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Why It Matters

What is this Balance of Nature that Ecologists Talk About?
—Stuart L. Pimm, *The Balance of Nature*[1]

That there is a balance of nature is one of the most deep-seated assumptions about the natural world, the world we know on planet Earth. For as long as we humans have had the ability to think seriously about our world we have attempted to find order in chaos. The world is vast and surely appeared vaster when our collective knowledge was far less than it is today. Humans living, say, 10,000 years ago, at the dawn of agriculture, must have perceived nature as impossibly complex, perhaps beautiful, very mysterious, and surely fairly scary. These perceptions have changed to various degrees. Today *Homo sapiens* has emerged as the dominant species on the planet, as measured by its collective effects on Earth's ecosystems. No single species in Earth's history has caused more changes on the planet than what we are doing today. We need to understand and act on this reality. But why? Begin by allowing me to take you on a journey beyond Earth, through a bit of space and time, and you'll soon see "why it matters."

We live in the Stelliferous era, the time of the stars. There was a previous time when there were no stars, and there will be a time in the far distant future when there will be only cold and dark remnants of stars, when absolutely no form of life will exist anywhere in the universe. All traces of human existence or any other forms of life will presumably have long since disappeared from

the cosmos. The universe, our universe, will be dead. The very early history of the universe in which we reside was one of short-lived symmetry and order, lasting but the tiniest fraction of a second, until small asymmetries made possible the eventual formation of elements, stars, and galaxies in a universe fated to expand forever. The universe, and all in it, has essentially been asymmetrical and evolving ever since.[2]

Much of the universe is a violent place. Stars periodically explode, becoming gargantuan supernovas, then collapse, shedding their outer gases to end their stellar existences as cold, dark dwarfs, some of which, the pulsars, spin around at a dizzying pace, curious space beacons in the aftermath of trauma. Immense black holes lurk menacingly in the center of galaxies, astronomical quicksand sucking up the stellar offspring of the big bang. Our own Sun is no less than a consolidation of billions of constantly exploding hydrogen bombs, a thermonuclear furnace, continuously engaged in the most violent reaction known, the result of which keeps us warm, gives green plants their most vital ingredient, and tans our skins. Yes, the universe is violent and basically unpleasant when you get too close. It's pretty hostile outside of the spacecraft. Thinking about the stunning forces that govern, indeed define, the universe can make humanity and life in general seem very frail.

Stars form, stars shine, and stars go dark, their nuclear fuel fully consumed. Such a fate eventually will befall our star, the Sun. These billions upon billions of huge, gassy gravitational concretions of concentrated thermonuclear energy just come and go. All that is required is time. Lots of time. And there has been lots of time. The universe is estimated to be 13.7 billion years old,[3] roughly two-thirds again as old as our Sun and its solar system. And the universe will become much, much older.

In July 1994, the planet Jupiter was repeatedly struck by pieces of Comet Shoemaker-Levy, whose path had been altered by the huge gravitational field of the planetary giant, itself a stillborn star.[4] Jupiter literally pulled the comet from space, shredding it in the process, and pieces of the comet left obvious impact marks across the face of the planet. If that happened to Earth (as it has in the past), it would be bad. Are we safe? No, we aren't. It's a matter

of probabilities. We've been hit before and will likely be hit again (chapter 10). Even in our local solar neighborhood among our sibling planets, the threat of violence is lurking. Maybe there's good reason to be afraid of the dark.

But on the other hand, on a warm summer night when it really is dark and that magnificent and vast assemblage of stars we call the Milky Way traces its winding course across the sky, we humans perceive the universe around us as anything but violent. Seeing dust-sized meteors streaking through the atmosphere leaving a momentary trace of firelike light does not inspire thoughts of imminent doom from asteroid impact. There is, more often than not, a sense of profound tranquility and serenity imparted to one's psyche when lying on one's back in the cool, damp grass and staring skyward at the slowly revolving panorama of thousands of points of light so far above, so far away. From our earthly perspective, the universe can seem ever so peaceful, constant, predictable, and essentially inviting. The phases of the Moon change, but do so in a most orderly, predictable fashion. The Sun never disappoints, always faithfully rising in the east, setting in the west, never the other way around. The constellations seem unchanging (though they are not—again, it's only a matter of time), and the planets predictably trace their respective paths around the Sun, moving through the Zodiac from constellation to constellation (regrettably keeping astrologers in business).

The universe is exquisite, never minding the copious unbridled forces underpinning and sustaining the apparent beauty. It's really no wonder that heaven, as it is envisioned by those who believe there is such a place, should be located somewhere in that cornucopia of glittering stars. The violent universe deceives us, seeming to welcome us, a falsely serene place, its parts working in the illusion of harmony, the so-called "music of the spheres."

The point here is that things, including natural things, are not always as they seem. Nor are they necessarily as we might wish them to be. They just are. One's perspective on the universe can be highly quixotic, a perception that satisfies, that makes us happy when thinking about the heavens above, even if not very accurate. Or, one might envision the universe exactly as astronomers say it

is, with all the accompanying violent reactions that have defined stellar birth and death from the big bang onward. In either case, one can be fascinated and mentally fulfilled just thinking about what's out there.

As far as the universe is concerned, it really doesn't matter what we think. Think anything you want. Whatever the universe is or isn't, there isn't anything you or I can do about it. We can't blow up Saturn, pollute the Sun, or cause the extinction of any of the stars. The clusters of galaxies will continue to fly apart from one another as spacetime expands, whether we approve or not. We have no power whatsoever to influence events occurring tens, hundreds, millions, or billions of light-years away from our own planet. We humans are utterly trivial in our collective influence on the workings of the universe we inhabit. A fly has more effect on the atmosphere of the Earth than we collectively have on the universe.

But, on the contrary, it does matter what we believe about the workings of our own planet, endowed as it is with a myriad of living systems we call organisms, including in excess of six billion human beings. We can and do affect the ecology of the Earth in innumerable and profound ways. If what we do is wrong, it will have consequences and costs. It already has. What we do is obviously largely determined by what we believe about the structures and workings of the systems we affect, so, to say it again, what we believe about Earth, ecology, nature, and our own biology and evolution, matters.

We are beginning what is called the twenty-first century. It isn't really. There have actually been 45 million centuries in the history of this planet, but we anthropocentric humans pretentiously identify only those that began with the birth of Christ plus a few hundred that preceded that particular historic event. In reality, for every year in which *Homo sapiens* has inhabited the planet (assuming approximately 100,000 years as "modern humans"), there have been roughly 45,000 when it was absent. Nonetheless, we are here now and the twentieth century was perhaps most notable for the degree to which one species, the human species, has influenced the Earth's ecology. Never in the 4.5 billion-year history of Earth has but one species had such an inordinate influence on all

others, and in such a short span of time. That influence grows every second.

It is the objective of these essays to examine what is known about some important aspects of how life on Earth functions. One theme will weave throughout the essays, connecting them as the message of the book: there really is no such thing as a "balance of nature." Nor is there purpose to nature. Nature, like the vast universe of which it is but an infinitesimal part, just is.

That our perception of nature may be erroneous is not a trivial point. It is, indeed, very critical to know how nature works. It does matter. Our welfare as well as that of many, and perhaps most other nonhuman life forms, ultimately depends on judgments we make based upon what we know about the workings of the biosphere, that thin layer of life that coats Earth's surface.

I don't believe in Santa Claus, though once I did. I think it does no harm to tell a child a myth about a red-suited, white-bearded, elderly philanthropist who likes hot cocoa. Realizing that the myth is, indeed, a myth is not really very traumatic, at least it wasn't for me. I hold no grudge against my parents for helping promulgate an enchanting falsehood. Quite the contrary, those were good Christmases, leaving me with the best of childhood memories. During the time when I believed in Santa Claus I took a nasty fall and a rusty nail penetrated deeply into my scalp. I soon developed a raging case of septicemia, and might have died. However, my parents saw to it that I quickly got to a doctor and was treated with massive doses of penicillin. After a few bad days, I recovered. I'm really glad my parents believed in medicine, not spiritual healing or something like it. My life was saved by a chemical evolved by a fungus in response to the collective competitive pressures exerted over eons by bacteria, the chief competitors of fungi. I owe my life to an evolutionary by-product of interspecific competition, from a species of mold, the properties of which, incidentally, were discovered mostly by accident. Millions of us owe the same debt. When it comes to life support systems, it won't do to create myths.

Knowledge is not easily acquired. It is far simpler to believe than to discover. To give but one example, Ancient Egyptian mummy preparators, who were otherwise pretty good at what they did,

routinely extracted the brain through the nostrils and discarded it, utterly ignorant of its function and profound importance.[5] Other organs were carefully saved and prepared, to accompany the pharaoh on the journey into the afterlife. Poor pharaoh. Eyes, ears, nose, heart, liver, lungs, body, but brainless. Not much of an afterlife. Imagine the deceased royalty of ancient Egypt all mingling about in the Great Beyond with nothing to say to each other but "Duh."

It required centuries of medical study and experiment to learn that the heart is not the center of the soul but is instead a sophisticated, coordinated blood pump. How the brain works is still far from fully understood. But this much we do know: we think, we feel, we love, we hurt, we hunger, and we believe with our brain. The ancient Egyptians were wrong. Their view of human physiology was flawed. Some contemporary cultural relativists, abounding as they do in the halls of academe, might argue that the ancient Egyptian view was "equally valid" to the modern view, and should be "celebrated." Celebrate it all you want, it's still wrong.

And there is something else in the example to note. Science is a way of knowing. It is actually possible to get the right answer, though many wrong ones may crop up along the way. Since scientific truths must be discovered, and since many, probably most, are far from intuitively obvious, wrong answers are inevitable. The path to the truth is sinuous, not easily navigated. One reason for such difficulties is that scientifically gained knowledge is often nonintuitive or even counterintuitive. In the vernacular of some college students, "science is hard." However, with a reasonably open mind and persistence, right answers and understanding are achievable.

From the time of early human civilization, most notably the intellectual contributions of the ancient Greeks, humans have envisioned life on Earth as having both balance and purpose. Such a notion was philosophically satisfying, immensely so, perhaps even essential for the psyche of those toga-clad early thinkers. It was supported, albeit at a superficial level, by lots of observational evidence. There are many people today who harbor similar beliefs. Creationists, now reinvented as "students of intelligent design," continue their efforts to make science subservient to religious

dogma, as they try harder and harder to philosophically pound a very square peg into an awfully round hole. As a second example, conservationists who believe fully in evolution, including human evolution, worry about upsetting the balance of nature, causing irreparable harm to Earth's life support systems. Most people in the United States are regrettably ignorant about what is known in ecology as it relates to evolutionary biology, and how this information, this knowledge, these facts, should affect decision making about environmental issues.

It will be my task to convince you that life on Earth has neither innate balance, nor purpose, at least in the meanings usually associated with those words. It is not my intention to demean human existence or that of any other species. Quite the contrary, I wish to focus on the importance of understanding how life functions evolutionarily and ecologically so that our species can assume a more realistic and ultimately more responsible role in its task of stewardship of the planet.

Philosophers have noted that scientific truths should not, in themselves, lead to prescriptive ethics. The so-called "naturalistic fallacy" asserts that one should not assume that what is, is what ought to be.[6] The naturalistic fallacy was conceived to separate science, especially evolutionary biology, from philosophy, especially ethics. However, in the latter part of the twentieth century, the two disciplines came increasingly closer. Some philosophers now refute much of the naturalistic fallacy. Ecosystem restoration and management, based on the science of ecology, is applied to moral decisions about whether or not we ought to try and preserve endangered species. Studies of animal behavior and molecular genetics that indicate a profound Darwinian link between humans and apes raise significant moral questions about whether sentient or even partially sentient nonhumans should endure medical experimentation.

In my view the time has come to free ourselves from some notions that originated almost as early as civilization itself, notions that have, in my opinion, become more of a hindrance than a help. We still carry too much philosophical baggage. The time has come to leave some of it behind.

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(Scientific names follow common names.)