Chapter 1
Introduction

Malin Ah-King

Myths about gender and biology abound. We are constantly fed with ideas about essential differences between women and men in popular books such as *Men Are from Mars, Women Are from Venus*, telling us that we had better accept and approve of innate differences or we will make ourselves unhappy [1]. Biological facts have often been and are still being used to make claims about what is "natural" and morally acceptable, thereby justifying oppression based on a variety of grounds for discrimination such as sex, sexuality, race, and class. In the nineteenth century, it was considered a scientific fact that brain use in women would drain limited energy from their true reproductive roles [2]. Today, biological claims of differences between men and women turn up everywhere and are used both to justify why men are not suited to taking care of babies and to substantiate relationship advice.

Biological arguments are sometimes used to account for our behavior when we cannot control ourselves, and our understanding of biology is internalized when we reflect on ourselves as cavemen [3] or as driven by hormonal cravings [4]. There exist many popular conceptions about biology, sex, gender, and bodies that stem from supposedly common-sense notions of gender difference, human evolution, biological processes, and animals. Science often underpins popular understandings of female-male sexual difference, but current research in biology also opens up a space for variable and non-static views of sex and gender. Instead of emphasizing polar differences between females and males, the natural sciences may underscore variation, sameness, and a continuum of morphologies, behavior, and processes.

This edited volume presents contributions from international researchers from a variety of disciplines—biology, history of science, anthropology, human evolution, and social sciences—all with the aim of challenging popular misconceptions of sex

M. Ah-King (✉)
Centre for Gender Research, Uppsala University, Uppsala, Sweden
e-mail: Malin.Ah-King@gender.uu.se

M. Ah-King (ed.), *Challenging Popular Myths of Sex, Gender and Biology*,
Crossroads of Knowledge, DOI 10.1007/978-3-319-01979-6_1,
© Centre for Gender Research, Uppsala University, Sweden 2013

differences. The chapters in this collection offer not only a critique of conventional understandings of sex and gender, but the authors also demonstrate that current research findings suggest alternative ways of conceiving of sex, gender, and biology. Our aim is to make current insights about sex and gender accessible to a broader audience. Popular beliefs are often not in accordance with the ideas developed and held by researchers in biology and medicine. Our goal is to question taken-for-granted assumptions and thereby deepen our readers' understanding of biology, sex, and gender by going beyond these popular conceptions.

1.1 Sex or Gender?

Sex and gender are often used interchangeably, but researchers in women's studies/gender studies use the term gender (as in gender identity or gender representation) as an analytical category which has enabled focusing on the social constructs of what it means to be a woman or a man, and to emphasize that these social constructs are changing over time and are variable across cultures. Notably, about a hundred years ago, the color pink was considered a "decided and strong" color suitable for boys, symbolizing "zeal and courage," while blue was considered "more delicate and dainty" signaling faith and constancy and thereby suitable for girls [5].

Among biologists, the term sex has several different meanings: the most common use is in the sense of sex as the female-male distinction, which is based on the size of the sex cells—females produce large sex cells (eggs), and males produce small ones (sperm). But there is also another term that is sometimes confused with the former one, namely, sexual reproduction. Sexual reproduction occurs when sex cells fuse to produce a new individual. There are species in which sexual reproduction occurs that have sex cells of the same size and that are therefore not categorized as males and females, such as *Chlamydomonas*, an algae.

The distinction between sex and gender is not clear-cut. We may think of biological sex differences that we can measure, but many measurable characteristics may be influenced by our ways of behaving as women or men, such as cultural ideals influencing the building of muscle mass. Even if we do find biological sex differences, for example, in brains, it is very difficult to distinguish between the cultural and biological influence producing these differences, because the brain develops in relation to how we use it [6].

In understanding and explaining sex differences, we often use stereotypes as a shortcut to process information [7] (see Chap. 4). Virginia Valian uses the term "gender schemas" to describe how our underlying generalizations about sex differences influence how we perceive and interpret different phenomena [8]. One example is how general knowledge of sex differences in body height influences how height in women and men is estimated. For instance, studies show that we tend to overestimate male height and to underestimate female height, despite the presence of reference objects. We tend to use these kinds of generalizations

in our interpretation of the world, which probably has contributed to current taken-for-granted conceptions of sex, gender, and biology.

In debunking myths about sex, gender, and biology, we have many predecessors. In 1985, Anne Fausto-Sterling wrote her critique of biological theories entitled *Myths of Gender*, in which she critically analyzed biological research on hormones, aggression, menstruation, and adaptive theories of rape.

In her book *Sexing the Body*, she presents an illuminating meta-analysis of studies investigating sex differences in a part of the brain called the corpus callosum, the tissue connecting the brain halves, which is popularly referred to as the "highway between brain halves." Fausto-Sterling shows that even though some studies have revealed significant sex differences in measures of the corpus callosum and thereby gained media attention, the overall results do not show any consistent sex differences in the size or shape of the corpus callosum [9]. Recent endeavors to scrutinize the science of sex differences have resulted in two books: Cordelia Fine's *Delusions of Gender: How Our Minds, Society, and Neurosexism Create Difference* [5] and Rebecca Jordan-Young's *Brain Storms: The Flaws in the Science of Sex Differences* [6]. Cordelia Fine reviews research showing that preconceptions about how men and women perform in different tasks have substantial effects on the results. For instance, investigating gender differences in mathematical problem-solving abilities may show sex differences that are due to gender stereotypes about the very mathematical abilities that are being tested. Fine also makes the point that when we see stereotypical differences between boys and girls, we tend to fall back on biological sex differences as an explanation, overlooking the overwhelming social influence. Rebecca Jordan-Young, in turn, scrutinizes evidence that is claimed to support the hypothesis that hormonal influences early in life organize the brain and cause permanent masculine/feminine effects, leading to differences between masculine and feminine desires, personality, and cognition. Jordan-Young demonstrates the methodological deficiencies and questionable assumptions on which these studies are based and shows that there is a great discrepancy between the contradictory research findings and the grand conclusions that have been drawn from them [6].

Language research is another area that fails to support commonly held beliefs about women's and men's communication [7]. Throughout her book *The Myth of Mars and Venus: Do Men and Women Really Speak Different Languages?* Deborah Cameron shows that research provides little support for the notion of women using more words than men when talking, of women being more verbally skilled than men, or of men using language in a more instrumental way than women. Clearly, challenging myths of sex and gender are as urgent as ever and require scientific knowledge from many disciplines.

1.2 Cultural Influence on Science

Science historians and gender researchers have shown how cultural conceptions influence the interpretation of research results and what questions are considered worthy of pursuing at a certain time. Cultural norms also influence how we view

biology. For example, the focus on reproduction in evolutionary theory has caused biologists to disregard how frequent same-sex sexuality is among animals [10, 11]. Science philosopher and science historian Evelyn Fox-Keller has analyzed how feminism has changed science. Keller's famous science historical account of Barbara McClintock's career is one example of this argument. McClintock showed that DNA restructures and changes, but her discovery was so radically different from the prevailing paradigm at the time she presented it that the scientific community did not understand it. This example shows that there are many theoretical approaches occurring simultaneously and that some perspectives are overlooked, and it is in this process that ideology in general may have its greatest impact. Therefore, Keller argues that feminist critique of science should make visible the history of science and that it also has the potential to transform science. Critical gender perspectives on science have the potential of decreasing biases and improving science [12]. Stereotypical portrayals of females and males in scientific models and in the scientific literature prevent researchers from approaching their research material with an open mind (see Chap. 4), and therefore gender-neutral models may lead to less biased scientific endeavors [12] (see Chap. 6).

1.3 Implications for Society

Why is it important to challenge myths of sex, gender, and biology? We think it is important because these myths are highly influential in human societies; they essentialize differences and make them seem natural and justifiable. Questioning the "essentials" or what constitute the fundamental sex differences is one way of taking on the task (see Chap. 2). Biological research on human nature is especially problematic in this sense, as it is concerned with examining what is "natural" for females and males. Priscille Touraille, in Chap. 7, problematizes the evolution of human sex differences in body height from an interdisciplinary perspective, including different cultural and biological perspectives. Furthermore, it is important to understand how developments in society and science are interdependent, and this volume includes historical perspectives on the science of sex hormones and evolutionary theory (see Chaps. 3 and 6). Finally, it is important to understand how arguments about nature and culture influence political debates and decisions and how we can understand policy as a reflection of traditions, ideologies, and local contexts (see Chap. 9).

1.4 The Chapters

The first chapters concern our understanding of sex differences, taking as a starting point the variation in sex among animals, fundamental sex differences, genes, and hormones. With reference to the huge variability in males and females among

animals and plants, Root Gorelick, Jessica Carpinone, and Lindsay Jackson Derraugh go on a quest for the fundamental and unequivocal sex difference (Chap. 2). They reject sex chromosomes—many species do not have sex chromosomes and an individual's sex may instead be determined by temperature—and genitals; a penis is definitely not a universal among males of all species; in birds the majority of species lack penises. The quest ends in possible minute details of the sex cells (eggs and sperm) that need to be further investigated before we have a definitive answer to what the fundamental sex differences may be.

Daniella Crocetti's Chap. 3, on genes and hormones, contains a historical review of the importance of genes and hormones for our understanding of sex. The history starts with binary conceptions of hormones, labeled by sex, although they later were found to occur in both sexes, and ends with the acknowledgment that what determines a person's sex is an intricate interplay between genes, hormones, and gendered components of the body. These different components may or may not coincide with that person's gender identity. She argues that intersexuality, which in medical terms is called disorders of sex development (DSD), questions the conception of sex as a binary, and she discusses current medical hormone treatment practices in general.

The next three chapters look at scientific research in evolutionary biology: the relatively new field of sexual conflict within evolutionary biology (Chap. 4), new findings in evolutionary biology showing alternative ways of heredity than genetic inheritance (Chap. 5), and the history of ideas in evolutionary biology pertaining to sex differences (Chap. 6). In Chap. 4, Josefin Madjidian, Kristina Karlsson Green, and Åsa Lankinen describe stereotypes in a new field of evolutionary research, namely, sexual conflict that focuses on the conflicting interests of the sexes in relation to mating. They show that gendered notions pervade in models as well as descriptions of animal behavior. Words used to describe females and males in these conflicts fall in two almost mutually exclusive categories, reflecting classic stereotypes of active males and reactive females. Madjidian, Karlsson Green, and Lankinen argue for a more balanced use of terms to facilitate research that is more inclusive of variation outside of female and male stereotypes. Furthermore, avoidance of stereotypes in biological research is also beneficial to communication of scientific findings to the general public, as biological research shows that nature is much more flexible than is typically described.

Popular views hold that genes steer the sexes, causing them to behave in stereotypical ways. Since the 1930s, evolutionary biology has positioned genes as the focus of evolution. In Chap. 5, Jonathan P. Drury explores recent biological research showing different paths of heritability that have an important impact on how we view evolution. Drury draws on empirical studies to show how environmental and social factors influence the expression of traits and, consequently, evolution. Social interactions and environmental factors influence the expressions of genes, affecting, for example, sex determination, such as in many lizards whose sex is determined by temperature. In an experiment on fruit flies, a special appearance (bi-thorax) was induced by treating individuals with an environmental factor: ether. After pairing these bi-thorax individuals for some generations, the fruit flies produced bi-thorax

individuals in the absence of treatment with ether. Thus, selection may influence regulatory processes to increase or decrease environmental effects on different characteristics. These research findings help us understand evolutionary processes as dynamic and dependent on both social interactions and other environmental factors, in stark contrast to the popular deterministic view of genes.

Evolutionary theory of sex differences, in particular the theory of sexual selection, has received a great deal of critique from gender perspectives, such as the overfocus on males and stereotypic portrayals of the sexes. In Chap. 6, on the development of evolutionary explanations for sex differences, Thierry Hoquet explores both stereotypic notions and Darwin's emphasis on male traits, critiques of them, and development of the theory of sexual selection. Darwin described females as generally coy and males as eager, in accordance with Victorian ideals, but he did not explain why this pattern had emerged. Subsequent biologists have tried to solve the question by relying on sex differences in investment in large versus small sex cells (eggs and sperm) and investment in parental care. These ideas have been challenged, and in the final part Hoquet reviews emerging models in evolutionary biology that do not build in taken-for-granted assumptions about what it means to be female or male.

The last three chapters deal with humans, the cultural and biological effects on sex differences in body height and how voices are gendered, and the last chapter addresses the political and cultural implications of the current debate on shared parental leave in Norway.

Human sex differences in body height are often discussed as a biological characteristic caused by ancient selection pressures, as a kind of remnant of our evolutionary history. In Chap. 7, Priscille Touraille problematizes this notion and explores different hypotheses about sex differences in human stature: selection on males to increase height and selection for women's increased height to decrease problems in childbirth, mate choice, and nutritional constraints. Finally Touraille provides a new hypothesis, positing that sex differences in height are a result of cultural gender systems that restrict nutrition for females and thereby influence biology and evolution. Using an interdisciplinary approach including anthropology, evolutionary biology, and gender studies, Touraille suggests that a cultural gender hierarchy may contribute to this biological characteristic.

In Chap. 8, "How do voices become gendered? A critical examination of everyday and medical constructions of the relationship between voice, sex, and gender identity," David Azul examines the often taken-for-granted assumption that voice characteristics have a biological basis in a person's physiology and morphology that results in a distinctive binary. This common-sense view has led to the medical pathologization of people who do not show "correctly" gendered voices and to the development of treatment approaches to what is perceived of as "gender-inappropriate" voices. Azul draws on empirical evidence contradicting the common-sense view that male/female vocal differences are straightforward reflections of a biological dimorphism. For example, sex differences in the fundamental frequency or pitch of the voice have been found to differ between cultures (one study showing that both female and male speakers of a dialect of Chinese speak on pitch levels above the "gender-dividing line"); there is a diversity of voices that do not conform to gender

norms, and our perception of gendered voices is influenced by how we think about sex and gender. Azul proposes an alternative perspective on the "natural binary" of voices, namely, that the gendering of voices is the result of performance and interpretation practices that draw on conventional ideas about what constitutes "femaleness" and "maleness."

In the last chapter, Ole Jacob Madsen analyzes the arguments in the political debate around paternity leave in Norway, illustrating how nature-culture arguments influence politics and the debates, as an example of localized and situated negotiations of the meanings of gender in society. Scandinavian parental-leave politics, based on an ideological agenda to increase equal opportunities in society and women's participation in the workforce, has been progressive and led to unequaled leave benefits for parents. In the current debate about prolonging or abolishing the father's quota of parental leave in Norway, opinions differ. On the one hand, arguments about the naturalness of women doing the caring, how breastfeeding benefits children's health, how sex roles evolved during the Stone Age, and the stress caregiver change causes children are all used to advocate against a special father's quota of parental leave. In contrast, reports on equality and quality of life are used by other child psychologists to promote prolonged paternal leave. Nature and culture continue to be a hot topic for debate in contemporary Norway.

Different views on the role of individuals in society underlie the debate. Political ideology in Scandinavia has moved from stressing equal opportunities, societal context, and cultural influences on women's and men's roles in society toward an emphasis on individual autonomy, which is currently strong in the Euro-American political climate. The latter understanding of individuals as isolated from their social context has paved the way for increased emphasis on biological explanations, which has implications for individual citizens as well as the development of society.

With our diverse disciplinary backgrounds and approaches, we take on the task of questioning taken-for-granted assumptions about sex and gender and of encouraging critical thinking about sex differences. We show that conventional notions of females and males are not only a manifestation of cultural representation but also that gender bias in (supposedly objective) scientific research persists until today. We hope that this volume will broaden our readers' perspectives and give new insights into sex, gender, and biology.

Acknowledgments This book has been made possible by the efforts of many people, notably the contributors themselves, a number of reviewers, and Andrew Lee. The Centre for Gender Research, Uppsala University, has also provided support. I wish to thank everyone involved.

References

1. Gray, J. (1992). *Men are from Mars, women are from Venus*. New York: HarperCollins.
2. Bleier, R. (1984). *Science and gender, a critique of biology and its theories on women*. New York: Pergamon.
3. McCaughey, M. (2007). *The Caveman mystique, pop-Darwinism and the debates over sex, violence and science*. New York: Routledge.

4. Fausto-Sterling, A. (1992). *Myths of gender, biological theories about women and men*. New York: Basic books.
5. Fine, C. (2010). *Delusions of gender, the real science behind sex differences*. New York: W. W. Northon & Company Inc.
6. Jordan-Young, R. M. (2010). *Brain storms: The flaws in the science of sex differences*. Cambridge, MA: Harvard University Press.
7. Cameron, D. (2007). *The myth of Mars and Venus: Do men and women really speak different languages?* Oxford: Oxford University Press.
8. Valian, V. (1999). *Why so slow? The advancement of women*. Cambridge, MA: MIT Press.
9. Fausto-Sterling, A. (2000). *Sexing the body, gender politics and the construction of sexuality*. New York: Basic books.
10. Bagemihl, B. (1999). *Biological exuberance, animal homosexuality and natural diversity*. New York: St. Martin's Press.
11. Ah-King, M. (2009). Queer nature, towards a non-normative perspective on biological diversity. In J. Bromseth, L. Folkmarson Käll, & K. Mattsson (Eds.), *Body claims*. Uppsala: Centre for Gender Research, Uppsala University.
12. Ah-King, M., & Nylin, S. (2010). Sex in an evolutionary perspective: Just another reaction norm. *Evolutionary Biology, 37*, 234–246.