

# **Evolution's Rainbow**

Diversity, Gender, and Sexuality  
in Nature and People

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# Contents

Introduction: Diversity Denied / 1

## PART ONE **ANIMAL RAINBOWS**

- 1 Sex and Diversity / 13
- 2 Sex versus Gender / 22
- 3 Sex within Bodies / 30
- 4 Sex Roles / 43
- 5 Two-Gender Families / 49
- 6 Multiple-Gender Families / 75
- 7 Female Choice / 106
- 8 Same-Sex Sexuality / 127
- 9 The Theory of Evolution / 159

## PART TWO **HUMAN RAINBOWS**

- 10 An Embryonic Narrative / 185
- 11 Sex Determination / 196
- 12 Sex Differences / 207
- 13 Gender Identity / 238

## INTRODUCTION

### Diversity Denied

On a hot, sunny day in June of 1997, I attended my first gay pride parade, in San Francisco. The size of the crowd amazed me. As I marched from Civic Center up Market Street to San Francisco Bay, a throng of onlookers six persons deep on both sides shouted encouragement and support. For the first time, I felt the sheer magnitude of the gay community.

I stored this impression in the back of my mind. How, I wondered, does biology account for such a huge population that doesn't match the template science teaches as normal? When scientific theory says something's wrong with so many people, perhaps the theory is wrong, not the people.

It wasn't just the number of gay people that astonished me, but the diversity of personal expression in the parade. A drag queen or two were featured in the newspapers, but many other, less flamboyant presentations with different mixtures of gendered symbols were evident as well. I was intrigued, and resolved to investigate further if I ever got the chance. During the next few months I intended to transition into a transgendered woman.<sup>1</sup> I didn't know what the future held—whether I'd be fired as a biology professor, whether I'd become a nightclub waitress, whether I'd even stay alive. I couldn't make long-term plans.

Still, I found my mind leaping from one question to another: What's

- 14 Sexual Orientation / 245
- 15 Psychological Perspectives / 262
- 16 Disease versus Diversity / 280
- 17 Genetic Engineering versus Diversity / 306

#### PART THREE **CULTURAL RAINBOWS**

- 18 Two-Spirits, Mahu, and Hijras / 329
- 19 Transgender in Historical Europe and the Middle East / 352
- 20 Sexual Relations in Antiquity / 367
- 21 Tomboi, Vestidas, and Guevedoche / 377
- 22 Trans Politics in the United States / 387

Appendix: Policy Recommendations / 401

Notes / 409

Index / 461

the real story about diversity in gender and sexuality? How much diversity exists in other vertebrate species? How does diversity evolve in the animal kingdom? And how does diversity develop as individuals grow up: what role do genes, hormones, and brain cells play? And what about diversity in other cultures and historical periods, from biblical times to our own? Even more, I wondered where we might locate diversity in gender expression and sexual orientation within the overall framework of human diversity. Are these types of diversity as innocent as differences in height, weight, body proportion, and aptitude? Or does diversity in gender expression and sexuality merit special alarm and require careful treatment?

A few years after the 1997 parade, I was still alive and still employed. I had been forced to resign from my administrative responsibilities, but found myself with more time for research and writing. I was able to revisit the questions that had flooded my mind as I walked in the parade on that lovely day. This book is the result.

I found more diversity than I had ever dreamed existed. I'm an ecologist—diversity is my job—and yet I was still astonished. Much of this book presents the gee-whiz of vertebrate diversity: how animal families live, how animal societies are organized, how animals change sex, how animals have more than two genders, how species incorporate same-sex courtship, including sexual contact, as regular parts of their social systems. This diversity reveals the evolutionary stability and biological importance of expressions of gender and sexuality that go far beyond the traditional male/female or Mars/Venus binary. I also found that as we develop from tiny embryos to adults, our genes make decisions. Our glorious diversity is the result of our “gene committees” passing various biochemical resolutions. No gene is king, no body type reigns supreme, nor is any template universal in a cacophonous cellular democracy.

I studied how some cultures value transgender people, found where in the Bible transgender people occur, and learned that people from various cultures organize categories of identity differently. Although all cultures span the same range of human diversity, they have different ways of distinguishing gay, lesbian, and transgender identities.

All these facts were new to me, and even now seem utterly engaging, leading to page after page of I-didn't-know-that, wow, and really. This book, then, is a memoir of my travels through the academic spaces of

ecology and evolution, molecular biology, and anthropology, sociology, and theology. My general conclusion is that each academic discipline has its own means of discriminating against diversity. At first I felt that the book's main message would be a catalogue of diversity that biologically validates divergent expressions of gender and sexuality. This validating catalogue is indeed important. But as I reflected on my academic sojourn, I increasingly wondered why we didn't already know about nature's wonderful diversity in gender and sexuality. I came to see the book's main message as an indictment of academia for suppressing and denying diversity. I now conclude that all our academic disciplines should go back to school, take refresher courses in their own primary data, and emerge with a reformed, enlarged, and more accurate concept of diversity.

In ecology and evolution, diversity in gender and sexuality is denigrated by sexual selection theory, a perspective that can be traced to Darwin. This theory preaches that males and females obey certain universal templates—the passionate male and the coy female—and that deviations from these templates are anomalies. Yet the facts of nature falsify Darwin's sexual selection theory. In molecular biology and medicine, diversity is pathologized: difference is considered a disease. Yet the absence of a scientific definition of disease implies that the diagnosis of disease is often a value-loaded exercise in prejudice. And in the social sciences, variation in gender and sexuality is considered irrational, and personal agency is denied. Gender- and sexuality-variant people are thought to be motivated by mindless devotion to primitive gods, or compelled by far-fetched psychological urges, or brainwashed by social conventions, and so on: there is always some reason to avoid taking gender- and sexuality-variant people seriously.

The fundamental problem is that our academic disciplines are all rooted in Western culture, which discriminates against diversity. Each discipline finds its own justification for this discrimination. This book blows the whistle on a common pattern of disparaging gender and sexuality variation in academia and predicts foundational difficulties for each discipline.

Although criticism is valuable in its own right, and a critic has no responsibility to suggest solutions, I do suggest improvements when I can. I offer alternatives for interpreting the behavior of animals, interpreta-

tions that can be tested and will lead ultimately to more accurate science. I suggest new perspectives on genetics and development that may yield a more successful biotechnology industry. I show that mathematical criteria for the rarity of a genetic disease point to possibly overlooked advantages for genes presently considered defective. I suggest new readings of narratives recorded from gender-variant people across cultures. I call attention to overlooked aspects of the Bible that endorse gender variation.

I do *not* argue that because gender and sexuality variation occur in animals, this variation is also good for humans. People might anticipate that as a scientist I would say, “Natural equals good.” I do *not* advocate any version of this fallacy that confuses fact with value. I believe the goodness of a natural trait is the province of ethical reasoning, not science. Infanticide is natural in many animals but wrong in humans. Gender variation and homosexuality are also natural in animals, and perfectly fine in humans. What seems immoral to me is transphobia and homophobia. In the extreme, these phobias may be illnesses requiring therapy, similar to excessive fear of heights or snakes.<sup>2</sup>

I also do not suggest that people are directly comparable to animals. Indeed, even people in different cultures have life experiences that may not be comparable, and comparing people to animals is even riskier. Still, parallels can sometimes be found between cultures. Rugby is a counterpart to American football but located in a different sports culture. Some aspects of American football, like the way play begins by hiking the ball, are comparable to rugby. Similarly, parallels can sometimes be drawn between how people behave and how animals behave, as though animals offered biological cultures resembling ours. I’m quite willing to anthropomorphize about animals. Not that animals are really like people, but animals are not just machines either. We make an error if we attribute too much human quality to animals, but we underestimate them if we think they’re mechanical robots. I’ve tried to strike a balance here.

I’ve borrowed the word “rainbow” for the title of the book and use it throughout. The word “rainbow” signifies diversity, especially of racial and cultural minorities. The Reverend Jesse Jackson ran for president with the Rainbow Coalition. The rainbow also symbolizes gay liberation.

You probably work with or supervise biologically diverse people. You

may be the parent or relative of an unusual child. You may be a teacher, Scout master, coach, minister, legislator, policy analyst, judge, law enforcement officer, journalist, or therapist wondering why your colleagues, clients, or constituencies are so different from the norms we were indoctrinated with as children. You may be a student in college or high school trying to understand diverse classmates. You may be taking a deep breath before coming out yourself, or you may have come out years ago and wish to connect with your roots. You may be studying gender theory and wondering where science fits in, or you may be a woman scientist wondering how to contribute to feminist theory. You may be a conservation biologist wondering how to make biodiversity more relevant to human affairs. You may be a medical student with a professional need for more information about diversity than medical school teaches. You may belong to a discussion group in your place of worship trying to understand how to be inclusive. You may be a young doctoral student shopping for a thesis topic. This book is for all of you.

In Part 1, *Animal Rainbows*, I begin with my own discipline of ecology and evolution. I’ve written previously on the evolution of sex: why organisms have evolved to reproduce sexually rather than simply by budding, fragmentation, parthenogenesis, or some other nonsexual means.<sup>3</sup> Reproduction that uses sex rather than bypassing it is better because species need a balanced portfolio of genes to survive over the long term, and sex continually rebalances a species’ genetic portfolio. Yet, even though this benefit of gene pool mixing is universal, the means of implementing sexual reproduction are incredibly diverse, spanning many styles of bodies, family organizations, and patterns of bonding between and within sexes, each with its own value and its own internal logic.

Part 1 reviews the body plans, genders, family organizations, female and male mate choices, and sexualities of animals, leading to the conclusion that Darwin’s theory of sexual selection is false. I find that competitive tooth-and-claw narratives about nature have been greatly exaggerated, that all sorts of friendships occur among animals, many mediated by sexuality, and that many social roles are signaled by gendered bodily symbols. The great difference in size between an egg and a sperm (a ratio in mass of usually one million to one) is not present to the same degree at the levels of body, behavior, and life history. When a gender binary does exist, the difference is usually slight and sometimes re-

verses gender stereotypes. Furthermore, there are often more than two genders, with multiple types of males and females. This real-life diversity in gender expression and sexuality challenges basic evolutionary theory.

Darwin is known for three claims: that species are related to one another by sharing descent from common ancestors, that species change through natural selection, and that males and females obey universal templates—the males ardent and the females coy. This third claim results from Darwin's theory about sexual selection, and this claim, not the first two, is what is specifically under challenge. The picture conveyed by Darwin's sexual selection theory is both inaccurate in detail and inadequate in scope to address real-world animal diversity. Darwin's theory of sexual selection is perhaps valid for species like the peacock, whose males have showy ornaments directly used in courtship, but it isn't a general biological theory of gender roles. Twisting Darwin's original theory to conform with today's knowledge renders the theory a tautology. Instead, I submit that the time has come to acknowledge the historical value of Darwin's theory of sexual selection and move on.

I've suggested a new theory that I call "social selection." This new theory accommodates variation in gender and sexuality. It envisages animals as exchanging help in return for access to reproductive opportunity, producing a biological "labor market" for mutual assistance by employing reproductive opportunity as currency. This theory proposes that animals evolve traits that qualify them for inclusion in groups that control resources for reproduction and safe places to live and raise offspring. These traits, called social-inclusionary traits, are either possessed only by females and unexplained by any theory, such as the penis of female spotted hyenas, or possessed only by males and interpreted as a secondary sex characteristic even though they are not actually preferred by females during courtship.

Part 2, *Human Rainbows*, deals with the areas of biology focused on human development. I tell the story of human embryogenesis as a first-person narrative ("when my sperm part met my egg part") to emphasize that agency and experience function throughout life, before birth and after. I also wish to destabilize the primacy of individualism, to emphasize how much cooperation takes place during development, from the mother who chemically endorses some sperm and not others as competent to fuse with one of her eggs, to genes that interconnect to produce

gonads, tissues that touch each other and direct each other's development, and hormones from adjacent babies in utero that permanently influence each other's temperament. Therefore, what we become arises more from our relationships than from our atomic genes, just as a piece of coal's atomic bonds differ from a diamond's, even though both consist solely of carbon atoms.

I've coined the term "genial gene" to distinguish my conception from the popular notion of the selfish gene, which is imagined to single-handedly control development for its own ends. Instead, I emphasize that genes must cooperate lest the common body they inhabit sink like a lifeboat filled with squabbling sailors. I dwell at length on genetic, physiological, and anatomical differences among people. We are as different from each other under the skin as we are on the surface. Although biological differences can be found between the sexes and between people of differing gender expression and sexuality, biological differences can also be found between any two people. For instance, musicians who are string players have been discovered to have brains that differ from those of people who don't play strings. Part 2 shows how medicine seizes on the often tiny anatomical differences between people, and on differences in life experience, to differentiate them from an artificial template of normalcy and deny a wide range of people their human rights by defining them as diseased. Meanwhile, in our society we face not only persecution of people with diverse expressions of gender and sexuality, but also the prospect of doing permanent harm to the integrity of the gene pool of our species, thereby damaging our species for posterity. Part 2 concludes with a summary of the dangers inherent in attempts by genetic engineers to "cleanse" diversity from our gene pool.

In Part 3, *Cultural Rainbows*, the book progresses from biology to social science, offering a survey and new reading of gender and sexuality variation across cultures and through history. Many tribes of Native Americans accommodated gender and sexuality variation by identifying people as "two-spirits" and including them within social life to an extent that is inspirational to those persecuted in modern society. In Polynesia, the *mahu*, comparable to the Native American two-spirits, are experiencing cultural tension as a result of the introduced Western concept of transgender. Across the globe in India, we find a large castelike group of transgender people called *hijra*; there are over one million hijra in a total

population of one billion Indians. The hijra enjoy an ancient pedigree and provide an Asian counterpart to the European history of gender variation that extends from Cybelean priestesses in the Roman empire to the transvestite saints of the Middle Ages, including Joan of Arc (called here Jehanne d'Arc), a transgender man. Early transgender people in Europe were classed as eunuchs, a large group similar to the hijra, with whom they may share a common origin. The Bible, in both Hebrew and Christian testaments (including a passage from Jesus), explicitly endorses eunuchs for baptism and full membership in the religious community. Gender variation was recognized in early Islamic writings as well.

Early Greece enforced a gender binary for techniques of sexual practice: certain practices were considered appropriate for between-sex sexuality and others for same-sex sexuality. Approved practices were called "clean" and those disapproved called "unclean." The Bible is relatively silent on same-sex sexuality, in spite of the centuries-old belief that the Bible condemns homosexuality. I suggest the Bible's clear affirmation of gender variation and its relative silence on same-sex sexuality reflect different ages of gender- and sexuality-variant categories of identity. The category of eunuch extended to the time of Christ and beyond into prehistory, whereas homosexuality as a category of personal identity originated relatively recently in Europe, during the late 1800s. Thus, when the Bible was written, there existed a language for categories of gender variance but not for categories of sexuality variance.

My focus then shifts to anthropologists working in Indonesia, who describe coming reluctantly to acknowledge a legitimate element of masculine gender identity in lesbian expression, although they at first believed that lesbian sexual orientation should not include a masculine presentation. In contrast, an investigator studying Mexican *vestidas* (transgender sex workers) never moves beyond pejorative descriptions. Also, an interesting situation has occurred in the Dominican Republic, where enough intersexed people lived in several villages to have produced a special social category, the *guevedoche*. I wind up the cultural survey by returning to the contemporary United States to discuss the politics of transgender people and their growing alliance with gay and lesbian organizations, and conclude by stating a political agenda for transgendered people. Part 3 demonstrates that our species manifests the same

range of variation across cultures and through time, but shows great variation in how we package people into social categories.

In Part 3, I've discussed affirming diversity from a religious standpoint. I believe that ignoring religion, and the Bible specifically, is to work with tunnel vision. Regardless of what science tells us, if people believe that the Bible disparages lesbian, gay, and transgender people, then the cause of inclusion is jeopardized because many would choose religion over science. In fact, I find that the Bible is mostly silent about sexual orientation and that the passages about eunuchs that directly affirm transgender people have been largely ignored. Overall, the Bible gives no support to the religious persecution of gender and sexuality variation. Moreover, the well-known story of Noah's ark imparts a moral imperative to conserve all biodiversity, both across species and within species.

As an appendix, I offer concrete policy recommendations. I suggest strengthening the undergraduate curriculum in psychology and improved education for premedical and medical students to prepare them better to understand natural diversity. I propose new institutional processes to prevent continuing medical abuse of human diversity under the guise of treating diseases. I demand that genetic engineers take an oath of professional responsibility and that they be licensed to practice genetic engineering only after having passed a certifying examination. Finally, I float the idea that our country should construct a large statue and plaza, called the Statue of Diversity, which would be to the West Coast what the Statue of Liberty is to the East Coast.

This book is my first "trade book," a term publishers use for books intended for a wide audience rather than specifically for classroom use—my previous books have been specialized textbooks, monographs, or symposium proceedings.<sup>4</sup> In this type of book I'm free to express opinion and to adopt an informal style. In this book, I freely declare where I'm coming from. Being up front about my position automatically raises the question of objectivity; I've told the truth, and the whole truth, as best I can. Yet I offer my own interpretation of the facts, as if I were a lawyer for the defense opposing lawyers for the "persecution." You, my readers, are a jury of friends and neighbors, and you will make up your own mind. Please consider that everyone writing on these topics is writing from a particular perspective and with a vested interest. Some bene-

fit from the biological excuse for male philandering that Darwin's sexual selection theory provides. Others find validation in Darwin's reinforcement of their aggressive worldview. Still others enjoy the genetic elitism of sexual selection theory, confident that their own genes are superior. I find that refuting sexual selection theory imbues female choice with responsibility for decisions about power and family far more sophisticated than what Darwin envisioned, and empowers varied expressions of gender and sexuality.

At times I've loved writing this book; at other times I've felt afraid of what I have to say. The view of our bodies, of gender and sexuality, that emerges is strikingly new. But I've carried on because I've found the message to be positive and liberating. I hope you enjoy this book. I hope it betters your life.

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