

**NAMING NATURE**

**THE CLASH BETWEEN  
INSTINCT AND SCIENCE**

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ONE

THE STRANGE CASE OF  
THE FISH THAT WASN'T

"What's the use of their having names," the Gnat said, "if they won't answer to them?"

"No use to *them*," said Alice; "but it's useful to the people that name them, I suppose. If not, why do they have names at all?"

"I can't say," the Gnat replied.

—LEWIS CARROLL

*Through the Looking-Glass*

More than two hundred years ago, scientists began a quest to order and name the entire living world—the whole squawking, scuttling, blooming, twining, leafy, furry, green, and wondrous mess of it. My initial plan for this book was simple. I was going to write about that quest, tell the story of this venerable science of classification, which is today also known as taxonomy or systematics. I would explain the intricacies of how scientists divvy up or group together animals and plants and everything else as they organize life into one all-encompassing hierarchical system. I planned to write, too, about the many quaint and curious ways that others organize the living world, from the Maya of Central America to the medieval Chinese to modern-day South Africans to

American schoolchildren. Odd and intriguing, these classifications would provide an entertaining sidelight. That they were wrong—insofar as they differed from science—I took as a given. However imperfect scientific ordering might be, however much a work in progress, I knew it was the best and only really valid way of ordering the living world. People, I knew, should defer always to science in the ordering and naming of life, as they reliably do.

It was no wonder, since I was raised on the milk of science. Both my parents were working scientists. On rainy Saturdays, I played with my father's laboratory mice on the living-room floor or chatted with my mother as she tinkered in the federally funded laboratory they had set up in our basement. Before I hit puberty, before I knew the power of love or sex or good hair, I had become well versed in the power of various statistical techniques (Chi-Square was our family favorite). I married a scientist; most of my friends are scientists, I became one myself, and I've spent most of the last two decades writing for the *New York Times* about the amazing and wonderful new findings that scientists have come up with.

So, imagine my surprise when, as I was working on this book, I began to see that science was neither the best nor the only valid way to order and name the living world. Instead, I realized that the ordering and naming of life was and always had been, at its heart, something much more democratic, subversive to the dominion of science even, and much more interesting. I eventually came to see that science itself might be undermining the very thing it sought to perfect: humanity's understanding of life. Even more unexpected, I realized that the thoroughly modern, entirely evolutionary new science of taxonomy was actually helping regular folks everywhere to become more and more disconnected from living things—a tragedy that has made it possible for species after species to disappear around the world with hardly anyone noticing or much caring. But there was good news here, too. I also realized that those many apparently incorrect names and categorizations—the orderings created by people across the world and throughout history as they

reveled in the life around them—actually were not wrong. They were as right as could be, and reclaiming them, any single one or the whole bunch if you like, was the key to remedying all of this.

This was not where I expected or ever wanted to land. Luckily, though, things don't always turn out the way you plan. The process of writing this book has been a series of tumbling, unfolding layers of discovery. Nearly everything that I thought I knew about the ordering of life has been tweaked, tossed, or completely turned on its head. And in place of my precious old ideas, I found I had something better: a new way of looking at the living world and the people who order and name it—scientists and all the rest of us—one more interesting and more full of promise than I could ever have imagined.

THIS BOOK BEGAN a long time ago, somewhere in the forest behind my parents' house. We lived in a small town outside of Boston. It looked like any other New England hamlet, with its white-steepled church, little grocery store, and gas station, but this was no ordinary place. Behind every house and farm lay a fantastic wildness, and when I was not watching cartoons or pestering my mother as she tried to cook dinner or do a dissection, I was out in it, wandering the woods that lay just beyond our backyard. There, under towering trees, I found marvels beyond count. There were huge black snakes, as fat around as a bicycle tire, which lay across the path. There were skinny snakes, two of which I once saw tangled together in the tree branches, and there were the plentiful striped snakes that sunned themselves on stones. Orchids poked up from under the oak leaves on the ground. In the bog there were tiny plants whose leaves were covered with pink, sparkly spikes. The pines made your fingers sticky and the maple trees sent out a sweet, lingering scent. There were dive-bombing ravens, noisy chickadees, fat, splashing mallards, and in the ponds and lake, there were frogs and toads and turtles and fish, fish, fish.

It was there that I first came to understand what all children

who wander in the woods know, without even realizing that they know it: the living world is not some random mess, but an array of clusters of more and less similar things. I could see that the wild world was comprised of various kinds of things, and within each of those categories, a further variety of kinds as well. I would only later realize that what I had seen had a name and had had one for centuries: the natural order. It was the same natural order observed and obsessed upon by people around the world since time before time. Like nearly all these people, I made observations that were neither detailed nor scientific, but children (like nearly all people, given the chance) are easy naturalists. Everything in those woods was plainly apparent to me, persistently obvious, very real and very palpable. Even now if I try, I can smell the forest, hear the croak of the ravens, feel the crack of a twig under my foot. It's just the way it was and it was as obvious as the clear blue sky.

Like many children who wander in the woods, I became a biologist. I grew up and put aside any foolish ideas I might have had about the different sorts of tadpoles I caught, or the kinds of grasshoppers I chased, or that weird swimming lump in the swamp that appeared each spring but that I could never get a good look at. I was ready for a truly scientific ordering of life. I was ready to be wowed.

What struck me first about the science of classification was how deeply and how often scientists seemed to disagree about how exactly to order the living world. The field of taxonomy is infamous among biologists for its intractable arguments. Even in the eighteenth century, as the infant science of classification was first taking shape under the father of the field, Carolus Linnaeus, botanists and zoologists were already in passionate debate about how best to order the flood of newly discovered plants and animals. Two hundred long years later, in 1980, taxonomists were still at it. By then, as I discovered upon entering college, the battles took the form of a kind of intertribal warfare among the different schools of taxonomists, each with its own methods and philosophies about

how best to order life. Still, it was going to take more than a mere two centuries of disagreement to shake my confidence in science. Conflict, I knew, is the stuff of progress.

Even when scientific classification clashed with what seemed to be the obvious truth, it never occurred to me to doubt the supremacy of science. In every case, I knew that science must be right, because scientists are privy to information that the rest of the world doesn't have. Two animals might look very much the same—two small brown salamanders, for example, might look absolutely identical—but the truth revealed by a molecular genetic analysis might be that they were from two quite distantly evolutionarily related species. Or two things might look completely dissimilar—like a cauliflower and a kale plant—and yet science could show and has shown that they are members of the same species.

A few years later, as a young graduate student, I encountered one such clash. It came at the hands of a band of taxonomists recently on the rise, a wild and unruly group known as the cladists (CLAY-dissts). The cladists were fanatical devotees of a new set of methods for determining evolutionary relatedness, or where it is that different groups of living things sit in the branches of the evolutionary tree of life, hence their name, "cladists," from the Greek *klados* for "branch." They were so zealous about their methods—as well as often being rude and raucous—that other taxonomists more commonly called them raving cladists or raging cladists or even rabid cladists. But the real reason that everyone was talking about them was that this new school of taxonomy was using its methods to foment a revolution in the classification of life. The cladists were making huge and exciting breakthroughs, carrying out bright modern science at its very best. Revolutions can be deadly dangerous, though, and one of this revolution's first victims was fish.

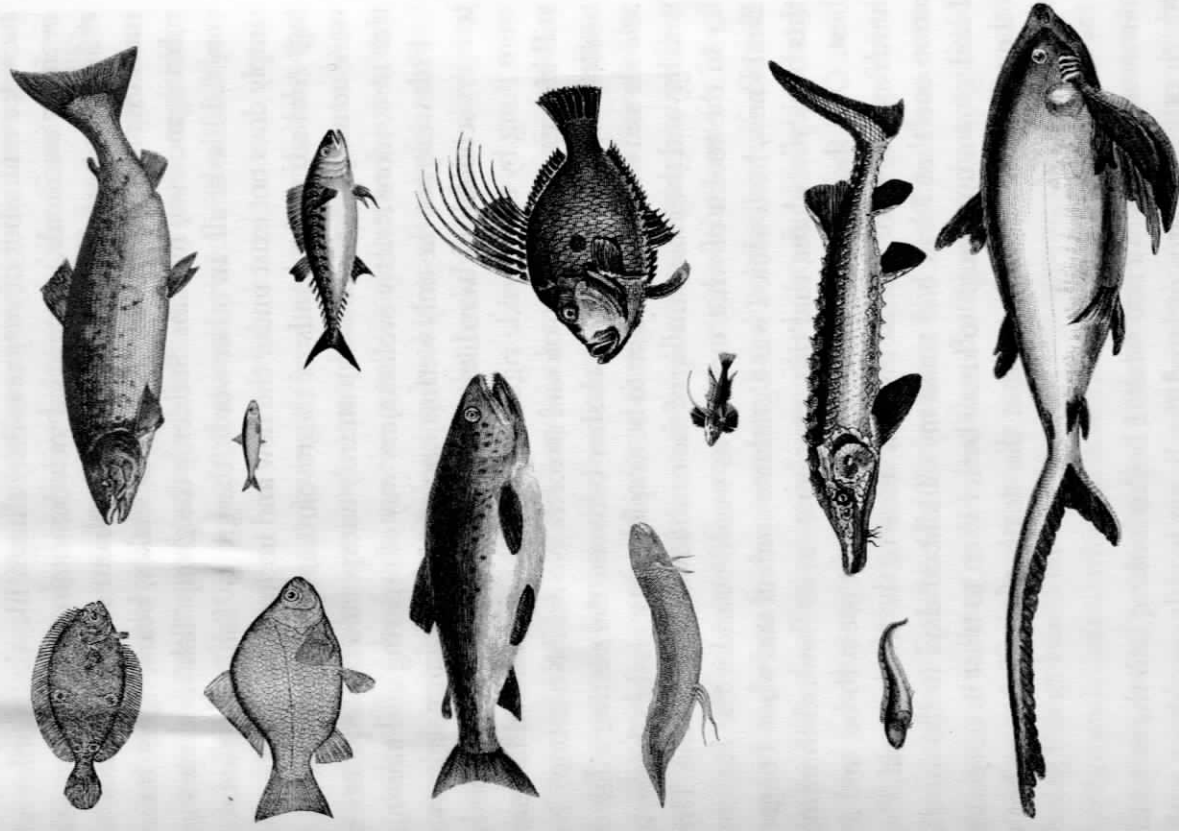
Here was the mother of all clashes: cladists declared that the proper evolutionary ordering of life revealed that the group "fish" did not exist. The various kinds of fish—the heroic salmon, the



friendly minnows, the lunch-worthy tuna—were all still very much in existence, they reassured everyone. But fish as a distinct and cohesive group, the cladists said, were not. It was no more a single, cohesive group, they said, than all the animals with red spots on them or all the mammals that are loud. No fish? It was a ridiculous idea, one that pushed the limits of scientific credulity, for here was a conflict between scientific classification and what would appear to be the obvious truth, if ever there was one. In fact, the idea that fish don't exist seems impossible at first. Generations of fishermen around the world could easily argue against such a notion, not to mention the many members of the U.S. Department of Fish and Wildlife, and most compelling of all, what would seem to be the obvious and simple *fact* of fish.

Yet, as ridiculous as the idea might appear to be, the death of the fish turns out to be scientifically and logically unassailable. If one orders living things based strictly on their evolutionary relationships—as Darwin long before decreed taxonomists should—it turns out that to do this properly, one must create and define groups in a new and very particular way. For a group to be legitimate, it has to include all the descendants of a single ancestor and nothing else. That is, all the species that descended from, say, *Tyrannosaurus rex* have to be included in a single group; anything that is not a direct descendant of *T. rex* has to be excluded from that group. Otherwise, whatever assemblage you've created would be an incomplete evolutionary grouping, or, equally bad, a grab bag group made up of bits that really belong to other groups. These were what cladists liked to say were not “real” groups. And that was the problem with fish. When cladists looked closely at all the species that we traditionally call fish, they found they did not add up to a single complete group.

Here's the problem. Let's say we put all the things we think of as fish into a single group. To make it a real group, we have to look at what else—by our rules of evolutionary relationship—has to go in there. We have to ask, what else is a descendant of that



How could scientists deny the reality of fish?

fishy ancestor that gave rise to all our fish? The answer surprisingly includes a number of very non-fishy things, like the reptiles and even the mammals, a group that includes some extremely non-fishy things, like ourselves. But in keeping with our strict guidelines, we must toss them all in, lizards, turtles, snakes, bears, tigers, bunny rabbits, and even humans. Suddenly the group "fish" becomes not very fishlike at all. In other words, the group "fish" as we know it simply does not exist under the new and improved rules of ordering. And so, at the hands of the revolutionary new cladists, fish were no more, their demise an entirely unexpected consequence of this new, more strictly evolutionary way of ordering and naming.

Fish were not the only victims, though. Zebras, animals known to every schoolchild, were likewise declared not to exist. The moths were flung by the wayside right on top of the abandoned fish and still-kicking zebra and so on and so forth. No fish? No zebras? No moths? These were serious clashes between the cutting edge of science and what would seem to be simple reality, clashes that went well beyond the close kinship of the cauliflower and the kale. This lay in the realm of what most of us would consider the bizarre. But I knew, both while I was a graduate student and when I began this book years later, that this was science at its forward-thinking best. Odd though these proclamations might seem to be, and as much as they went against my own sense of the living world, the same one that I had had since my childhood days in the forest, I had grown up enough to know better than to trust in anything other than science. I knew that the death of the fish was both right and good.

THE TROUBLE STARTED when I began looking into the ways in which other cultures ordered the living world, something with which I was entirely unfamiliar. I wanted to give people a sense of the world's wacky diversity of prescientific and non-scientific orderings. I figured that there must at some point have been research into such topics as what different language groups call a bird versus

a bat, how ancient societies conceived of what a tree is or a human being. Right away, I found a few interesting tidbits. There was an anthropological study that showed that some New Guinea tribesmen, despite being excellent naturalists, classified a giant bird as a mammal. Another study described how Filipino headhunters appeared to conceive of orchids as human body parts, explaining to a bewildered anthropologist that here grow the thumbs, there the elbows.

I found it instantly intriguing to see just how confused—that is, how different from science—people were on the point of how to order life. I began to see the possibilities for the book taking shape—the tale of the endearing kookiness of people's ways of looking at the living world against the backdrop of the clarifying correctness of modern science.

I figured that finding out very much more about the orderings of different peoples would be a scavenger hunt, a matter of digging up bits and pieces of odd information, scrounging for the definition of the term for "shrub" in some obscure language or picking through dictionaries to figure out the origin of the term for "dog" in another. I soon found, however, that this was the stuff of a full-blown field of anthropological research: the study of folk taxonomy, or how it is that regular folks order the living world.

It is a vast, thriving field because everyone—the !Kung San of the Kalahari Desert, the Vietnamese, the French—does actually order the living world. But they don't just produce any kind of taxonomy. People universally create a hierarchical ordering of living things based on how living things appear, that is, on similarities and dissimilarities in how they look, smell, sound, and act, the same sort of taxonomy that professional scientific taxonomists have ever been after. People might or might not produce other additional orderings based on such factors as how they use or interact with those living things. Take, for example, our own folk taxonomies, which divide animals up into farm animals, pets, and wild animals, or plants into the weeds and the plants we like.

However many extra taxonomies they invent, though, everyone will create that one basic, appearance-based taxonomy. Here was a rich mine of information.

I set to work expecting to find a wild, exotic mess of orderings—or, really, misorderings. The studies were indeed full of exotica, strange animals and still stranger plants, and the orderings I learned of were full of fascinatingly foreign ideas. But to my surprise, all was not disorder and chaos; quite the contrary. Not only did all peoples order life, but anthropologists had found that people around the world ordered the life around them in very similar, even stereotyped ways, regardless of where they lived, what language they spoke, or which animals and plants they were ordering. The countless varieties of folk taxonomies were, at their base, variations on a single theme: that same basic, effortlessly perceived natural order that I had myself seen in those woods long ago, the same natural order that it turns out people everywhere see. Folk were so regular and reliable in how they taxonomized that anthropologists were able to articulate actual rules that they could be counted on to follow, unconsciously, while ordering life. It was enough to make my biologically trained jaw drop quite nearly to the floor. A unity among folk taxonomies from here to Timbuktu? Rules for ordering life? Who knew?

Taxonomy—what I had always thought of as a technical science—began to seem like it might be something else, something much more deep-seated, but just how deep-seated I still had no idea. At least not until I strayed still further from the science of taxonomy into research done by psychologists on a very particular class of brain-damaged hospital patients. In study after study, scientists described people who, through accident or disease, were no longer able to order and name living things—both animals and plants—often while retaining the ability to recognize everything else. In 1984, for example, researchers at London's National Hospital for Neurology and Neurosurgery reported the case of a young university student, referred to only as "J.B.R.". After J.B.R.

recovered from swelling of the brain caused by herpes, researchers found that while he could recognize inanimate objects—he knew full well what a flashlight, a compass, a kettle, a canoe were—he was mystified by anything living. J.B.R., once an entirely normal university student, was now unable to recognize a kangaroo, a mushroom, or a buttercup. He simply could not say what a parrot was. In another report, researchers in Italy described the case of "L.A.", a fifty-six-year-old housewife and former student of biology from Rome, who upon awakening from a coma was similarly at a loss when trying to recognize living things. She called a cricket a lion, a cat a dog, and a fish a bird. L.A. and J.B.R. were far from alone, though, for the more researchers looked, the more such patients they found. Psychologists around the world were finding people who could tell the television from the tank, the chair from the chimney, but who could not tell the tangerine from the tomato or the chicken from the chives. These were people who had lost their sense of the natural order. Beyond that, other studies indicated that people with such loss of ability often had damage in one particular region of their brain. Some scientists—both anthropologists and psychologists—even suggested that there might be a part of the brain built specifically to order the living world. The doing of taxonomy, these scientists were arguing, might be, in some way, innate. What in the world, I began to wonder, could this mean?

Things got even more interesting when I learned that psychologists had been studying the ordering of life by children, including infants, for years. What they had shown quite clearly was that these youngsters were ordering the living world—and quite skillfully—even before they could walk or talk. Without realizing it, we actually expect everyone, babies included, to have a kind of savantlike fluency with the ordering of life. That is why we are not surprised at the very surprising fact that a toddler can recognize what the entity "dog" or "cat" is, after seeing just a few of the beasts. When you think about it, there are many kinds of dogs, in many shapes and sizes, and it is not that simple to describe how in a glance one



can distinguish them from all the other furry four-legged creatures like cats, cows, or goats. Nor are we surprised that a child or anyone else can recognize a tiger, even if it is a strange albino white, even if it has mutated to have two heads, or been mutilated to have only three legs. It is a curiosity that we find not curious at all: "Plato's dilemma." How do we know so much based on so very little? For we do know astonishingly much about the living world without effort or thought. Knowing what an organism is—in particular, where it lies in the great natural order—does indeed come surprisingly easily to all of us, so easily as to fit neatly into our subconscious. And lastly, children appeared not only to be very adept at this but also to be drawn early and deeply to learning the ordering of life, the names and groupings and organization of living things.

Taxonomy began to take on quite a different look, not the look of a tidy solid science, but the look of something instinctual, something that, like hope, would spring eternal, in every newborn child. The classification of the living world, the envisioning and perception of the natural order, it seemed, might be much more than what it has been reduced to today—an abstract, laboratory science. It might be one of the essential and, at least early in life, irreplaceable functions of being a human being, of being alive.

The more I thought about it, the more sense it made. Why wouldn't we have evolved exactly that: a stereotyped, hard-wired way of looking at and ordering the living world? Why wouldn't we have evolved a very particular vision of the natural order of life? For what, before anything else, would our hairy, dirty, cavedwelling ancestors have had to contend with, have had to be equipped to deal with, to sort, order, remember, name, recognize, and communicate about in order to survive? Both what they ate and what might eat them: the living world.

Then I remembered something I had learned back in college, in a class I'd taken on animal behavior with a professor who was enamored of bees. He had explained to us the existence of what

biologists term the "umwelt" (pronounced OOM-velt). *Umwelt* is a German word that means literally "the environment" or "the world around," but scientists studying animal behavior use it to evoke something much more specific. For these biologists, the umwelt signifies the *perceived world*, the world sensed by an animal, a view idiosyncratic to each species, fueled by its particular sensory and cognitive powers and limited by its deficits. Most of us aren't familiar with the term, but we are more than familiar with the idea. We know that our dogs live in a universe painted not in colors, which they cannot see, but in smells. That's why Fido behaves as he does, sniffing at every fencepost and every passerby. My professor's beloved bees, with their multifaceted eyes, see ultraviolet light that is invisible to the human eye. That's why bees are able to home in on a flower's nectar so quickly, guided to it by patterns painted on the flower in ultraviolet swaths and stripes. But not only dogs and bees have umwelts, all animals do, even humans. We might call it reality, but it is indeed an umwelt, an idiosyncratic sensory picture of the living world around us. And there was the answer.

The human umwelt, I realized, had a significance that had remained unseen. It is the umwelt—this shared perceived world—that gives us our stereotyped, hard-wired way of perceiving the order in living things. If biophilia, humanity's love of the living world as proposed by Harvard biologist E. O. Wilson, explains why we are so often attracted to living things (and I believe it does), then it is perhaps the human umwelt—its peculiarities, its strengths and weaknesses, and everything else about it, including its very existence—that explains why we see the living world and the natural order within it the way we do and always have.

The little pieces of a puzzle I had not even known I was working on fell into place. The umwelt, I realized, was the explanation for the similarity in ordering from Africa to Asia to the Americas, across different languages, cultures, societies, and habitats. We all have the same umwelt, so no wonder then that we should all see the same natural order, and that we would make the same kinds of



folk taxonomies, again and again and again. The *umwelt* was also what psychologists had been tracking down while studying their brain-damaged patients. It was what was missing or broken in the brains of those poor souls who had lost their ability to distinguish living things. And it was the *umwelt* that revealed to babies, little tiny people who could not yet even sit up on their own, what the living world indeed was.

It became clear that the *umwelt* was the reason for so many things, none of which I had even really connected with taxonomy before. As I looked around, I could see that the *umwelt* had us seeing order—and acting on that order—everywhere. Without even thinking about it, we order within a species, including our own, every day. We sort out every person we see, instantly assessing where they fall in our natural order—among blacks, whites, Asians, men, women, children, and so on. We use those orderings to prescribe medical care, pick an appropriate bathroom, give out scholarships, opportunities, and even love—and we do it all through the lens of our *umwelt*.

Then the last and biggest piece of the puzzle fell into place. I realized, with a bit of a shock, that human beings having an *umwelt*, a peculiarly human vision of order in the living world, meant that the history of the science of classification—from its birth through its rocky centuries of argument and struggle—was something quite different than I had ever conceived of it being. It had been a two-hundred-year-long battle against the human *umwelt*.

I had always envisioned the history of the science of classification as a series of orderly sequential insights and late nights in the laboratory, of the sort that we are told advances all good science. But taxonomy is not just another science, born out of naked reason and using elegant experimentation to make its way steadily forward. Taxonomy is instead a science born out of an ancient human practice—the ordering and naming of life—out of the urgings of the human *umwelt*. The *umwelt* quickly became the field's great

and enduring weakness, however, because the *umwelt*'s vision of life turns out to be absolutely the wrong thing upon which to base a science.

Why are the *umwelt* and science so thoroughly opposed to one another? The *umwelt* shows every indication of having been molded during our species' days as hunter-gatherers. It is built to understand a tiny piece of the world, as much as a caveman or cavewoman might explore on foot, and it is useless or even a hindrance in trying to do what modern scientists must, that is, understand a whole globe's worth of species. The *umwelt* also sees a clear vision of life, of a natural order, but it is a vision that knows nothing of objectivity, of evolutionary change over aeons, of rigor or hypothesis testing, and it cares even less. In fact, the *umwelt*'s vision of the natural order often stands in direct conflict with a scientific and evolutionary ordering of life. The *umwelt* is instead thoroughly sensuous and wildly subjective. It is the *umwelt* that could let a New Guinean hunter-gatherer see a giant bird as a mammal and a Filipino headhunter envision an orchid as a thumb. It is wondrous nonsense and perfect sense, glorious, aromatic, delicious variations on an ever-sounding theme, and it is absolutely positively not science.

The *umwelt*, I realized, had been science's invisible, unrecognized enemy, the most difficult kind to fight. It had been such a formidable enemy that it had kept taxonomists battling for more than two centuries. Science did triumph at last, however, jettisoning the *umwelt* and escaping from its unscientific and unevolutionary vision of life. I had, by chance, actually seen this happen. For the declaration by cladists that fish were no more was not just the latest revolution in taxonomy. It was science's trouncing and final abandonment of the *umwelt*. It was the victory of an evolutionary and scientific view of life, at long last, over that anciently perceived vision—one just swimming with fish!—that had for too long ruled the science of classification. The death of fish at the hands of the cladists marked the birth of taxonomy as a truly modern science.

EVEN AS THE UMWELT revealed where science's problems ended—in the death of the fish—it simultaneously revealed where the rest of ours began. For the same umwelt that had always been science's unseen foe had also been humanity's unrecognized ally. Science had triumphed with the jettisoning and the discrediting of the umwelt; but that triumph has turned out to be a tragedy for the rest of us, one that has brought us all to this very strange place where so many of us are wretchedly and profoundly disconnected from the living world.

Long before the umwelt ever birthed a science, it had served for countless millennia as something much more important: humanity's best and most intimate connection to everything that lives. The umwelt is more than just a view of the living world. It is and always has been a view of the reality around us, the context in which we understand who we are. By showing us a natural order, the umwelt, in essence, declares what *is* and what is *not*; it determines the boundaries of reality itself, the delineations in a living world, including who we ourselves are within it. The living proof of this are those people who have lost their umwelts, the brain-damaged patients who can no longer perceive the natural order in living things.

The first thing you notice about these people is how at sea they are. They have lost the ability to deal with even the simplest, most mundane tasks of life—sorting the vegetables in the produce section or knowing that it is the horse that people get onto and ride as opposed to the cat. Whatever lives is, for them, an unending mystery. Their struggles are the evidence that being able to recognize the natural order—from which we get food, clothing, shelter, and much of our enjoyment—is critical to surviving and thriving. What is most striking—and most tragic—though is that these people are more than just confused at the grocery store. They are deeply and profoundly lost, anchorless in a strange and confusing world. For they have lost more than a librarianlike ability to classify things,

to sort the broccoli from the bear, the dandelion from the donkey. These people, who have lost the ability to recognize the natural order, have lost a sense of what the world around them is, and, as a result, who they are in it.

Over the ages, people have understood the significance of the umwelt, if not consciously. That is why scholars from Aristotle to the twelfth-century German abbess Hildegard of Bingen to Linnaeus to Charles Darwin obsessed over the vision of their umwelt, spending years attempting to define and describe the natural order therein revealed. Humanity's earliest recorded thoughts are a literal zoo and garden of notes from the umwelt. The oldest known example of Chinese inscription, dating from approximately 2000 BC, is not a governmental proclamation, a love letter, or a treasured recipe—but a list of animal species. And what does the Old Testament tell us was the first thing Adam did in the Garden of Eden? God paraded the animals before him and Adam, the Bible's first naturalist, ordered and named the animals of the earth. Even before the first written history preserved our species' utterances, it preserved the vision of its umwelt. What dominates the silent world of cave paintings from Europe to Australia to the Americas? Visions from an umwelt, beautifully rendered: mammoths, reindeer, horses, bison, and wolves.

Adam knew what Darwin knew, what Linnaeus knew, what all children who collect flowers in the shadow of trees and follow ants and bugs about in grassy fields know. The umwelt and the natural order it reveals matter.

Yet, today, most of us have forgotten that a natural order even exists. We modern-day citizens of the world have abandoned our umwelt, that ancient vision of an order of life, without even realizing it. We have something else to determine what our vision of life should be, what the reality of the living world is, something else to which we routinely hand over the power to say what is and is not. So, what is it that now rules over our vision of life? Science.

That, I think, is why there has been an explosion in the publication

and purchase of field guides in recent decades, with well over a half million sold every year in the United States alone. We depend upon field guides not simply because we are hoping to understand living nature, but because we do not feel that we have really understood it—despite having seen, heard, and enjoyed it with our own eyes and ears—until we have verified for us by science what we *really* saw. Our deference to science and mistrust of ourselves is the reason for the ever-increasing number of interpretive centers. We need to have life—the life right before our eyes—interpreted for us, because we have reached a point where we believe we really can't see, hear, or understand it by ourselves. In fact, we've reached a point in the process where we don't even remember that there is any valid way, other than science, to determine what a living thing is or is not. I was at exactly that point when I began this book.

It is a curious effect that seems restricted to our understanding of the living world. Even though a physicist might know much better why a ball moves through the air in the way that it does, we don't consult with physicists when making an arcing toss of a basketball toward the hoop. Scientists might understand much better the dynamics of friction than any of the rest of us do, but we feel no need to involve them when deciding how hard to brake on our tires. No interpretive signage is necessary or wanted. Yet we hesitate at the sight of an interesting plant or animal. Wait a minute, we think, we'll need a professional to handle this.

Scientists have, over the years, come not to trust the rest of us, either. The ordering of life, today the domain of an isolated, esoteric profession, was once a much more democratic endeavor. As recently as the eighteenth and early nineteenth centuries, for example, it was not uncommon for someone we would today regard as an amateur to go into the wild and make observations, generate new ideas, and then present them at meetings and publish them alongside the most respected botanists or zoologists of the day. In fact, a few centuries ago, the amateurs were some of the most respected botanists and zoologists of the day. Today, regular folks

are rarely, if ever, allowed to participate in the upper echelons of scientific activity. Even that most democratic of mediums, the Internet, has not restored our faith in our ability to understand life, but merely provides us quicker and easier access to the scientific ordering to which we are all too prepared to defer.

It's certainly simpler in a way to let scientists deal with whatever ordering might need to be done, but it comes at a cost. We are so used to someone else being in charge of the living world that we have begun not to even see the life around us. When great scads of insistent wildlife appear with a flourish right in front of us, and there is such life always—hawks migrating over the parking lot, great colorful moths banging up against the window at night—we barely seem to notice. Even in that undeniable connection to the living world that every one of us makes every single day—eating—we seem less and less able to see that what we are eating is in fact the living world. We think of meat as a perfect red oval on a Styrofoam platter, not as the chunk of a big, snorting mammal that it is. Life is everywhere, always. The living world is, every minute, right before our eyes, and we are missing it all.

The cost may run higher still. We are at risk of losing the biggest thing of all: wild living nature itself. Life is disappearing, but we have become so profoundly disconnected from it that we are having trouble feeling, let alone doing, anything about it. We aren't even certain that it really matters. An area of rain forest half the size of Florida being destroyed each year? Yawn. Species going extinct at a rate 100 to 1,000 times the rate at which they were disappearing before humanity got involved? Double yawn. We can hardly rouse ourselves to care any more, so distant is the living world, so little does it seem to have to do with us.

So, how did we get here? And how—now that we find ourselves here—do we make our escape? This book is my attempt to answer these questions. It is the story of our journey—both scientists' and everyone else's—to this strange place, and a road map home.

I, for one, want my fish back. As it turns out, I'd had it right in



the first place, when I'd let my umwelt run wild in the woods of my childhood, where it showed me a world full of snakes, birds, and splashing, gorgeous fish. So, with all due respect to science, I must insist: Fish exist. For as much as we need science, and we very much do, we need our fish as well, perhaps more than anyone guesses. Those slippery, flashing swimming beasts—along with everything else that naturalists have perceived for ages beyond count—are at the heart of our connection to the living world.

Now, to the start of our story, the tale of our journey to this odd and too fishless place. We begin in the first days of the science of classification, a time long before the umwelt got the boot and long before our current cool detachment, a time when people were madly in love with the living world. And we begin with perhaps the most ardent lover of them all, the man who would set out to solve the greatest intellectual problem of his time, the ordering of the entire living world, and who would, in so doing, set our story in motion. He was Carolus Linnaeus, the man who would become the father of scientific classification, a believer in fish, zebras, moths, and everything else we have long perceived under the gorgeous, crystalline blue sky.

## THE SEARCH FOR THE NATURAL ORDER BEGINS