received additional reinforcement each time she did it. Eventually, it became a habit and she no longer needed to make a conscious decision to go running. It became automatic.

To change a habit, you have to study the cues that trigger the habit and understand the true reward that you seek. For example, if you have a habit of eating ice cream every night with your friends, it might not just be the satiating taste of ice cream that you crave. The true reward might be that it is a break from the stress of studying, or time out with friends. Carefully note the time and circumstances of your next ice cream craving. Are you stressed or overwhelmed by your work? Are you feeling lonely? Are you hungry? Do an experiment to see if just a walk down the hall and a chat with friends fulfills your needs, or if you are just hungry, grab a healthy snack and see if that gets you past the urge. Whatever creates a sufficient reward can become your new habit.

Sometimes you have to do more and actually change the environment around you. Make it easy for yourself to engage in good habits and more difficult to engage in bad habits.

For example, as I adapted to my inactive life of chairs and cars that was leading to the demise of my health, my bike ended up stored away on a hard-to-reach hook in the garage overhanging my car. In this environment, the bike was simply too far out of reach to seem like a reasonable possibility. Removing the bike would require backing the car out, getting out a ladder, and then trying to keep my weak and stiff body balanced on the ladder while lifting the bike off of the hook and down onto the ground. It would have never happened had my neighbor not given me a new bike seat for my 2 year old son which I felt obligated to try out to show that I appreciated the gift.

After trying out the bike seat I was too lazy to put the bike back on the hook and just stuffed the bike back into the garage behind the car. Suddenly there was a shift in my environment. When I walked out to my car to drive to work the next

morning, the bike was behind the car. As I was moving the bike out of the way I remembered the fun I had on it with my son the day before, and the next thing I knew I was riding the bike to work.

I parked the bike behind the car again that day and every day. Every morning for several weeks I would struggle with the decision of whether or not to bike or take the car. Taking the car involved moving the bike out of the way, driving the car out of the garage, and then re-parking the bike in the garage before leaving for work. It was complicated, so the bike kept winning. Within a few weeks I wasn't even asking myself whether I should take the bike or the car. It was a habit. And it stuck. No amount of snow or cold weather could break it. The next year I did not even bother buying a parking pass. Two years later I sold the car.

I started looking at my other habits. At work I often found myself checking Facebook and cruising the Internet. I found that the cue was stress. Each time I felt stressed and overwhelmed I sought relief on the Internet. I decided to replace the routine of Internet surfing with push-ups. So each time I started feeling stressed, I did push-ups. It cleared my head, gave me a quick rush of endorphins, and I could get back to work.

I started making a habit of breaking habits and trying new things. My body started to transform. Before long I looked and felt as good as I had when I was twenty years old. But soon I surpassed even that and started feeling stronger, lighter, and more agile than I ever thought possible. I started thinking back to my friends in New Guinea and the remarkable things they could do. *Could I do those things?* I wondered.

I learned to do handstands, then some basic gymnastics, and then turned to people like Erwan Le Corre and Ido Portal

who were exploring the limits and potential of human movement.

As I was writing this chapter, I started another new habit: running. I made a simple rule for myself*: If I'm taking the kids, take the bike. If not, run.* I strapped on a backpack and started running everywhere. I ran slow, easy, and smooth, using the light barefoot step of our ancestors that I had seen in New Guinea and that MacDougal saw among the Raramuri. My body immediately began to adapt. My muscles ached for a few days but quickly grew stronger to adjust to the new loads. Within just a few weeks it was a habit. I didn't even bother to go to the garage anymore to grab the bike. I just stepped out into the cold morning air and let it rip.

I was most concerned about how the experiment would affect my bad hip and knee. As I expected, they ached through the first two weeks and I was sure that I would be giving up on running for good after 28 days. But by week three the pain seemed to be subsiding.

By Day 28 I felt so good I couldn't stop. I kept running. I had come to enjoy the freedom of moving through the world without a car or bike to worry about. Everything I needed was always right with me. I felt free, fast, light, and agile. And I enjoyed the steady stream of endorphins that came with the ongoing "runner's high" I received in little bits throughout a day of running here and there.

One day while listening to a good book on my headphones I ran for 90 minutes, only stopping because I had to run to a meeting. I was sure that after a long run like that I would soon be feeling the familiar hip and knee pain that would leave me immobile for a day or so. But I woke up the next day with no pain. I started running longer and longer distances, blissfully absorbing audiobooks as I ran.

Using the light, elastic gate of our ancestors I skittered along trails just as my friends in New Guinea do it. Even after a 20 mile day I did not feel tired or winded. Instead I felt a blissful calmness. I started wondering where my limit might be.

So one ordinary Wednesday I set off running into a brisk 36 degree morning. My feet skittered across the earth with ease and I felt as if I were just being carried gently along by the continuous whirl of my feet doing what they were meant to do. My breath was steady and easy. I lost myself in the deep thought of a good book. Three hours later I noticed that my friend's class was getting out so I stopped in to visit with him. I had already run 18 miles and I wanted to know, *could I run a marathon?*

After a brief chat with my friend I hit the trail again. The next 8 miles were as blissful as the first 18. It was a strange experience. I have been enculturated to believe that running 26.2 miles is almost superhuman and most certainly extreme and dangerous. I have been led to believe that you have to be crazy to do it, that you only do it when you really have "something to prove." I would have never thought that it could be fun, enjoyable, or relaxing.

Relaxing? Strange as it may seem, that is what I felt above all other feelings as I finished. I felt deeply relaxed. My friends were amazed and said they couldn't believe that I was able to train for a marathon. I felt confused by the word "train." At no point did I ever feel like I was "training" for anything. I realized that instead of "training" I had simply slowly been changing my habits over the past six years. I went from a lifestyle that involved a lot of sitting in cars, at desks, and on sofas to a lifestyle of constant movement. By the time I ran

the marathon I was habitually moving a minimum of 8 to 10 miles per day.

The best way I can describe it is that I just got into the habit of moving and one day I just happened to run 26 miles.

Challenge 3
The 28 Day Challenge
Break a Habit / Try Something New

Your challenge is to try something new or break a habit.

Step 1: Choose something you would like to do (or stop doing) over the next 28 days. Take a picture of yourself doing this thing and post it to ANTH101.com.

Ideas: Slow Media Diet, Slow Carb Diet, Running, a new instrument, movement, exercise, gratitude, writing, or stop doing something (smoking, sugar, alcohol, video games, Netflix, porn)

Step 2: Post regular updates of your progress by editing your post on ANTH101. Post videos of your progress if possible. It is always fun to really see how much you have learned.

Step 3: At the end of 28 days, reflect on the following:

- How successful were you?
- Under what conditions were you most successful?
- What were your barriers to success and how can you get past them?
- What did you learn about how you learn?

More details and inspiration at anth101.com/challenge3