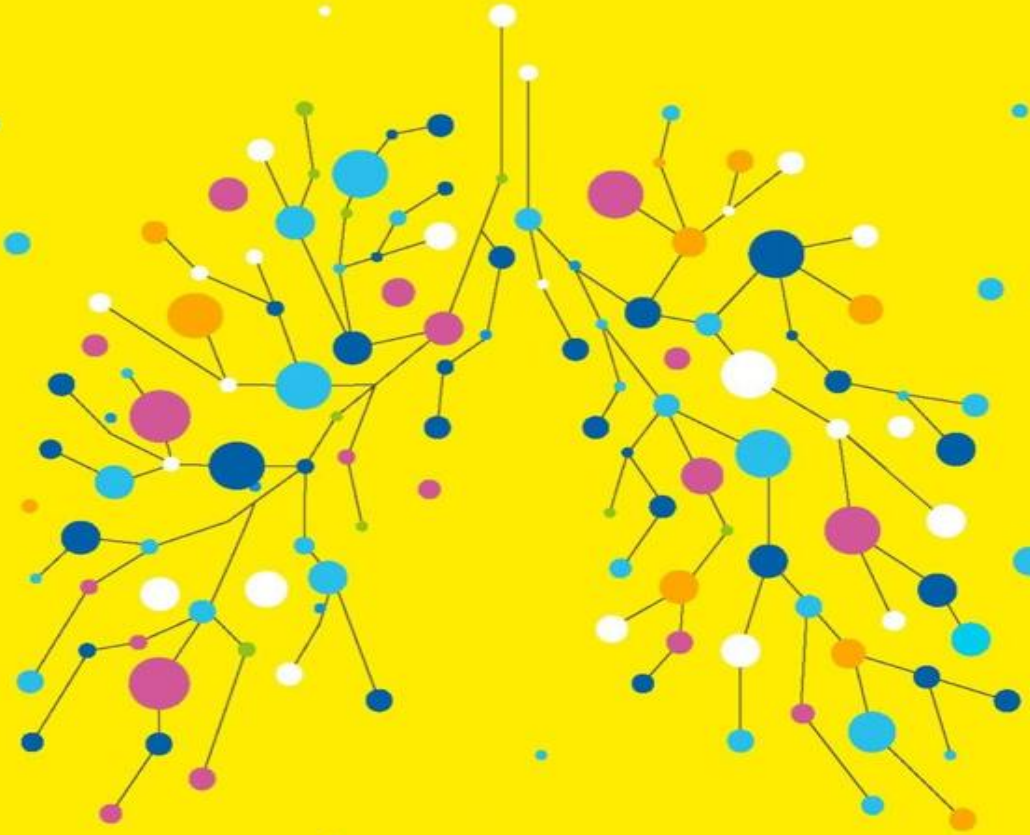
BREATH



THE NEW SCIENCE OF A LOST ART

JAMES NESTOR

Also by James Nestor

Deep: Freediving, Renegade Science, and What the Ocean Tells Us about Ourselves

BREATH

The New Science of a Lost Art

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In transporting the breath, the inhalation must be full. When it is full, it has big capacity. When it has big capacity, it can be extended. When it is extended, it can penetrate downward. When it penetrates downward, it will become calmly settled. When it is calmly settled, it will be strong and firm. When it is strong and firm, it will germinate. When it germinates, it will grow. When it grows, it will retreat upward. When it retreats upward, it will reach the top of the head. The secret power of Providence moves above. The secret power of the Earth moves below.

He who follows this will live. He who acts against this will die.

—500 BCE ZHOU DYNASTY STONE INSCRIPTION

Contents

The place looked like something out of Amityville: all paint-chipped walls, dusty windows, and menacing shadows cast by moonlight. I walked through a gate, up a flight of creaking steps, and knocked on the door.

When it swung open, a woman in her 30s with woolly eyebrows and oversize white teeth welcomed me inside. She asked me to take off my shoes, then led me to a cavernous living room, its ceiling painted sky blue with wispy clouds. I took a seat beside a window that rattled in the breeze and watched through jaundiced streetlight as others walked in. A guy with prisoner eyes. A stern-faced man with Jerry Lewis bangs. A blond woman with an off-center bindi on her forehead. Through the rustle of shuffling feet and whispered hellos, a truck rumbled down the street blasting "Paper Planes," the inescapable anthem of the day. I removed my belt, loosened the top button on my jeans, and settled in.

I'd come here on the recommendation of my doctor, who'd told me, "A breathing class could help." It could help strengthen my failing lungs, calm my frazzled mind, maybe give me perspective.

For the past few months, I'd been going through a rough patch. My job was stressing me out and my 130-year-old house was falling apart. I'd just recovered from pneumonia, which I'd also had the year before and the year before that. I was spending most of my time at home wheezing, working, and eating three meals a day out of the same bowl while hunched over week-old newspapers on the couch. I was in a rut—physically, mentally, and otherwise. After a few months of living this way, I took my doctor's advice and signed up for an introductory course in breathing to learn a technique called Sudarshan Kriya.

At 7:00 p.m., the bushy-browed woman locked the front door, sat in the middle of the group, inserted a cassette tape into a beat-up boom box, and pressed play. She told us to close our eyes. Through hissing static, the voice of a man with an Indian accent flowed from the speakers. It was squeaky, lilting, and too melodious to sound natural, as if it had been taken from a cartoon. The voice instructed us to inhale slowly through our noses, then to exhale slowly. To focus on our breath.

We repeated this process for a few minutes. I reached over to a pile of blankets and wrapped one around my legs to keep my stocking feet warm beneath the drafty window. I kept breathing but nothing happened. No calmness swept over me; no tension released from my tight muscles.

Nothing.

Ten, maybe 20 minutes passed. I started getting annoyed and a bit resentful that I'd chosen to spend my evening inhaling dusty air on the floor of an old Victorian. I opened my eyes and looked around. Everyone had the same somber, bored look. Prisoner Eyes appeared to be sleeping. Jerry Lewis looked like he was relieving himself. Bindi sat frozen with a Cheshire Cat smile on her face. I thought about getting up and leaving, but I didn't want to be rude. The session was free; the instructor wasn't paid to be here. I needed to respect her charity. So I closed my eyes again, wrapped the blanket a little tighter, and kept breathing.

Then something happened. I wasn't conscious of any transformation taking place. I never felt myself relax or the swarm of nagging thoughts leave my head. But it was as if I'd been taken from one place and deposited somewhere else. It happened in an instant.

The tape came to an end and I opened my eyes. There was something wet on my head. I lifted my hand to wipe it off and noticed my hair was sopping. I ran my hand down my face, felt the sting of sweat in my eyes, and tasted salt. I looked down at my torso and noticed sweat blotches on my sweater and jeans. The temperature in the room was about 68 degrees—much cooler beneath the drafty window. Everyone had been covered in jackets and hoodies to keep warm. But I had somehow sweated through my clothes as if I'd just run a marathon.

The instructor approached and asked if I was OK, if I'd been sick or had a fever. I told her I felt perfectly fine. Then she said something about the body's heat, and how each inhaled breath provides us with new energy and each exhale releases old, stale energy. I tried to take it in but was having trouble focusing. I was preoccupied with how I was going to ride my bike three miles home from the Haight-Ashbury in sweat-soaked clothes.

The next day I felt even better. As advertised, there was a feeling of calm and quiet that I hadn't experienced in a long time. I slept well. The little things in life didn't bother me as much. The tension was gone from my shoulders and neck. This lasted a few days before the feeling faded out.

What exactly had happened? How did sitting cross-legged in a funky house and breathing for an hour trigger such a profound reaction?

I returned to the breathing class the next week: same experience, fewer waterworks. I didn't mention any of it to family members or friends. But I

worked to understand what had happened, and I spent the next several years trying to figure it out. —

Over that span of time, I fixed up my house, got out of my funk, and got a lead that might answer some of my questions about breathing. I went to Greece to write a story on freediving, the ancient practice of diving hundreds of feet below the water's surface on a single breath of air. Between dives, I interviewed dozens of experts, hoping to gain some perspective on what they did and why. I wanted to know how these unassuming-looking people—software engineers, advertising executives, biologists, and physicians—had trained their bodies to go without air for 12 minutes at a time, diving to depths far beyond what scientists thought possible.

When most people go underwater in a pool they bail out at ten feet after just a few seconds, ears screaming. The freedivers told me they'd previously been "most people." Their transformation was a matter of training; they'd coaxed their lungs to work harder, to tap the pulmonary capabilities that the rest of us ignore. They insisted they weren't special. Anyone in reasonable health willing to put in the hours could dive to 100, 200, even 300 feet. It didn't matter how old you were, how much you weighed, or what your genetic makeup was. To freedive, they said, all anyone had to do was master the art of breathing.

To them breathing wasn't an unconscious act; it wasn't something they just did. It was a force, a medicine, and a mechanism through which they could gain an almost superhuman power.

"There are as many ways to breathe as there are foods to eat," said one female instructor who had held her breath for more than eight minutes and once dived below 300 feet. "And each way we breathe will affect our bodies in different ways." Another diver told me that some methods of breathing will nourish our brains, while others will kill neurons; some will make us healthy, while others will hasten our death.

They told crazy stories, about how they'd breathed in ways that expanded the size of their lungs by 30 percent or more. They told me about an Indian doctor who lost several pounds by simply changing the way he inhaled, and about another man who was injected with the bacterial endotoxin *E. coli*, then breathed in a rhythmic pattern to stimulate his immune system and destroy the toxins within minutes. They told me about

women who put their cancers into remission and monks who could melt circles in the snow around their bare bodies over a period of several hours. It all sounded nuts.

During my off-hours from doing underwater research, usually late at night, I read through reams of literature on the subject. Surely someone had studied the effects of this conscious breathing on landlubbers? Surely someone had corroborated the freedivers' fantastic stories of using breathing for weight loss, health, and longevity?

I found a library's worth of material. The problem was, the sources were hundreds, sometimes thousands, of years old.

Seven books of the Chinese Tao dating back to around 400 BCE focused entirely on breathing, how it could kill us or heal us, depending on how we used it. These manuscripts included detailed instructions on how to regulate the breath, slow it, hold it, and swallow it. Even earlier, Hindus considered breath and spirit the same thing, and described elaborate practices that were meant to balance breathing and preserve both physical and mental health. Then there were the Buddhists, who used breathing not only to lengthen their lives but to reach higher planes of consciousness. Breathing, for all these people, for all these cultures, was powerful medicine.

"Therefore, the scholar who nourishes his life refines the form and nourishes his breath," says an ancient Tao text. "Isn't this evident?"

Not so much. I looked for some kind of verification of these claims in more recent research in pulmonology, the medical discipline that deals with the lungs and the respiratory tract, but found next to nothing. According to what I did find, breathing technique wasn't important. Many doctors, researchers, and scientists I interviewed confirmed this position. Twenty times a minute, ten times, through the mouth, nose, or breathing tube, it's all the same. The point is to get air in and let the body do the rest.

To get a sense of how breathing is regarded by modern medical professionals, think back to your last check-up. Chances are your doctor took your blood pressure, pulse, and temperature, then placed a stethoscope to your chest to assess the health of your heart and lungs. Maybe she discussed diet, taking vitamins, stresses at work. Any issues digesting food?
How about sleep? Were the seasonal allergies getting worse? Asthma?
What about those headaches?

But she likely never checked your respiratory rate. She never checked the balance of oxygen and carbon dioxide in your bloodstream. How you breathe and the quality of each breath were not on the menu.

Even so, if the freedivers and the ancient texts were to be believed, how we breathe affects all things. How could it be so important and unimportant at the same time?

I kept digging, and slowly a story began to unfold. As I found out, I was not the only person who'd recently started asking these questions. While I was paging through texts and interviewing freedivers and super-breathers, scientists at Harvard, Stanford, and other renowned institutions were confirming some of the wildest stories I'd been hearing. But their work wasn't happening in the pulmonology labs. Pulmonologists, I learned, work mainly on specific maladies of the lungs—collapse, cancer, emphysema.

"We're dealing with emergencies," one veteran pulmonologist told me. "That's how the system works."

No, this breathing research has been taking place elsewhere: in the muddy digs of ancient burial sites, the easy chairs of dental offices, and the rubber rooms of mental hospitals. Not the kinds of places where you'd expect to find cutting-edge research into a biological function.

Few of these scientists set out to study breathing. But, somehow, in some way, breathing kept finding them. They discovered that our capacity to breathe has changed through the long processes of human evolution, and that the way we breathe has gotten markedly worse since the dawn of the Industrial Age. They discovered that 90 percent of us—very likely me, you, and almost everyone you know—is breathing incorrectly and that this failure is either causing or aggravating a laundry list of chronic diseases.

On a more inspiring note, some of these researchers were also showing that many modern maladies—asthma, anxiety, attention deficit hyperactivity disorder, psoriasis, and more—could either be reduced or reversed simply by changing the way we inhale and exhale.

This work was upending long-held beliefs in Western medical science. Yes, breathing in different patterns really can influence our body weight and overall health. Yes, how we breathe really does affect the size and function of our lungs. Yes, breathing allows us to hack into our own nervous system,

control our immune response, and restore our health. Yes, changing how we breathe will help us live longer.

No matter what we eat, how much we exercise, how resilient our genes are, how skinny or young or wise we are—none of it will matter unless we're breathing correctly. That's what these researchers discovered. The missing pillar in health is breath. It all starts there.

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This book is a scientific adventure into the lost art and science of breathing. It explores the transformation that occurs inside our bodies every 3.3 seconds, the time it takes the average person to inhale and exhale. It explains how the billions and billions of molecules you bring in with each breath have built your bones, sheaths of muscle, blood, brains, and organs, and the emerging science of how these microscopic bits will influence your health and happiness tomorrow, next week, next month, next year, and decades from now.

I call this a "lost art" because so many of these new discoveries aren't new at all. Most of the techniques I'll be exploring have been around for hundreds, sometimes thousands, of years. They were created, documented, forgotten, and discovered in another culture at another time, then forgotten again. This went on for centuries.

Many early pioneers in this discipline weren't scientists. They were tinkerers, a kind of rogue group I call "pulmonauts," who stumbled on the powers of breathing because nothing else could help them. They were Civil War surgeons, French hairdressers, anarchist opera singers, Indian mystics, irritable swim coaches, stern-faced Ukrainian cardiologists, Czechoslovakian Olympians, and North Carolina choral conductors.

Few of these pulmonauts achieved much fame or respect when they were alive, and when they died their research was buried and scattered. It was even more fascinating to learn that, during the past few years, their techniques were being rediscovered and scientifically tested and proven. The fruits of this once-fringe, often forgotten research are now redefining the potential of the human body.

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But why do I need to learn how to breathe? I've been breathing my whole life.

This question, which you may be asking now, has been popping up ever since I began my research. We assume, at our peril, that breathing is a passive action, just something that we do: breathe, live; stop breathing, die. But breathing is not binary. And the more I immersed myself in this subject, the more personally invested I felt about sharing this basic truth.

Like most adults, I too have suffered from a host of respiratory problems in my life. That's what landed me at the breathing class years ago. And like most people, I found that no allergy drug, inhaler, mix of supplements, or diet did much good. In the end, it was a new generation of pulmonauts who offered me a cure, and then they offered so much more.

It will take the average reader about 10,000 breaths to read from here to the end of the book. If I've done my job correctly, starting now, with every breath you take, you'll have a deeper understanding of breathing and how best to do it. Twenty times a minute, ten times, through the mouth, nose, tracheostomy, or breathing tube, it's not all the same. How we breathe really matters.

By your thousandth breath, you'll understand why modern humans are the only species with chronically crooked teeth, and why that's relevant to breathing. You'll know how our ability to breathe has deteriorated over the ages, and why our cavemen ancestors didn't snore. You'll have followed two middle-aged men as they struggle through a pioneering and masochistic 20-day study at Stanford University to test the long-held belief that the pathway through which we breathe—nose or mouth—is inconsequential. Some of what you'll learn will ruin your days and nights, especially if you snore. But in your next breaths, you'll find remedies.

By your 3,000th breath, you'll know the basics of restorative breathing. These slow and long techniques are open to everyone—old and young, sick and healthy, rich and poor. They've been practiced in Hinduism, Buddhism, Christianity, and other religions for thousands of years, but only recently have we learned how they can reduce blood pressure, boost athletic performance, and balance the nervous system.

By your 6,000th breath, you will have moved into the land of serious, conscious breathing. You'll travel past the mouth and nose, deeper into the lungs, and you'll meet a midcentury pulmonaut who healed World War II veterans of emphysema and trained Olympic sprinters to win gold medals, all by harnessing the power of the exhale.

By your 8,000th breath, you'll have pushed even deeper into the body to tap, of all things, the nervous system. You'll discover the power of overbreathing. You'll meet with pulmonauts who have used breathing to straighten scoliotic spines, blunt autoimmune diseases, and superheat themselves in subzero temperatures. None of this should be possible, and yet, as you will see, it is. Along the way, I'll be learning, too, trying to understand what happened to me in that Victorian house a decade ago.

By your 10,000th breath, and the close of this book, you and I will know how the air that enters your lungs affects every moment of your life and how to harness it to its full potential until your final breath.

This book will explore many things: evolution, medical history, biochemistry, physiology, physics, athletic endurance, and more. But mostly it will explore *you*.

By the law of averages, you will take 670 million breaths in your lifetime. Maybe you've already taken half of those. Maybe you're on breath 669,000,000. Maybe you'd like to take a few million more.

Part One

THE EXPERIMENT

One

THE WORST BREATHERS IN THE ANIMAL KINGDOM

The patient arrived, pale and torpid, at 9:32 a.m. Male, middle-aged, 175 pounds. Talkative and friendly but visibly anxious. Pain: none. Fatigue: a little. Level of anxiety: moderate. Fears about progression and future symptoms: high.

Patient reported that he was raised in a modern suburban environment, bottle-fed at six months, and weaned onto jarred commercial foods. The lack of chewing associated with this soft diet stunted bone development in his dental arches and sinus cavity, leading to chronic nasal congestion.

By age 15, patient was subsisting on even softer, highly processed foods consisting mostly of white bread, sweetened fruit juices, canned vegetables, Steak-umms, Velveeta sandwiches, microwave taquitos, Hostess Sno Balls, and Reggie! bars. His mouth had become so underdeveloped it could not accommodate 32 permanent teeth; incisors and canines grew in crooked, requiring extractions, braces, retainers, and headgear to straighten. Three years of orthodontics made his small mouth even smaller, so his tongue no longer properly fit between his teeth. When he stuck it out, which he did often, visible imprints laced its sides, a precursor to snoring.

At 17, four impacted wisdom teeth were removed, which further decreased the size of his mouth while increasing his chances of developing the chronic nocturnal choking known as sleep apnea. As he aged into his 20s and 30s, his breathing became more labored and dysfunctional and his airways became more obstructed. His face would continue a vertical growth pattern that led to sagging eyes, doughy cheeks, a sloping forehead, and a protruding nose.

This atrophied, underdeveloped mouth, throat, and skull, unfortunately, belongs to me.

I'm lying on the examination chair in the Stanford Department of Otolaryngology Head and Neck Surgery Center looking at myself, looking into myself. For the past several minutes, Dr. Jayakar Nayak, a nasal and sinus surgeon, has been gingerly coaxing an endoscope camera through my nose. He's gone so deep into my head that it's come out the other side, into my throat.

"Say *eeee*," he says. Nayak has a halo of black hair, square glasses, cushioned running shoes, and a white coat. But I'm not looking at his clothes, or his face. I'm wearing a pair of video goggles that are streaming a live feed of the journey through the rolling dunes, swampy marshes, and stalactites inside my severely damaged sinuses. I'm trying not to cough or choke or gag as that endoscope squirms a little farther down.

"Say *eeee*," Nayak repeats. I say it and watch as the soft tissue around my larynx, pink and fleshy and coated in slime, opens and closes like a stop-motion Georgia O'Keeffe flower.

This isn't a pleasure cruise. Twenty-five sextillion molecules (that's 250 with 20 zeros after it) take this same voyage 18 times a minute, 25,000 times a day. I've come here to see, feel, and learn where all this air is supposed to enter our bodies. And I've come to say goodbye to my nose for the next ten days.

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For the past century, the prevailing belief in Western medicine was that the nose was more or less an ancillary organ. We should breathe out of it if we can, the thinking went, but if not, no problem. That's what the mouth is for.

Many doctors, researchers, and scientists still support this position. There are 27 departments at the National Institutes of Health devoted to lungs, eyes, skin disease, ears, and so on. The nose and sinuses aren't represented in any of them.

Nayak finds this absurd. He is the chief of rhinology research at Stanford. He heads an internationally renowned laboratory focused entirely on understanding the hidden power of the nose. He's found that those dunes, stalactites, and marshes inside the human head orchestrate a multitude of functions for the body. Vital functions. "Those structures are in there for a reason!" he told me earlier. Nayak has a special reverence for the nose, which he believes is greatly misunderstood and underappreciated. Which is

why he's so interested to see what happens to a body that functions without one. Which is what brought me here.

Starting today, I'll spend the next quarter of a million breaths with silicone plugs blocking my nostrils and surgical tape over the plugs to stop even the faintest amount of air from entering or exiting my nose. I'll breathe only through my mouth, a heinous experiment that will be exhausting and miserable, but has a clear point.

Forty percent of today's population suffers from chronic nasal obstruction, and around half of us are habitual mouthbreathers, with females and children suffering the most. The causes are many: dry air to stress, inflammation to allergies, pollution to pharmaceuticals. But much of the blame, I'll soon learn, can be placed on the ever-shrinking real estate in the front of the human skull.

When mouths don't grow wide enough, the roof of the mouth tends to rise up instead of out, forming what's called a V-shape or high-arched palate. The upward growth impedes the development of the nasal cavity, shrinking it and disrupting the delicate structures in the nose. The reduced nasal space leads to obstruction and inhibits airflow. Overall, humans have the sad distinction of being the most plugged-up species on Earth.

I should know. Before probing my nasal cavities, Nayak took an X-ray of my head, which provided a deli-slicer view of every nook and cranny in my mouth, sinuses, and upper airways.

"You've got some . . . *stuff*," he said. Not only did I have a V-shape palate, I also had "severe" obstruction to the left nostril caused by a "severely" deviated septum. My sinuses were also riddled with a profusion of deformities called *concha bullosa*. "Super uncommon," said Nayak. It was a phrase nobody wants to hear from a doctor.

My airways were such a mess that Nayak was amazed I hadn't suffered from even more of the infections and respiration problems I'd known as a kid. But he was reasonably certain I could expect some degree of serious breathing problems in the future.

Over the next ten days of forced mouthbreathing, I'll be putting myself inside a kind of mucousy crystal ball, amplifying and hastening the deleterious effects on my breathing and my health, which will keep getting worse as I get older. I'll be lulling my body into a state it already knows, that half the population knows, only multiplying it many times.

“OK, hold steady,” Nayak says. He grabs a steel needle with a wire brush at the end, about the size of a mascara brush. I’m thinking, *He’s not going to put that thing up my nose.* A few seconds later, he puts that thing up my nose.

I watch through the video goggles as Nayak maneuvers the brush deeper. He keeps sliding until it is no longer up my nose, no longer playing around my nasal hair, but wiggling inside of my head a few inches deep. “Steady, steady,” he says.

When the nasal cavity gets congested, airflow decreases and bacteria flourish. These bacteria replicate and can lead to infections and colds and more congestion. Congestion begets congestion, which gives us no other option but to habitually breathe from the mouth. Nobody knows how soon this damage occurs. Nobody knows how quickly bacteria accumulate in an obstructed nasal cavity. Nayak needs to grab a culture of my deep nasal tissue to find out.

I wince as I watch him twist the brush deeper still, then spin it, skimming off a layer of gunk. The nerves this far up the nose are designed to feel the subtle flow of air and slight modulations in air temperature, not steel brushes. Even though he’s dabbed an anesthetic in there, I can still feel it. My brain has a hard time knowing exactly what to do, how to react. It’s difficult to explain, but it feels like someone is needling a conjoined twin that exists somewhere outside of my own head.

“The things you never thought you’d be doing with your life,” Nayak laughs, putting the bleeding tip of the brush into a test tube. He’ll compare the 200,000 cells from my sinuses with another sample ten days from now to see how nasal obstruction affects bacterial growth. He shakes the test tube, hands it to his assistant, and politely asks me to take the video goggles off and make room for his next patient.

Patient #2 is leaning against the window and snapping photos with his phone. He’s 49 years old, deeply tanned with white hair and Smurf-blue eyes, and he’s wearing spotless beige jeans and leather loafers without socks. His name is Anders Olsson, and he’s flown 5,000 miles from Stockholm, Sweden. Along with me, he’s ponied up more than $5,000 to join the experiment.

I’d interviewed Olsson several months ago after coming across his website. It had all the red flags of flakiness: stock images of blond women

striking hero poses on mountaintops, neon colors, frantic use of exclamation points, and bubble fonts. But Olsson wasn't some fringe character. He'd spent ten years collecting and conducting serious scientific research. He'd written dozens of posts and self-published a book explaining breathing from the subatomic level on up, all annotated with hundreds of studies. He'd also become one of Scandinavia's most respected and popular breathing therapists, helping to heal thousands of patients through the subtle power of healthy breathing.

When I mentioned during one of our Skype conversations that I would be mouthbreathing for ten days during an experiment, he cringed. When I asked if he wanted to join in, he refused. "I do not want to," he declared. "But I am curious."

Now, months later, Olsson plops his jet-lagged body onto the examination chair, puts on the video glasses, and inhales one of his last nasal breaths for the next 240 hours. Beside him, Nayak twirls the steel endoscope the way a heavy metal drummer handles a drumstick. "OK, lean your head back," says Nayak. A twist of the wrist, a crane of the neck, and he goes deep.

The experiment is set up in two phases. Phase I consists of plugging our noses and attempting to live our everyday lives. We'll eat, exercise, and sleep as usual, only we'll do it while breathing only through our mouths. In Phase II, we'll eat, drink, exercise, and sleep like we did during Phase I, but we'll switch the pathway and breathe through our noses and practice a number of breathing techniques throughout the day.

Between phases we'll return to Stanford and repeat all the tests we've just taken: blood gases, inflammatory markers, hormone levels, smell, rhinometry, pulmonary function, and more. Nayak will compare data sets and see what, if anything, changed in our brains and bodies as we shifted our style of breathing.

I'd gotten a fair share of gasps from friends when I told them about the experiment. "Don't do it!" a few yoga devotees warned. But most people just shrugged. "I haven't breathed out of my nose in a decade," said a friend who had suffered allergies most of his life. Everyone else said the equivalent of: *What's the big deal? Breathing is breathing.*

Is it? Olsson and I will spend the next 20 days finding out.

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