

Praise for *The Natural Navigator*

“*THE NATURAL NAVIGATOR* is a wonderfully stimulating book. Tristan Gooley sidesteps technology to celebrate our own powers of observation, and suggests that the art of natural navigation is something we should never have forgotten.”

—MICHAEL PAL

“THIS WONDERFUL BOOK takes the skill set back several generations ... to the vanishing (but often surprisingly simple) arts of navigating by sun, moon, stars, and natural phenomena... . A must for any lover of the outdoors.”

—TIM JEPSON, *The Telegraph*

“GOOLEY IS A fine writer with a philosophical passion for the subject, and he occasionally veers into areas that are perhaps not strictly within the remit of the book, but these are effortlessly pleasant diversions that add to the whole. His timing is strong, with anecdotes dropped in just at the right intervals to keep you turning the pages. His advice is at times glorious in its simplicity and fascinating in its execution.”

—LAURENCE MACKIN, *The Irish Times*

“A DEFINITIVE VOLUME on the subject.”

—PAUL GELDER, *Yachting Monthly*

“IN A SAT-NAV dominated world, where GPS and a host of other acronyms designed to get us from A to B have overtaken paper maps, it is refreshing to meet someone who understands technology, but prefers to find his way by practicing the rare and ancient art of using nature’s signposts, from puddle patterns to shadow length... . I’m hooked.”

—PAUL EVANS, *BBC Wildlife Magazine*

“AS GOOLEY REMINDS us, navigation is, first of all, about understanding where you are. His marvelous book is a good starting point.”

—MICK MERRON, *Geographical Magazine*

“GOOLEY’S CALM, CONTEMPLATIVE authority on matters solar, lunar, and celestial establishes his guru credentials—but it’s his revelations about the clues that lie scattered about the natural environment that really entrance: how puddles drying on paths, the shapes of sand dunes, the graininess of scree on the lee of a slope can all be enlisted to summon compass points to your horizon.”

—CHRIS BORN, *Time Out London*



BECAUSE EVERY BOOK IS A TEST OF NEW IDEAS

The Natural Navigator

Tristan Gooley

A Watchful Explorer's Guide to a Nearly Forgotten Skill



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For Sophie, Benedict, and Vincent

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PROLOGUE

Two Journeys

The idea for this book came many years ago and stemmed from a desire to launch a salvage operation. A fundamental human skill was disappearing, as efficient and ubiquitous technology came to dominate our understanding of what it means to find our way. I dreamed of creating a record of the skills of natural navigation, lest they be forgotten altogether. The idea evolved dramatically over the years, as I came to realize that not only was the rare art of natural navigation in danger of extinction, but that the modern world had misunderstood its potential entirely. Nobody seemed to regard what were once practical tools for survival as a contemporary art, but that is how I see it. An art, and one that is at its most beautiful and powerful when it is treated as exactly that, as something exquisite and profound, not a chapter of history or a series of tricks for the modern survivalist.

When I was ten we went on our summer holiday to Bembridge, on the Isle of Wight. At the end of a five-day dinghy sailing course, the instructor approached my sailing partner and me as we prepared our little wooden dinghy for the water.

“Where would you like to go today?”

The three of us discussed some options, casually, as though this was the most normal thing and then my sailing partner and I launched our Mirror dinghy and set sail. We were going for a picnic on the neighboring beach. I can remember sitting in that boat as we made our own way through the high seas of our imagination (the safety boat was tactfully out of sight). I was only ten years old, and somehow had garnered the skills to go wherever I wanted. Not where my teachers told me to go, not where my parents wanted me to go, but where I wanted to go. Heady thoughts indeed.

The journeys grew a little more ambitious over time and by my mid-twenties I had some basic experience of trekking, sailing, and flying a light aircraft. It was not the physical activities that were holding my interest, but the science and art behind the ability to go places—the skills that were allowing me to understand and shape journeys. This art had a name, I discovered: It was “navigation.”

As part of a desire to pursue my interest in this wonderful art, I decided to try to fly solo and then sail single-handed across the Atlantic. Seven very full years later (during which time I became a father twice over, and my work pressures sky-rocketed) I achieved this on January 1, 2008, and was presented by the Duke of Edinburgh with the Royal Institute of Navigation’s Award at the Royal Geographical Society.

This book is about a different journey, one that had taken place in the shadow of my more visible Atlantic excursions. It is also the more interesting journey.

In the midst of studying books at night about air law and learning how to find my way using radios I came to the awkward realization that the technical detail that was the stuff of my studies had little in common with a passion that had been within me since early childhood. It was an uncomfortable feeling, one that frustrated me. I loved going places—creating and experiencing journeys—long before I understood that the word “navigation” could unite my disparate interests. But it was the sense of connection that the journeys brought that really excited me, the contact with the world around me. I began to read as widely as possible on the subject of instrument-free navigation. My sense of frustration lifted as an alternative interest developed strongly alongside a conventional one.

In a bid to gain the skills to undertake the journeys I dreamed of, I had been forced into another

world, one as removed from my romantic impulses as can be imagined. A world of screens and bureaucracy, of checklists and never-ending acronyms. Over the years I became familiar with not only GPS but also AIS, ILS, ADF, NDB, VHF, DME, UHF, SSB, VOR, ASI, VSI ... the list seems to run on indefinitely. It was clear that this was a world I needed to understand, but not one in which I wanted to live. My future lay in understanding the natural side of journeys.

There was a sense of mounting exhilaration as I began to immerse myself in the subject of natural navigation. The world that around me came more alive than ever with the question, "Which way am I looking?" It acted as the key that could unlock the natural world. I quickly came to realize that it is not the answer that is all-important, but how we arrive at it, or even fail to arrive at it. For that reason this book will attempt to do more than answer the question, "Which way am I looking?"

There is a difference between finding direction and *knowing* direction. It is possible to teach someone a method of finding direction, accurately to within 1 degree, in under five minutes. They would have the practical knowledge to undertake a simple journey without a map, compass, or GPS, but that is all. They may have found direction, but they would remain disconnected from their environment.

The following chapters demonstrate how it is possible to find your way using natural navigation, but my primary aim is to give an insight into the beauty and possibilities of the subject. Natural navigation can be as much a mental journey as a physical one, and it is this that makes it a profound art.

The way we use our senses and mind to answer the question, "Which way am I looking?" can lead to thoughts, connections, and ideas that are as exciting as any journey that follows. You are about to catapult yourself into the top 1 percent of natural navigators in the world. Welcome to a very rare art indeed.

Tristan Gool



INTRODUCTION

The Art of Natural Navigation

When analytic thought, the knife, is applied to experience, something is always killed in the process. That is fairly well understood, at least in the arts. Mark Twain's experience comes to mind, in which, after he had mastered the analytic knowledge needed to pilot the Mississippi River, he discovered the river had lost its beauty. Something is always killed. But what is less noticed in the arts—something is always created too.

—Robert M. Pirsig,
Zen and the Art of Motorcycle Maintenance

Natural navigation is the art of finding your way by using nature. It consists mainly of the rare skill of being able to determine direction without the aid of tools or instruments and only by reference to natural clues including the sun, the moon, the stars, the land, the sea, the weather, the plants, and the animals. It is about observation and deduction.

Natural navigation is an ancient art, borne from an era when there were no alternatives. Any attempt to fully understand it must begin by looking back. The earliest journeys hold many mysteries. We know that they took place, since human beings found their way to every far corner of the globe, but there is very little physical evidence of them. Archaeological evidence can trace the routes but gives little insight into the earliest methods of navigating. A 13,000-year-old human femur has been discovered on an island off the Pacific coast of the United States that was separate from the mainland at the time of its owner's life. This makes it clear that humans were attempting boat journeys at the time, but does not begin to explain how they were finding their way.

Natural selection dictated that those animals and humans unable to work out a way of getting to where they needed to be in order to survive did not contribute to the next generation's gene pool. If the outward journey was not always critical, the return one was. There is no harm in going for a wander, but if the ability to return to food and shelter was missing, then that adventure may have proved fatal. Evolutionary theory tends to focus on the physical: as a general rule, the faster the animal, the better its chances. However, in the race for survival (as in all other journeys) speed in the wrong direction was a fast way to lose out. We now know that we exist in part because our ancestors learned how to navigate, even if we do not yet fully understand how they did so.

Ancient journeys can enrich contemporary ones, because the ancients learned to read their surroundings more skillfully than most modern travelers can. They have much to teach, but it is not laid out in ancient textbooks. Some of the pieces of the puzzle come from oral traditions or even the very earliest images etched in stone.

The myths of a particular culture connected its people with their surroundings, their past, and each other. Myths should never be totally discounted, because even if a story is not meant to be understood literally, the teller still must add a degree of authenticity in order to convince the audience. One way of ensuring this was by making the context in which the story was set as detailed and accurate as possible. The narrative of myths may be fantastical, but they are set in the world of their audience. The ancient Egyptian god Horus may not help us to navigate directly, but the myths that surround him illuminate the way in which the ancient Egyptians perceived the sky. Horus took the form of a falcon and his two eyes were the sun and moon. He had injured his left eye, the moon, and was sometimes

blind in it, but even when he could see it was always weaker than his right eye, the sun. This helps demonstrate the Egyptian familiarity with the moon's phases as it moved from an invisible new moon to a full moon. The sun has no such phases.

Myths were not conceived to assist the modern traveler, so the lessons in them are often hidden. Tales about characters like Perseus might seem to offer little to the contemporary navigator, but knowing that he rescued Andromeda from a sea monster can help make sense of the night sky—the constellations of Perseus and Andromeda are neighbors.

Religious texts are another ancient source. They exist either as a reflection of reality or an attempt to explain it, depending on your viewpoint, but either way they yield valuable information about early journeys, perspectives, and methods. The Koran refers to the use of rivers, the sun, moon, stars, landmarks, and shadows as means of navigating and even points readers to them: “Surely in this there are signs for men of understanding.”

The history of human navigation is mostly concerned with an attempt to answer the question, “How did people find their way?”, but a better place to start might be to ask, “Why?” Any motive for navigating is inseparable from our motives for travel in general, as navigation is one of the practical faces of travel.

Why Navigate at All?

The legendary Viking Erik the Red fled Norway with his parents in the tenth century following a murder and survived a crossing of the cold North Atlantic to Iceland. Unfortunately he was blamed for some violent deaths there, too, and so he moved on again, this time to Greenland. The name “Greenland” was chosen by Erik to entice the Icelanders to come to a land that was anything but green. Twenty-five ships set sail from Iceland to follow Erik to the new land. Eleven of them didn't make it there to discover just how optimistic the name Greenland was, but a colony was established. Nonetheless, Erik the Red is credited with opening up that land and the sea route to Europeans.

Violence on a grander scale than Erik's has been a motive both for great journeys and pioneering navigation. War and conquest have spurred nations on to epic undertakings. The hunger for new territory can be found behind many of the great expeditions, from the ancient Egyptian ruler Necho I (probably the pharaoh referred to in several books of the Bible), who wanted to see canals forced through land and sent ships to circumnavigate Africa, and on down to the European scramble for colonies in the late nineteenth century. The earliest journeys were probably often triggered by hunger and the struggle for survival. When the resources of a land fail, the choice for the starving population is to move or die where they stand. But the human story is one of an appetite that is hard to satisfy. One navigator might assist in the fight against hunger as she straps a chart to her thigh pad, climbs aboard a Hercules transport aircraft, and prepares to fly food aid into the Sudan. Another navigator tries to satisfy a different hunger by poring over the chart on the bridge of a container ship in the Chinese port of Ningbo, preparing to set out with a cargo of plastic toys bound for the United States.

One of our many modern conceits is to believe that the desire to travel to satisfy intellectual curiosity belongs to our era, but how erroneous this is. The ancient Greek Solon traveled to Egypt on a sightseeing trip, while the Roman poet Manilius wrote of his astonishment that people would travel to see art and temples rather than to stand and wonder at the volcano of Mt Etna.

Not every journey has a grand purpose. Rather, there is a strong human tradition of impetuosity, spontaneity, and adventure. The great natural navigators of the Micronesian island of Puluwat have long had a habit of getting drunk and then sailing to the neighboring island of Pikelot:

A minimum of equipment and any available food is loaded aboard and they depart, singing and shouting as they work their way across the lagoon and out of the pass, while their wives and other sober souls scowl their disapproval on shore.

Part of the motive for these sorts of journeys may be a temporary flight from responsibility. Who can honestly claim to have never wished to pack a bag and “get away from it all?”

Some desires are best admitted to even if they do not feature as openly around dinner tables as they might. For instance, that we travel for sex. Long before the Pacific explorers of the eighteenth century returned with tales of the beauty of the women and their generosity with their sexual favors, new lands have hinted at the possibility of sexual adventure. There is inevitably a phallocentric bias to our historical understanding in this area, but it has never been wholly one-sided. Inanna, the Sumerian goddess of sexual love, looked at her vulva and, being delighted with the power of her genitals, set out in a boat on a mission of sexual predation. She got the god Enki drunk, exhausted him, and made off with a boat full of the prizes she sought. This was not the last time such tactics have proved effective.

We travel not only to escape, consume, and copulate but also to think and create. “When I stay in one place I can hardly think at all,” wrote Jean-Jacques Rousseau.

Navigation is one aspect of travel, but our chances of getting the most from it are greatly increased if we question our reasons for each journey. Whether we are moved by hunger, thirst, greed, love, sex, war, philosophy, culture, or a desire to smell the sea, our motives will likely determine how much there is to be gained by looking at the world in a different way.

The Silent Revolution

Navigation has undergone a metamorphosis. There has been a silent, technical revolution in wayfaring.

Simple instruments like the kamal, a wooden card and length of string that helped to measure angles, began to appear a little over a thousand years ago. The kamal was the forerunner of the sextant which does no more than measure angles quite accurately. One of the earliest glimpses of the compass can be found in a French poem by Guy de Provins at the start of the thirteenth century. And so we witness the start of the process whereby an individual with previously valuable knowledge of the stars, the sun, the moon, and the sea itself is to be usurped by an “ugly brown stone” to which iron sticks. And now the compass itself is having its supremacy tested by the irrepressible rise of satellite navigation.

The history of the development of navigational instruments has been tackled elsewhere, and there is no need to dwell on it here. But an understanding of the seismic change in the relationship between the navigator and the natural world that has occurred with the development of increasingly sophisticated instruments is helpful when studying the role of navigation in a journey.

The impact of this revolution is given perspective by looking at the changing role of the navigator in society. The relationship between the navigator and their community reveals much about that society’s relationship with the natural world. In many societies there are cultural links between maturity and an ability to navigate. Young Australian Aboriginal men are expected to set out on a journey of some length as part of the rite of passage to adulthood. The acquisition of navigation skill is seen as a metaphor for the gaining of life skills and is marked in this ritualistic way.

In the Pacific, navigators were traditionally afforded an elevated status in the social hierarchy, not far below that of a priest. Their knowledge was passed down from father to son and jealously guarded. In a similar spirit to the notion of the one-eyed man being king in the land of the blind, pioneering navigators were probably able to choose their role, since they were the people who could enable

journeys and sometimes made new settlements possible. There is the legend of Nana-Ula, who led a huge expedition 1,000 years ago from Tahiti to Hawaii and later became the first king of Hawaii.

It is not surprising that in places like the Arctic, where life is fragile and nature harsh, any skills that improve the odds of survival hold an important place in the society. For the Inuit, “A good navigator is quietly revered, a poor one gently ridiculed.”

In our industrialized society, the navigator is in danger of losing the place afforded to those with valuable skills and becoming viewed as just one more machine operator. The job often disappears altogether as the task of navigating by computer is assimilated into a broader job: There are still pilots in the cockpits of aircraft who navigate effectively, but very few “navigators” left in these cockpits.

Why Navigate Naturally?

Natural navigation is one of the rarest arts on the planet, but it has not yet disappeared altogether. We tend to see it primarily in relation to our understanding of how earlier cultures looked at the world around them. There is something patronizing in the modern attitude to the way things were done in the past. It is common to encounter the notion that the degree to which the ancients were connected to the natural world indicates their lack of sophistication. This attitude reflects a peculiar modern illness. We consider our need to lead lives that leave no time for contemplation of our physical environment as superior, but in doing so we often fail to recognize what has been lost. The historical treatment of the subject of natural navigation helps the modern-day navigator to understand what is possible, but it is not where the subject should be confined. Natural navigation does not belong in a museum.

The second way in which natural navigation has endured is as a survival technique. There are very few books on the subject of natural navigation itself, but it surfaces in a superficial way as a few pages in the hundreds of books that cover survival skills. The approach in this context is nearly always ruthlessly pragmatic, for good reasons. The sun or stars are used to find direction, but any deeper understanding is not a priority. Survival is by definition a desperate and urgent business. By necessity, this approach strips out almost all that is fascinating in the subject. Survivalists are not going to spend time contemplating the ancient Greek astronomer Hipparchus or any arcane relationship that might exist between beaches and the moon.

However, the biggest drawback to the survival philosophy is that it is not relevant to most outdoor experiences. For every situation in which survival is at stake, there must be more than a million journeys of varying types in which the participants can enrich their experience of the outdoors through a greater understanding of nature.

Sometimes the subject is taught as a series of “tricks,” but looking at direction in relation to nature in this perfunctory way can rob us of the opportunity of connecting properly with it. There is a subtle difference between finding direction and knowing direction—it is sometimes possible to find direction using nature in seconds without feeling any great understanding of the natural world. To *know* direction it is necessary to have a more fundamental understanding of the world we move through. If the aim is to enrich an experience, then it is more important to understand why the methods work than to be able to use them. This is the defining difference between survival navigation and natural navigation.

Necessity is the force that shaped navigation methods, and for thousands of years the greatest need was improved safety. Navigation has always been connected to safety. We may conclude that safety remains the top priority in any journey, but we should not lose sight of the reasons for each journey. The aim might only be to reach the destination safely, or it might be to enjoy the challenge of finding

it.

There is an old joke about how most of us drive clapped-out, uncomfortable bangers all our lives, but then those very few who “make it” go out and buy a bespoke Rolls-Royce—only to hand the keys to someone else to enjoy the drive. Why, when the fun in a journey can be in understanding the world we move through, would we want to hand that all over to a GPS unit?

The best news is that it does not have to be a choice between safety and experience. It is now possible get the best of both worlds. Natural navigators can use nature to find our way without diminishing safety at all, and, if used responsibly, nature actually enhances safety.

There is a beautiful irony in all of this. The new technologies actually enable us to reconnect with nature in a way that might not have been possible 100 years ago. The fact that we now have navigational instruments to hand can provide us with the opportunity to take more notice of the navigational clues that nature offers. The land or sea, the sky, the feel of wind on our face can be given more attention without leaving the instruments at home.

A very common question is whether being able to navigate naturally is a necessary skill. Since it is quite possible to get through our daily lives without any knowledge of this most ancient of arts, the answer must be “no.” However, it is also true that we can get by in life without any knowledge of music, art, drama, or history. So a better answer to this question is perhaps that it does not matter if you are walking to the coffee shop or sailing across an ocean, natural navigation can provide a unique insight into the world around you.

Natural navigation is a skill for the present and future, not the past. It is an art for when things are going well much more than when our lives are in danger. For many, it becomes a “key to unlocking a fascinating text in the Earth’s rich library.”

Getting Ready

Familiarity is the foundation stone of all early navigation experiences. Very young children like to keep parents or home within sight and take comfort from recognizing clues to help them to find their way. As the child grows older, the distance from their comfort zone of home and parent to which they are prepared and able to travel grows steadily.

By the time of adulthood the process is so intrinsic that little thought is given to understand “how” it works. From a familiarity with surroundings, a series of associations develop, most of which are logical and useful: Living on top of a hill will quickly lead to the realization that a downhill path is unlikely to be the route home. But humans are also prone to making incorrect assumptions: We may, for example, conclude that a town is in the direction of some buildings we can see in the distance, whereas in fact it is in the opposite direction. Natural navigation is therefore about effectively combining observation and deduction. Finding a clue to direction is no good if it leads to the wrong conclusion.

We all learn to “read” our home areas as a series of recognizable landmarks, man-made ones like shops and road junctions to broader natural clues like where we are in relation to a river. There does not appear to be any bias toward either natural or manmade landmarks, only toward what works. We tend to shift our attention automatically to what seems to us to be the most effective clue, sometimes to the detriment of our understanding of previous ones. Some have attributed the loss of native navigational methods in North Alaska to the arrival of artificial but very effective landmarks like radio masts, towers, and other tall buildings. This point was demonstrated when in 1990 the authorities tried to take down some large radar installations. The local Inuit people asked that they be

left standing as they were useful landmarks, visible from forty miles away. This adaptability can also be seen in the animal kingdom: Bees look for patterns that they recognize, regardless of whether they are natural or man-made.

Here, then, is the first system for wayfaring without instruments. All we need to do is become familiar with the landmarks of an area and then remember where they are, relative to each other and our destination. There are only two real flaws to this method, one of which you will probably have spotted already. Landmark navigation only works on land and only if you are already very familiar with an area. The second flaw is that our perception of the world around us is subjective. We each develop a unique memory map of an area, which will vary significantly from that of any other person. Think how many times someone has given you directions in their local area that they seem to think are idiot proof: "... go over the hill, turn left at the pine trees and then it's second right after the house with the red roof ...". Was that undulation back there the hill, or is the hill still ahead? Are those the trees they meant and is that roof red or orange?

There is a way of describing locations that does not require familiarity and is not subjective, but a new way of describing places is needed to use it. In fact, it is a new language.

Taming Conventions

Every location in the world can be described in terms of its direction from a known point and the distance from that point. In order for this to work both parties must understand exactly where that known point is, how to describe direction, and what the chosen unit of distance means. Once those criteria have been met, there are no rights or wrongs, only what works. The international navigational language that has become most prevalent is to describe location by referring how far north or south a place is from the equator (latitude) and how far east or west it is from Greenwich, London (longitude). Direction is described by cutting the circle of all possible directions up into 360 degrees, starting at the direction of the "north," which means "toward the North Pole," and working clockwise all the way back round to it. This is the most widespread way of describing place and direction, but it is not a universal system. Many Muslims understand direction relative to Mecca, and many people think more locally, hence expressions like "I'm heading up to town" might easily mean heading south, not north.

The use of "degrees" is a common and useful convention, but one that can make a natural situation appear cold and mathematical. Degrees are normally measured by instruments, something we will not be doing at all, but the concept remains a natural one: 10 degrees is simply one thirty-sixth of a circle, whether it is measured by a sextant, compass, or an outstretched fist. An outstretched fist is a rough measure of 10 degrees for most people, since we share similar body proportions.

The conventions over distance are more convoluted, since the means by which distance is measured differs between nations to this day. But here, too, we find roots in nature. The "mile" stems from the Roman term "*mille passus*," denoting 1,000 paces, and the meter was defined by the French in 1791 as one ten-millionth of the distance from the North Pole to the equator, via Paris.

All of this just amounts to a language, a kind of shorthand for communicating directions and distances. There is nothing that makes any one method of shorthand inherently more correct than another. If you find it easier to discuss direction among friends in terms relative to a local landmark and to communicate distance using fruit, then not even the Royal Institute of Navigation can call that wrong. Birmingham is still in the same place if it is described as being 947,976 banana lengths in the direction of The Hound and Fox from the post office as if it is described as being 100 miles northwest of London, or 52.5 degrees north of the equator and nearly 2 degrees west of Greenwich. The truth is

that most people find the latter two methods more meaningful, which is how conventions become established. ~~The conventions are only a language that is meant to make life easier, but learning a new language is often daunting and can make navigation seem foreign, even when a lot of the concepts are natural and simple.~~ The same is true of other areas where conventions have grown up, like astronomy.

Memorizing the names of stars does not make them any more beautiful. Constellations do not exist except in our imagination, so it is an entirely personal decision whether we adopt the conventional names or give them our own ones. Take the star Castor in the constellation Gemini. Is it just that, a star in a constellation? Or is it the mortal son of Tyndareus, brother of Helen of Troy? Is it a sextuple star system that is fifty-two light-years from Earth? Perhaps it is a “beaver,” since this is what “castor” means in both Greek and Latin? Of course it is all of these things and many more, depending on the viewpoint we choose.

As with so many human skills, the art of navigation has become arcane through convention, which is a shame. It is a wonderful subject, and one that is so very relevant to our lives. It would be so much more accessible and therefore, probably, popular if it were not so shrouded in technical language. Most of what is popularly described as “exploration” these days has more in common with navigation than exploration. Exploration captures the imagination of so many because it is seen through powerful images and gripping narratives, but the art that makes these adventures possible is navigation.

Wherever I have used the established conventions in this book, it is because they stand the best chance of being meaningful, not because they represent the beauty in the subject. Natural navigators should feel free to translate these conventions into the language they find most comfortable—banana or anything else.

The first stage in becoming a natural navigator is to master observation, and the first lesson in this area is that observation is not all about the eyes. And even when it is about the eyes, there is more to than meets our eyes.

A Sense of Connection

The natural world is a dull place. Another furry creature appears before us on TV as the monotone drawl of a commentator waxes all over it. A boat moves lazily through endless blue water beneath a hot bland sun, and the crew play cards and sweat tedium. Homogenous trees fly past a car window. And then, in an instant, everything changes.

The air squeezing in through the thin gap in the car window brings with it the unmistakable scent of the sea; we are approaching the coast, memories of childhood car trips flood our minds, and nostalgia pushes us to gaze out through the window. We grasp at memories of chewing sand in sandwiches as our eyes meet those of a deer for a second. It holds our stare and then flees.

There is another splash; it comes from the bow of the boat, but is different from the other watery sounds and so we race forward with the rest of the crew and find a porpoise playing off the bow wave. As we step back we notice the albatross circling high above the boat and someone warns us that we will suffer the torment of the Ancient Mariner if we do not respect the bird.

Our fingers reach for the remote control as we spot a strange shape on the leggy spider, red emblem an hourglass. We recognize the shape and pause before switching channels, long enough for the commentator’s voice to come to life as he growls excitably about the black widow, its venom that can paralyze and suffocate us. He continues, explaining the female’s habit of killing and eating her partner after mating. The synapses fire. Our imagination goes to work. The natural world has ceased to be a dull place.

The pressure on our time leads us to compartmentalize the things we observe in the world around us, but this habit cuts us off from the richness of detail in our surroundings. It makes us less aware.

Learning to navigate naturally forces us to reexamine the ways we connect to our physical environment, how our senses are pivotal to effective natural navigation and how they in turn define our experience and understanding. Sensual awareness is critical to finding our way without instruments, but it is also important if we do not want to be denied some of the texture of a journey.

Over time, the natural navigator comes to use the senses intuitively. American explorer and sea captain Edmund Fanning awoke suddenly in the middle of the Pacific, in the middle of the night, rushed on deck, and ordered his crew to heave-to. It was not until the following morning that they realized this had saved them from a reef less than a mile away. Fanning had felt the proximity of the reef through the action of the water.

It is easy for those of us who are not blind or partially sighted to take the sense of sight for granted. Our eyes feed far more detailed information to our brains than we can possibly process and so a filtration takes place. Our brain sorts through the visual information, tries to make sense of it, and allows us to focus on what seems most important. This has been honed by evolution: Our brain and eyes will work quickly together to spot and identify a prowling tiger before spending time to analyze the colors of a flower. It is efficient, but it is not perfect for two key reasons. The first is that there are biases in our view of the world, often psychological, and probably driven by evolutionary necessity. These biases manifest themselves in what we notice. We are much more sensitive to shape than we are to color, for example. We will notice the path curving away in front of us, but fail to spot the subtle shift in hue from one side to the other.

The second reason is that we are no longer primarily concerned with survival and so it is often necessary to unlearn our instinctive response to the world we see—we don't need to focus only on perceived threats. The modern natural navigator must stop, look and think about the environment in a way that even our most naturally astute ancestors may not have done. Very little of nature is entirely random, but it can appear complex and chaotic, and so the challenge is to study this complexity and look for patterns that provide clues.

This need not be an arduous process and once accustomed to looking for detail it is a habit that yields its own pleasures, as the explorer Frederick Cook discovered:

The clouds were at first violet, but they quickly caught the train of colors which was spread over the sky beyond. There were spaces of gold, orange, blue, green, and a hundred harmonious blends, with an occasional strip like a band of polished silver to set the colors in bold relief. Precisely at twelve o' clock a fiery cloud separated, disclosing a bit of the upper rim of the sun.

The pioneering Australian navigator Harold Gatty referred to the smells of rosemary off Spain, peat off the Falklands, and orange groves off the islands of Cape Verde. It is something that all sailors who have spent time away from land will have experienced. There is a well-known connection between smell and memory, which is made more poignant by the fact that our sense of smell peaks in middle age and then deteriorates as we get older. Alert and focused humans will still only manage to sense a very limited olfactory world, "like color-blind men gazing at a painting full of subtle nuances of color." But even within our human limits, it is too easy to let a wealth of detail pass by. This is partly about sense and partly about deduction. If we are on land and smell the sea, the typical response is limited to a general positive reaction, "I can smell the sea!" If we tune our senses and try to make a more detailed deduction we might note that there is a strong whiff of seaweed in the sea smell, which denotes that it is likely to be low tide: The seaweed on the beach has been exposed to the elements. The very fact that we are smelling it indicates an onshore breeze, very possibly a sea breeze. This in turn suggests that there may be a wind direction reversal to a land breeze as the day ends and the night

cool draws in. “I can smell the sea” becomes “I suspect that I know what the wind and water are doing!”

The human ability to use smell to understand territory is weak compared to most animals, but not nonexistent. We might come to know urban areas relative to the most striking smell signposts, such as a sewage works. There is a street market on North End Road in west London that sells a lot of fruit and fresh produce. This may be what attracts the seagulls in such numbers. It leads to an unusual sensory map of the area that includes the sight and sound of the gulls, but the street itself smells different at different times of the day and year. Early on a winter day there is no way of telling how close you are to the market by smell, but late on a summer day the scent of overripe fruit that has been trampled on the roads and pavements carries several hundred yards downwind.

This relationship between temperature and smell can be used in a rural context, too. There is a distinct difference between the smell of open country and woodland, and this can be used to find your way out of the woods if you pick it up on the breeze. It is also occasionally possible to find an opening in woodland from temperature and smell. If the sun is bright and the wind light, but not still, then very occasionally it is possible to sense a pocket of slightly warmer air that is richer in smell. This is when the opening in the wood has allowed sunlight in to warm the vegetation and create a stronger smell.

In wilderness areas the most unusual smells will be a clue to humans, other animals, or changes in the environment. The desert smells very clean until humans, animals, or water are introduced, all three often coming together at an oasis and giving off a relatively strong smell and the buzz of thousands of flies. Our taste buds are most sensitive to sweet, sour, salt, and bitterness. Nearly everything else is determined by our sense of smell. Different meats taste the same if we hold our nose, and so it is best to think of the two senses, taste and smell, as working in tandem. It is possible, with care, to tell whether a waterway is freshwater or tidal seawater from its salinity. If you are following a stream hoping to emerge from the wild nearer the coast, then this may be of some help.

Horace Beck, the American collector and author of nautical folklore, tells a wonderful story of an old sailor who could reputedly tell where he was by tasting the sounding lead after it had been hauled off the bottom of the seabed. On a foggy day the crew decided to trick him, and when he was not watching they dipped the lead into some hen manure and passed it to him:

First he looked at it, then he smelled and finally tasted it. He became very excited and shouted, “Luff up, boys, luff up! Something’s terrible wrong! Accordin’ to the lead, we’re in the middle of Mrs Murphy’s hen yard on Smith Island!”

Sounds form an integral part of a landscape and journey. The best evidence of our ability in this area comes when we learn from those who have been deprived of the sense of sight. Blind people use a cane stick for the sense of touch, but also to gauge echoes. The effectiveness of echoes is easy to test for ourselves, even without the refined awareness that long-term blindness brings. On my courses I ask a volunteer to walk in silence, with their hands behind their back and their eyes shut, toward a wall until they feel uncomfortably close. Next I ask them to do the same thing while making a constant noise, “*la-la-la-la-la*.” They typically manage to get more than a foot closer to the wall when making the noise. This is of course the principle behind radar and echo sounders, but it has been used in a practical way long before that. The timed echo of a whistle in Puget Sound was used by the navigator in fog to gauge how far the cliffs were. The timbre of the echo gave clues as to the exact bluff or cliff off of which it was bouncing. A variation of this method has been used by explorers in polar regions to gauge the thickness of ice, as was noted by one of Captain Robert Scott’s polar companions, Apsley Cherry-Garrard, in the Antarctic: “We sounded all about and everywhere was hollow.” Ben Underwood, who lost his sight to retinal cancer at the age of three, learned how to walk and even rollerblade around his home area, inside and out, by using echoes. He was totally blind, but he could

point to cars or dustbins in the street from a distance by picking up their echoes from the clicking sound he made with his mouth. He could even play table football and video games by understanding the sounds better than others.

Another beautiful example of using our ears to navigate comes from British army officer F. Spence Chapman's experiences with the Inuit in Greenland. He watched them navigate their way in kayaks along the coast in fog, using birdsong to identify where their home fjord was.

Buoys with bells have been used for centuries to help mariners in fog. The criminal mind of the wrecker worked out a valuable, if morbid, source of income. They would row out to the buoys and damp them by stuffing a rag into the bell, then lie in wait. The ship's crew would listen nervously for a bell that had fallen silent before the ship foundered on the shore and the wreckers could pick it clean.

On land the sound of water may mean a river is near, but it might also be able to reveal something about the shape of the land itself. Water flows downhill, of course, but sound does not travel well through the ground itself. The sounds we hear will be determined by our height, as well as the contours of the land around us.

Sounds carry differently over varying surfaces, both in distance and quality. The sounds that we make change on differing surfaces, too. Our footsteps can reveal clues about the moisture of the ground we walk over. A simple "squelch" can yield clues about the orientation of a path.

The Australian Aboriginals have long used their ears to understand journeys in a unique way. Their "songlines" mapped the territory around them in a series of songs and stories, some of which are still in use today. Each part of a song corresponds with an important landmark, such as a ridge or source of water. By recalling the right song the land can be navigated with greater familiarity and, thanks to the sense of hearing, the memory and experience of their journeys lives on beyond their destination.

The sensations of the ground underfoot have always been a delight for sailors returning to shore, but also for those who have been on the ice for too long. Robert Scott felt this acutely: "A lot could be written on the delight of setting foot on rock after fourteen weeks of snow and ice and nearly seven months of sight of aught else."

The contrasts are often much subtler. The difference between one side of a ridge and another may have been generated by millions of years of erosive forces, but that may only translate into the tiniest change underfoot, from a coarse to a fine scree. There are some paths that feel different on each side, despite looking identical. These paths might have one side that is more exposed to the prevailing wind than the opposite side, thinning the soil and making it feel harsher and more "gravelly" underfoot. When there is a harsh ground frost the sense of touch can sometimes help, even in pitch darkness. Paths are usually marginally higher or lower than the surrounding ground, and when warmer daytime breezes come to thaw the ground, paths tend to retain or lose their frost at a different rate from the ground on either side. It is sometimes possible to follow a lower path, in the dark, by keeping the crunchy feel of frozen grass underfoot.

It is not always what we can feel, but what we cannot, that triggers our senses. The Antarctic explorer Frederick Cook sensed danger in stillness. When we become accustomed to a sensation, like a biting wind, its absence can make us uneasy, a prompt for us to be alert to the fact that something in our environment has changed.

Not all sensations are external. We are more likely to be able to understand where we have traveled if we walk it ourselves than if we are carried—even if we are deprived of all our external senses. The feeling of muscle contractions can give clues about direction and distance. This "kinesthetic" ability is something that we have all experienced in a general sense: We can tell the difference in feeling in our legs between a one-mile walk and a ten-mile one, but it is not something that we give as much

attention to as we might.

When important natural clues like the sun disappear, then the senses must be relied on to their fullest. If the sun vanishes behind clouds, it does not mean that all trace of it has disappeared. It is possible to “remember” where it was by touching two sides of a large boulder. One side will retain warmth for a long time after the sun has gone in, the exact length of time depending on the type of rock.

Although not one of the five senses, time is integral to navigation. Most of us will have proved to ourselves that it is possible to sharpen our natural awareness of time. Everyone who has gone a few weeks or months of their lives without wearing a watch will likely have noticed that their “inner clock” starts to run more accurately.

Experiments going back to 1935 have demonstrated this ability. Humans deprived of all external time clues are able to gauge time accurately with only about a ten-minute error per twenty-four hours. Our ability to gauge time using external references like the sun is therefore a lot better than most of us imagine. More recent research has found that our ability to gauge time alters with age. Our perception of minutes, days, and months changes as we age, but they also feel different to us as we grow older. Our time on this planet seems to shape our understanding of time itself.

Time is part of nature. Units of time are only definitions of natural phenomena that occur in those parcels. A second was defined as 1/86,400th of a day ($60 \times 60 \times 24$) and then measured using a 39-inch pendulum. Time is meaningless without natural phenomena.

There is evidence of water clocks being used in Babylonian times, and a sundial could be found in the forum at Rome from the third century BC onward. The sundial had its grandest moment with the erection of a seventy-five-foot-high one by Augustus in the first century AD. It now stands in the Piazza di Montecitorio in Rome. Use of the sun to gauge time can still be seen in cultures that do not rely upon modern technology. In the Kalahari Desert, members of the Gwi tribe measure time in days and fractions of days by pointing to where the sun will be at the time they mean on the day in question. The people of the Mursi tribe in Ethiopia count days between planting time and the harvest by tying knots in a cord around their ankles. This type of technique is of great interest to the natural navigator because of the relationship between time and distance. Modern walkers still measure distance using time. The question, “How far is it?” from one walker to the next is often answered by, “An hour.” Rather than, “Three miles.” Sailors have traditionally talked in terms of the number of “days’ sail.” Scott used a combination of time and knowledge of his animals to mark distance in the Antarctic: “We are at Number Fourteen Pony Camp, only two pony marches from One Ton Depot.”

There is an important aspect to the consideration of time for the natural navigator that is more philosophical than practical. In the Pacific, the traditional oceanic navigators would aim to arrive at any new island in daylight unless they knew it intimately. If there was any risk of coming across land unexpectedly at night they would heave-to and wait for dawn the following morning before continuing. This is not a concept that the contemporary Western mind has to tackle very often. Imagine driving to a friend’s house, but when it gets dark more quickly than you expected it to you park by the side of the road, go to sleep, and continue the following morning.

Learning to understand nature takes time. It is not something best approached with firm schedules or a particular deadline. Natural navigators will regularly set out hopeful of returning with some new knowledge in one area and return with something else, which they had not been seeking. Perhaps it is near the summer solstice, and you set out early in the morning to watch the early sun, thinking that it is a good time of year to get a feel for its bearing. But you return, late, having been waylaid by thoughts about a spider’s web in the lee of a gatepost.

A lot of the enjoyment of the subject is to be had in lateral thought and mental detours. This is helped enormously by an old-fashioned approach to time. It is much better to go for a walk that happens to take half an hour than to go for a half-hour walk.

It is time for us to take the first steps.



CHAPTER 1

Vale and Dune: The Land

The most common method for finding direction on land relies on the traveler's familiarity with the landscape itself. This is known as landmark navigation. Young men of the Tuareg, a Berber nomadic people who are the principal inhabitants of the Sahara Desert, tend goats from a very early age. They are given clear guidelines as to the range within which they and the goats are allowed to go. This area is then extended steadily in order to mold the herders' instinct. Over time, they learn to find their way over a large area without any formal training in the art of navigation. A very similar method of learning is experienced by all of us as we come to know our own home area. All of us make countless routine journeys each day, and the methods we apply in navigating our way through known territory can equally apply to journeys made through unknown lands.

An important childhood lesson is that getting lost is not much fun. From ancient wilderness to supermarket aisles, few people have reached adulthood without some memories of being disoriented and the accompanying fear. At the heart of this experience is the realization that if one strays from family or ventures away from home, one needs to be able to get back. This is one of the simplest of navigational philosophies: If you can find your way back safely, knowledge about the direction of the outward journey is a lot less critical and can often be dispensed with.

Learning this forms a fundamental part of human development, and is woven into our culture. Children grow up with tales like that of Hansel and Gretel, the two children who become lost in the woods and are captured and fattened up by a cannibalistic witch. The story delivers a strong moral: Getting lost can end in terror. Knowing that there is a need to get back is not enough; it is the ability to find the *way* back that is crucial. Hansel and Gretel were aware that they needed to be able to find the way home, but failed because the trail of breadcrumbs they left behind them was eaten by the birds.

Age brings with it experience and greater abilities, but the challenge remains. The stories that adults enjoy continue to reflect our fear of being lost. On the island of Crete the Minotaur, a half-bull, half-man monster, lived at the heart of a complex labyrinth. Each year Minos, the king of the island, demanded that the Athenians feed the Minotaur seven boys and seven maidens to avenge the death of his son at their hands. One year the Athenian hero Theseus decided to put an end to this and asked to be delivered to the Minotaur as one of the sacrificial boys. He made his way into the labyrinth and successfully slew the Minotaur. If Theseus had acted alone this may have been the end of him as well as the monster, since this was as far as he had planned. Fortunately, he had an accomplice. He was able to escape the labyrinth and survive only because the princess Ariadne had shown him how to find his way back out of the maze by following a thread she gave to him.

The woods of childhood become the Cretan labyrinth, and the breadcrumbs become the thread, but the moral—and the fear—remain.

If myth and legend help illustrate the perils of getting lost and the importance of navigating the return journey, they are less effective at demonstrating any practical and effective methods of retracing the same route.

A more practical method than leaving thread or breadcrumbs is to in some way alter the landscape itself. Trail blazing is the process of marking a path at various points, creating markers that then assist on the return journey and on subsequent visits. This takes many forms, from leaving chalk markings to broken branches. Signposts are themselves just highly evolved trail blazes.

In most areas of open country it is possible to find evidence that those who have gone before us have subtly changed the appearance of the landscape. The Inuit in the Arctic left *inuksuit*, mounds of stone, to indicate good hunting areas and also a guide to the safest way home, while Captain Scott did the same in the Antarctic. Cairns have been used by the American Indians, the nomads of Mongolia, and across the mountain ranges of Europe, America, and Asia. In one of the many incidents that lend authenticity to Cormac McCarthy's postapocalyptic novel, *The Road*, the protagonists come across cairns that have been left by survivors fleeing a dying town.

At other times and places a different solution might be used. The Aboriginals of Australia traditionally lit spinifex grass fires that indicated the way from a considerable distance. When you drive along a straight road in Europe, it is possible that it is an old Roman road, built with the help of fires to signal the route. Trail blazes, cairns, and fires have been set up to stand out from nature, to become visible against the landscape around them for a good reason. Finding direction by reading the land can be difficult and even dangerous. Today's travelers are fortunate in that modern instruments have allayed some of that immediate danger, but in many ways modern navigational tools do not make the task of reading the land easier; if anything they have made this much more difficult by conditioning the traveler's focus away from the land itself.

A compass contains no information about the landscape its owner is moving through. Satellite navigation maps strip out much detail, sometimes leaving only public roads in their reds, yellows, and greens against a banal beige. This is only the latest in a long cultural development, from Greek philosopher and geographer Anaximander's first map of the world, created in 550 BC, that has proved that it is possible to convey information about the location of a place without the need to convey a sense of the place itself. This has been a powerful development, but its very success has led to a strangely limited perspective of the world and the journey itself.

The largest scale map becomes featureless in the world of sounds, temperature, textures, colors, and smells. This may lead to a belief that these features are irrelevant to a journey. Perhaps we even cease to believe that they exist.

On May 17, 1984, Marvin Creamer sailed into Cape May harbor in New Jersey, having completed a sailing circumnavigation of the world without the assistance of navigational instruments. He would seem an unlikely person to think of in relation to the land, but his understanding of the natural world was shaped early on, when his feet were still dry, and must have helped foster a fascination in the methods he would later use very effectively at sea. Early in his account of the voyage he writes:

Farm life for a growing boy was fun. Chirping frogs told you when it was time to get rid of long underwear, the throbbing call of the Whip-poor-will beckoned you to shed your shoes and feel the freshly turned earth between your toes. The sequent blooms of arbutus, violets, laurel, lady slippers, honeysuckle, and magnolias provided a calendar guide for closing school and getting plants started for the summer's crops.

Navigating naturally on land is about reintroducing a childlike curiosity to the journey. It is about learning to take note of the things that do not always appear on maps and sensations which are not easily recorded. It is about reconnecting with the land, and in doing so, keeping at bay the feelings of bewilderment and fear that getting lost can bring, on the outward journey and the return one.

Reading the Land

There are two key foundation stones to reading the land. One is learning to interpret the effects of sun, wind, and water. The other is gaining an appreciation of the importance of scale.

Useful clues can be on a distant horizon or just inches away. This means that it is necessary to keep the senses scouring, shifting focus constantly, which requires conscious effort, but yields plenty of rewards. The natural navigator puts more into a land journey than other travelers, but returns with a basketful of observations and sensations that pass others by: the valley that comes to life with the sound of water over rocks being carried by a breeze—all of this has been felt, has been understood.

The effects of sun, wind, and water are ubiquitous. Sometimes it is obvious: the outline of the coast seen from a hilltop. At other times their effects are harder to glean—the infinite number of subtly different shades of bark color. This is where science and art meet, at once tantalizing and frustrating. However hard it might be to decipher the complex information being delivered by our eyes and other senses, it is crucial to remember that within a seemingly random series of events, there will almost certainly be some order, some beautiful, if hard to fathom, logic to it all. All living things rely on the sun and water, even if indirectly, and if their behavior does not reflect the need to harness these two elements, then their chances of survival are lower. Keeping this in mind and using all the senses can help solve many enigmas. A tree on the edge of a city park growing in a way that appears confusing initially may start to make sense when the sunlight bouncing off the tall mirror-glass building on the other side of the road is felt on one cheek.

HILLS, ROCKS, AND RIVERS

The search for distant and closer clues should start from the best position possible. This usually means finding the highest vantage point and then looking all around, as well as up and down. A good view will help to form a picture of the shape, the patterns, and grain of the land itself. Studying the land will reveal whether it consists of flat open plains or gentle undulations, or perhaps steeper, more dramatic rises and falls to the Earth's surface. High ground will tell a story of geological formation and erosion. In the south of England there is a range of hills called the South Downs, mounds of chalk that have determinedly weathered erosion over millions of years. They form a range that runs broadly west to east, near parallel to the south coast. Once this alignment is understood, one can make simple deductions. If the sea can be seen, then there must be some south in the view, but if the land slopes away continuously to low country it must be close to north. To the east and west the ridge continues across rolling summits without losing height. I use this example to demonstrate how it is possible to learn the characteristics and features of a range of hills, to read their text. Some, like the Biligirirang Hills, in India, follow a very straight line, others are more sinuous and therefore present more of a challenge. It takes time to become familiar with a new range of hills, but they all yield their secrets eventually. When they do, it can become possible to walk a long way in a chosen direction with no other aid.

The shape and alignment of hills and valleys can yield directional clues, but the character of the hills themselves can also be influenced by aspect. The southern side of any range of hills in the northern hemisphere will experience a greater variety of temperature than the northern side. In winter the southern side of a hill may go through repeated frost and thaw cycles, while the northern side, hidden from the warmth of the sun, remains consistently frozen. In mountainous regions like the Alps this difference is drawn by the varying heights of the snow line. This leads to greater erosive forces on the southern side, often giving it a different look and feel.

On a smaller scale, burrowing animals like moles tend to prefer damper, softer, more malleable mud that can be found on the shaded slopes, and this can lend a darker, rougher appearance to one side of a grassy hill. Sometimes the general effect is detectable from a distance, but the detail can only be seen close up. In the summer in particular, shaded areas retain moisture longer: A grassy slope that

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