

# To Search and Search Again: On the Practice of Environmental Research

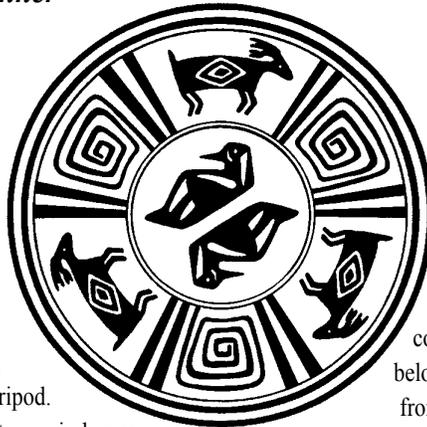
*Thomas Lowe Fleischner*

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the same source as good love and  
good art: passion for the process.*

**D**awn has not yet arrived; I scurry in the darkness along the edge of a large embayment in Northern Puget Sound. A large pack on my back holds a variety of field biology tools: standard ones, such as notebooks and a spotting scope, and odd ones, like a video camera and tripod.

Binoculars, a stopwatch, and a light meter encircle my neck. I am not far from town, yet at this hour no one else strolls the shoreline. Armed and dangerous, I am ready to record and measure anything that moves. Like any good warrior, I focus on but a single quarry: the harlequin duck, *Histrionicus histrionicus*. Although beauty radiates spectacularly from this sea duck, few scientists have ever studied it. Little is known about basic elements of its natural history. I am here this dawn to capture on film its habit of reappearing at the shore after receding into the further reaches of the bay each evening. Where does it go at night? When does it return? Does it come back at the same point in the breaking of dawn each morning?

This morning, my vigilance is rewarded with a rare view of true harlequin romance. Copulation, to use the biologist's austere term, had been observed only a couple of times previously. No one knew at what stage of its unusual migratory cycle male and female joined in partnership. Here, in this gray saltwater dawn, I watch intently as a male and female skitter across the surface of the bay from different directions, "head-nodding" furiously, chattering their squeaky call notes continuously. The water trails left in the wake of their passion form a giant arrowhead—one slanting in from the left,



the other from the right. At the point where they meet, love flashes forth in a salty, feathery, floating tumble that lasts but a few seconds. Then, shaking water from their multi-colored heads, they part pathways, dive below the surface, and eventually disappear from view. The harlequins' reward is love; mine is to gather information.



Another time and place. I am deep within the sandstone layer cake of Cedar Mesa on the Colorado Plateau. I have traveled several days with a group of students as we have attempted to grasp a few of the many lessons offered by this land of red stone, blue sky, and stunning silence. We are at our deepest camp, furthest from the fossil fuel contradictions at the trailhead. During an afternoon of independent study time, I wander alone downcanyon and find an anomaly in the habitat—one which has an obvious cause. Terrace to terrace, the canyon is absolutely lacking in vegetation. Fresh hoofprints spiral in all directions; dust rises into the air. Only limited tracking skills are needed to determine that a large herd of cattle has recently departed. The barren soil and cowpies are nothing new. Throughout the Southwest, in every ecosystem type and at every elevation, we encounter them. But here, among Anasazi ruins and polished slickrock walls, they somehow feel worse. To use the scientific terminology, I feel pissed off. I want to do something. By coincidence, I have just been invited to speak

at a conference of ranchers and range managers about my research on the impacts of livestock in arid regions. Amid the stench of fresh dung, and the dust of a once-green streamside, I commit.

Three months later, I stare at a roomful of hostile eyes as I make my first public presentation on the effects of grazing on biodiversity. The question and answer period consists of neither questions nor answers—just lots of angry shouting and no opportunity for me to respond. This experience initiates me into the highly politicized world of range ecology research.

I had spent four years of my “spare” time engaged in the work behind this presentation. For countless hours, I crouched over obscure papers, trying to glean what had been learned about the effects of livestock upon arid landscapes. I sought to be the shuttle that wove together the literatures of several professional fields that should, but do not, interact: range management, conservation biology, wilderness management, plant ecology, geomorphology.

All of this solitary deskwork culminated in a single article, a mere fifteen pages long. With the exception of a few public presentations, all this work occurred indoors and absolutely alone. No other people, no beautiful animals, no leafy plants offering shade.



These are but two snapshots of environmental research. The word “research” conjures up images of bespectacled men with serious expressions, wearing white labcoats, holding test tubes up to the light for inspection. In fact, a small portion of environmental research does involve test tubes and labcoats. But it also includes chasing seaducks at dawn, scouring obscure treatises in solitude, and a thousand other acts.

Just what is environmental research? The word “research” derives from the French *cherche*, “to search.” “Environment” derives from Old French *environer*, “to form a ring around.” To conduct environmental research, then, means to search again our encircling ring.

This re-searching encompasses a healthy diversity of approaches: everything from keeping track of backyard birds to analyzing marine mammal tissue in a gas chromatography lab; from studying the effects of vibram soles on nitrogen uptake in plants, to chatting with indigenous elders

about dryland farming techniques. The encircling ring of our lives—the environment—consists of limitless relationships between humans and nature. Environmental research can pluck at any of these connecting cords.

Research typically comes laden with a bundle of implicit assumptions: it should be logical, quantitative, objective, and it is best done by highly trained specialists. Here, I offer a few simple cautions on these assumptions, as we seek to search and search again.

**Beware Logic.** As much as textbooks would have us believe to the contrary, the hypothetico-deductive method (“scientific method” in common parlance) is not used as literally and straightforwardly as legend would have it. Rather, as W.I.B. Beveridge pointed out, this type of metaphorical thinking—more akin to poetry than engineering—is often used to help us make the mental leaps necessary for scientific discovery. Although the method seems clean and linear, in actual practice it is less orderly than one might assume. Imagination is as important an ingredient in the scientific method as the linear thought of hypothesis testing. It is interesting to note that the scientific method of testing hypotheses was originally described by philosophers of science (most notably Karl Popper), not by scientific researchers themselves.<sup>1</sup>

My point is not that the scientific method is invalid, merely that it is only one method of searching. To search and search again often requires shifting perspectives. As Gary Snyder once phrased it:

*If you climb up  
one floor  
You'll see a thousand miles more.*<sup>2</sup>

**Beware Measurement.** Barry Lopez contrasted the methodologies of Eskimo hunters and Western field scientists as they attempted to understand Arctic animals. The Eskimo's methods, he pointed out, are less formal, but no less rigorous. The native hunter typically spends far more time observing his study subjects than does the academically trained scientist. As well, the Eskimo tends to be reluctant to extrapolate from an individual animal to generalize about all of its type (“Caribou do this ...”), whereas the Western scientist seeks exactly those generalized patterns, albeit based on less intimacy with the individuals.<sup>3</sup> Why is the hunter's

method often dismissed as anecdote while the scientist's is consecrated as "research," and thus granted the respect of society?

Another obvious difference between the methods of hunter and data-gatherer is the latter's emphasis on quantification. Over the past half-century, the convention of ecological science veered toward believing something only if it is represented by numbers—and the more manipulated the numbers, the better. Quantitative description came to preside over the "merely" qualitative. A quick perusal through back issues of the research journal *Ecology*, for example, shows a dramatic growth of numerical description, statistical tests, and the use of calculus and other mathematical modeling tools to describe the interrelationship between organisms and their habitats. The problem is: does quantification ensure accuracy?

Confusion of precision and accuracy permeates many aspects of our culture, including all sciences. Consider for a moment the difference between a digital watch and an old grandfather clock. Most people would agree that the watch is more precise—4:29:34 is specific, more so than a sweep hand could ever be. But precision need not have anything whatsoever to do with accuracy. While the digital watch precisely declares "4:29:34," it may, in fact, be midnight.

Our culture and our research are enamored of precision. But we must recognize its modest limits. Exact measurements that are wrong, or correct measurements of the wrong thing, obscure rather than clarify.

We tend to deceive ourselves that counting makes something more real. So we measure anything we can. This flaw permeates ecology, economics, anthropology, sociology, psychology, and every other would-be science. The introduction to a leading textbook declares: "Economics is vitally concerned with the measurement of important phenomena..."<sup>4</sup> The question is, are we measuring the right things? Since certain qualities are beyond measurement, we often make the tragic error of assuming they are unimportant.

Immeasurables may be inconvenient, but they often convey essential truths. Why is it, Barry Lopez once pondered, that scientific ecologists unanimously accord significance to air temperature and wind speed, but would laugh aloud if someone suggested—as a hunter might—that the color of this morning's sky affected this animal's behavior?<sup>5</sup> At least in part, it is because the color of the sky cannot be measured as simply as the temperature or the wind speed. The

result of such selective attention is that qualitative aspects of environmental issues are routinely ignored. Who knows what we are missing?

**Beware Objectivity.** There is a common misconception that a scientist must remain dispassionate, else risk the objectivity that guarantees accuracy. On the contrary, passion is the wellspring of all good science, just as it stimulates all good art. It should be nurtured and treasured. Without passion, a scientist is merely a technician, making checks on graph paper. With it, she is alive with ideas, questions,



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alternate hypotheses. Most decent research emanates from the same source as good love and good art: passion for the process.

Reflecting on my own past, I recall that I chose to study harlequin ducks because I wanted to enmesh more completely with their beauty and mystery—I wanted to hang out with the most gorgeous birds in the neighborhood. Anger, not any inherent intellectual attachment to the subject, motivated my research into the ecology of livestock grazing. Anger provided a strong enough wind to carry me through four years of solitary desk work, perhaps more effectively than mere curiosity might have done.

The cloak of "objectivity" is often burdened with an assumption that one must be neutral on issues. Thus, many an environmental researcher feels he cannot speak out publicly on a controversial issue, lest his objectivity be questioned. To be objective means to present facts, regardless of personal feelings or biases; to be neutral is to resist expressions of opinion in a controversy. True objectivity—loyalty to the truth—should compel us. Neutrality about environmental crises should repel us. As David Orr has written, "Life in jeopardy ought to cause us to take a stand, not retreat into a spurious neutrality."<sup>6</sup> Why should one spend a lifetime studying something only to avoid taking a stand on the significance of the findings? Massive silence by many ecologists, some would say, has made them complicit in

biological destruction. Objectivity and taking a stand are compatible—so are neutrality and bias.

**Beware Specialization.** Ecologists are fond of distinguishing between animals with narrow and broad niches—specialists and generalists. Brant primarily eat eelgrass, whereas ravens eat everything from carrion to eggs to small birds. The brant, we would say, is more of a specialist than the raven, who makes do everywhere, regardless of climate, vegetation, or available prey. Both brant and raven have found a good way to survive. No ecologist would ever claim that the brant is more important than the raven because it is more specialized.

In the world of humans, however, research is increasingly considered the domain of specialists. We look to the political scientist to explain our voting and to the psychologist to cure our hang-ups. Environmental research calls upon chemists to tell us why the water tastes bad, ornithologists to mark the decline of bird populations, and botanists to identify endangered wildflowers. We want to hear from expert witnesses in the courtroom and expert teachers in the classroom.

All this work of experts is absolutely essential. It takes a lifetime of work to recognize every plant in a given mountain range or to tease out the taxonomic distinctions between like-looking passerine birds. It takes great focus to understand water chemistry and unfailing commitment to build the necessary laboratory to study it in. I am not attacking specialists—on the contrary, they contribute irreplaceable insights. Without specialists, we wouldn't even recognize the pieces of the puzzle. My point is simply that generalists, too, offer crucial services, even though being a generalist has gone out of favor, at least in academia. We need people who, like the raven, are at home in many habitats—people who pay attention to birds *and* plants *and* water. We need people who not only recognize pieces of a puzzle, but can put the puzzle together and show us the picture. In a word, we need synthesizers.

Let's say we want to learn something about traditional patterns of human relationship with nature. Today, academia would send forth an anthropologist to look at some very specific aspect of culture. In contrast, I recall Jaime de Angulo, a Spanish physician who came to North America and ended up living with the Pit River Indians of northern California for forty years. His skills ranged from medicine to linguistics to poetry. He published many articles in scholarly

journals (most, he later wrote, “would put you to sleep in five minutes”), but his enduring work, *Indian Tales*, is a collection of stories written for his young children. As he tells us: “I have not paid very much attention to scientific accuracy ... So don't worry about it.” Carl Carmer, in the book's introduction, commented that de Angulo “had both the judgment and the intuition to realize that translation of atmosphere and feeling and fancy can not be left to scholars.”<sup>7</sup>

Ironically, by deciding to not worry about scientific accuracy, de Angulo provided us with one of the purest written glimpses into Indian daily life. The telling of *Indian Tales* utilized skills of attentiveness de Angulo sharpened during his scientific training. But it also required the talents of a poet and the humility of a person who had listened well around countless campfires.

Aldo Leopold once called for “a reversal of specialization; instead of learning more and more about less and less, we must learn more and more about the whole biotic landscape.” That remains as true today as when he wrote it half a century ago. We need brant and we need ravens. We need to taste seagrass, carrion, and bird eggs. We need synthesizers who can weave whole webs from independent strands.

**Beware the Uncommon Tongue.** Consider the following example from a government document that was supposed to provide the public a chance to participate in setting environmental policy: “More restrictive emission dispersion conditions, potentially responsible for higher ground-level concentration, were studied using Intercomp, a three-dimensional, numerical model, the NOM model, the EPA model (C4M3D) and the TVA model. ‘Stable,’ ‘limitedmixing,’ and ‘inversion-breakup’ meteorological conditions were examined, using available data. With the Intercomp model, the highest ground-level concentrations of S02 resulted from ‘inversion-breakup’ or fumigation conditions, with ‘limited-mixing’ giving the second highest level.”

Now, there is ample reason for the exacting prose of science and good reason for statistical analyses, which can help clarify relationships. But an enormous, unhealthy communication gap exists between the specialists who do the writing and speaking and the citizens and policy makers who need the information.

Speaking in the uncommon tongue can be valuable—allowing specialists to be clear with one another about fine shades of meaning. But let's face it: it's a lot easier to hide biases amongst a tangle of statistical tests and the standard trappings of “objective science” than in plain English. Speaking in the common tongue serves a different, often ignored purpose: to link ideas and facts with people who can thoughtfully consider them and put them into action. We need both.



Logic, measurement, precision, objectivity, and specialization—I have warned against the standard pillars of research. Each of these approaches unquestionably offers a great deal; but each also has pitfalls. These standard operating procedures of research are recurrently taken out of context, becoming half-truths that are often honored more than other overarching values, like common sense. Properly applied, each of these pillars helps us see the world more clearly. But just as easily, they can obscure it.

To search and search again—ever more deeply—within our circle of life, is the essence of environmental research. To search well, we need passion, insight, and persistence. We need to weave various wisdoms together into a whole. And we must communicate our understandings in clear language, with respect and humility.

The circle of our searching can be smaller than our eyes can see, or large as the globe. When our culture reintegrates with nature, environmental research will no longer remain the domain of specialists. Everyone should be paying attention, searching, re-searching, and—with patience—one day, seeing. The world will be a healthier place.

Let's begin today. What do you see?



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## Notes

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