

Evolution's Rainbow: A Review

Everybody has an agenda. The most pernicious are those that go unspoken and unchallenged because they're a part of the culture or zeitgeist in which we're embedded, the very air we breathe. Though science prides itself on its objectivity, it too is sometimes influenced by hidden agendas — assumptions so universal they go unnoticed. The so called "hard" sciences like physics and chemistry are less prone to personal prejudice; an equation or an experiment either works or it doesn't. Sir Isaac Newton showed gravity doesn't care about our feelings. It obeys his equations regardless. Radium didn't care that Madam Curie was a woman.

Other fields of study aren't as clear cut. Disciplines like sociology and psychology are less amenable to experiments that yield unambiguous results. Sigmund Freud invented "penis envy" in a rigidly patriarchal society in which women were seen as inherently inferior. These days the penis isn't as revered an organ as it was in nineteenth century Europe, thus "penis envy" has been relegated to the dustbin of discarded ideas. This may be due, in part, to a sea change in society over the last seventy-five years or so as women have become more influential in academia. Women have made a difference, for they bring fresh perspectives to their chosen fields of study. Lynn Margulis, for example, a biologist at the University of Massachusetts, helped revolutionize our understanding of the evolution of the cell. She discovered that every living cell, including those of which our bodies are made, is a cooperative of entities that once lived independently. Strange as it may seem, the mitochondria in our cells were free living organisms deep in our evolutionary past, that learned to cooperate with and live within other cells. This explains why these mitochondria contain their own DNA separate from the nucleus.

Thus it should come as no surprise when a transgendered woman working in biology questions current ideas about evolution. Joan Roughgarden is a Professor of Biological Sciences at Stanford University and the author of several college-level books on ecology and evolution. She expresses her doubts and concerns in *Evolution's Rainbow: Diversity, Gender, and Sexuality in Nature and People*.

Roughgarden isn't coy about her agenda. She states it up front, in the introduction, as she tells of a June day in 1997 when she attended her first gay pride parade in San Francisco. She says, "For the first time, I felt the sheer magnitude of the gay community." How, she wondered, "does biology account for such a huge population that doesn't match the template science teaches as normal?" These thoughts started her on a quest to learn the truth about diversity in nature. She says, "I found more diversity than I had ever dreamed existed."

Evolution's Rainbow is an indictment of what Roughgarden calls academia's suppression and denial of diversity in nature. This is not due to some vast conspiracy, but merely to the fact that our academic disciplines are rooted in Western culture which discriminates against diversity. This denial has been a problem from the start, even as Darwin sailed among the Galapagos Islands taking note of the astonishing variety he found there. In his day it was believed that a species was as unique and unchanging as a chemical element. It was taken for granted that each Biblical "kind" was the result of a unique creation, and that "kinds" never changed. What Darwin found seemed to contradict this notion. He found endless variation in finches alone, each unique to a particular island or ecological niche. Does each variety of finch, then, represent a separate instance of creation by God?

Since Darwin's time biologists have come to realize that the idea of "species" is fluid through time and space. They have rejected the philosophical notion of "essentialism," or the Platonic Ideal. Variation is so prevailing in nature that no single finch embodies the perfect finch template. Each variety of finch is normal. Yet in spite of this we still cling to essentialist ideas about people. In medicine variation is pathologized; difference is considered a disease. This attitude, contends Roughgarden, denies diversity in people, for in medicine we are all supposed to conform to a

universal ideal. This is not to say there is no such thing as disease; rather, Roughgarden's contends we lack a scientific definition of disease; this absence, she says, "is often a value-loaded exercise in prejudice."

Evolution's Rainbow takes the reader on a tour of the remarkable diversity found in the living world. There is a species of fish with two sexes, but with two varieties of male. One male is large and masculine, while the other is smaller and looks somewhat like the female. Roughgarden calls these variations of maleness "genders"; thus this species has two sexes and three genders. Roughgarden is careful to point out the feminine male isn't sick or deformed; it is, in fact, perfectly normal.

Some species of lizard reproduce via parthenogenesis; in other words, they have altogether eliminated the messy business of sexual reproduction. They literally clone themselves. They are all female, and yet they court one another and go through the motions of sex, and seem to enjoy it. These are lesbian lizards.

Some species can change sex, and then change back. A kind of bass that lives in coral reefs is both at the same time. Roughgarden takes us on a tour of these amazing variations, including animals in which the male bears the young; there is a species of sunfish with three male genders and one female, and another with two male and two female. In fact there are so many variations of the themes of sex and gender it all starts to blur together.

Lest we get the impression that this diversity exists only among fishes and lizards, Roughgarden presents us with some astonishing facts about mammals, including our cousins the primates. "In some mammalian species," she tells us, "intersexed bodies are a minority; in others, the majority." By "intersexed" she means some variation of hermaphroditism in which sexual characteristics are ambiguous, including the genitalia. There are several species of deer in which hermaphroditism is surprisingly common; that is, males with feminine characteristics and females with masculine characteristics. In some areas the frequency of intersexed deer is as high as 80 percent! Roughgarden wonders how a trait that is so common can be seen as abnormal, or how it can be a deleterious mutation. Among the kangaroo rats of the American Southwest "sixteen percent have both sperm- and egg-related plumbing, including a vagina, a penis, a uterus, and testes in the same individual." Several varieties of bear are natural gender mixers. Roughgarden writes that "ten to twenty percent of the female bears in some populations have a birth canal that runs through the clitoris, rather than a separate vagina. An intersex female bear actually mates and gives birth through the tip of her penis."

Roughgarden lists such stunning variations for several chapters before discussing homosexual behavior among monkeys, chimps and gorillas. Suffice it to say that homosexuality, in her view, is not "unnatural" by any rational definition. In the later chapters she discusses issues that lie beyond her area of professional expertise. This include Biblical interpretation, and is probably the weakest section of the book. However, at this point she has made her point with admiral clarity, conviction and authority. Early on she makes clear she is not saying that what's good for animals is necessarily good for people, what philosopher David Hume called the "naturalistic fallacy." Rather her aim is to refute the notion that variations of sexuality and gender are necessarily signs of pathology, that something has gone terribly wrong, or "goes against nature." Even hermaphroditism among humans is too common, she says, to be considered beyond the "normal" range of body types. Intersexed people should be left unaltered to discover their own true individual natures. Roughgarden has been bitten by the same bug that so disconcerted Darwin aboard the *Beagle*: when difference is so common in nature it must be telling us something. As nature was once thought to abhor a vacuum, so she seems to abhor uniformity. No two finches are exactly alike; if they were, evolution would have nothing to work with, for genetic variation is the source of novelty and adaptation. If all finches were clones they would be at a disadvantage when their environment changed. They would find themselves stuck at an evolutionary dead end.

And so it is with people. Human individuals are individual because that's way nature works. Genes get shuffled each time a sperms meets an egg. The human genome is so vast the possibilities are endless — and this doesn't even include the possibilities that arise from mutations. And I hasten to point out that "mutation" isn't necessarily an ugly word. Mutation too is an integral aspect of nature's scheme, and the primary tool employed by natural selection. A few years ago it was discovered that a tiny number of people were naturally immune to HIV. These people were literally genetic mutants, and a good thing, too, for it hinted that a cure was possible.

Our faults lie not in our stars, dear Brutus, but in ourselves. Since we human beings are essentially social animals, even tiny differences can seem hugely important emotionally. We are still deeply tribal creatures, attuned to the small differences that make one tribe distinct from another. So while nature revels in variation — indeed depends upon it — societies and religions (which are tribal in nature) mistrust and seek to eliminate it. The adherents of every religion declare, "Our way is the way God made us." Roughgarden attempts to dispel this kind of provincialism by pointing to nature herself, to what she calls evolution's rainbow. If raw facts matter she will have succeeded splendidly.