PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

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Preface

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One contribution of 14 to a Theme Issue 'Female competition and aggression'.

The 'one animal in all creation about which man knows the least'

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Biologists today absorb evolutionary perspectives in worlds very different from that inhabited by Charles Darwin while he was writing *The Descent of Man and Selection in Relation to Sex* (1871). Women then did not attend universities or participate in formal scientific meetings. It was 1945 before a woman, other than its patron Queen Victoria, was admitted to the Royal Society. Well might a scholar of that era have taken for granted that a man will attain 'a higher eminence, in whatever he takes up, than woman can attain—whether requiring deep thought, reason or imagination'[1, Part II: 327]. Females of his species had few opportunities to demonstrate otherwise. The determinate event in the lives of most women of his acquaintance would have been choosing, or being chosen by, a man of means.

A handful of iconoclasts did step forward at the time to respectfully challenge Darwin's view of female natures. In 1874, Darwin's French translator, Clemence Royer, complained that 'Up until now, science, like law, has been exclusively made by men and has considered woman too often an absolutely passive being, without instincts or passions, or her own interests.' She is 'the one animal in all creation about which man knows the least'.[1] Compared with Darwin's exquisitely detailed observations of barnacles, coral reefs and orchids—even the emotional development of his own children—this consummate naturalist's observations of women and other female primates were curiously cursory.

Texts I encountered as an undergraduate at Harvard College a century later were little better. In the only essay then available on female primates, I would read that 'the most important, time-consuming role of the nonhuman primate female, and her primary focus as an adult, is motherhood. She raises one infant after another from the time she assumes adult roles . . . until the time she dies [4, p. 5]'. Implicit assumptions here led to gross underestimation of myriad sources of variance in the reproductive success of one female relative to another. Vociferous and unabashedly political critics of sociobiology from *Science for the People's* Sociobiology Study Group actually had a valid point when they charged: 'sociobiology carries with it the implication that human social behavioral traits evolved primarily through sexual selection on male traits' [5, p. 485]. At the time, of course, this was true for Darwinian theory generally. What these critics of sociobiology missed was the transformative role that the new synthesis of natural selection with studies of social behaviour would soon play in expanding Darwinian theory to encompass selection pressures on both sexes.

This expansion meant including competition among individuals of *either* sex, not just for mates, but for any resource that contributed to survival or successful production or rearing of offspring. Competition included that between mothers or would-be mothers for physical resources such as food or for current or future benefits such as assistance from advantageous partners. From this perspective, Darwinian sexual selection (typically entailing competition between males for mates) came to be seen as a special class of what Mary Jane West-Eberhard [6]—and, over time, an increasing number of others—would categorize as Darwinian 'social selection' (for recent overview, see [7]).

This broadening of evolutionary perspectives and its chronology can be illustrated by a quick 'Google Ngram' scan.[2] According to a search of books published between 1850 and 2008, references to 'competition among females' were rare prior to 1970 but increased dramatically after 1975 (figure 1). Typing in the phrase 'Female reproductive success' produces a similar pattern.

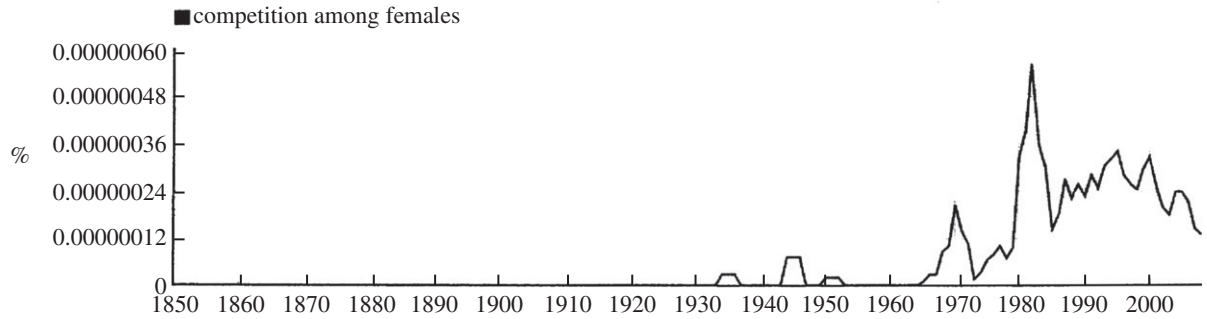

Figure 1. Google Ngram Viewergraph for the period between 1850 and 2008 illustrating the dramatic increase in usage of the phrase 'competition among females' in the 1970s and 1980s and continued usage thereafter.

Neither are random correlations. Closer examination for each time period reveals that the increases were almost entirely owing to authors with backgrounds in sociobiology. The women's movement, sexual revolution and other forces transforming Western cultures, as well as the genderscape among those obtaining higher degrees, also had roles to play. The late twentieth century witnessed a marked increase in women awarded degrees in biology as well as in the social and behavioural sciences; by 2010 more than 60% of doctoral degrees were being awarded to women.[3] These demographic changes are beginning to be reflected in the percentage of women biologists invited to address organizations such as the European Society for Evolutionary Biology, which between 2001 and 2011 fluctuated between 9% and 23% of invited speakers [9]. Some might say this is slow going, but I marvel at the changes just within my own life experience.

Zoologists have proposed various possible explanations for why it took more than a century for Darwinians to recognize just how much intrasexual competition was going on among females. Inherent difficulties in documenting selection pressures on females required more sophisticated sampling methods and longer-term field studies. As mothers often have more to lose if injured, they were likely to be more risk averse. Compared with the conspicuous displays and bloody conflicts leading to skewed reproductive success among males, female–female competition will often be more indirect or subtle.

In addition to these inherent difficulties, a fuller explanation of the delay in moving evolutionary theories beyond old stereotypes needs to take into account the ever-present problem of bias. After all, a long, if scattered, record of field studies documents (for those actually looking for it) competitive behaviours, sometimes lethally so, involving females across a wide array of species (see literature reviewed in [10]). Primatologists, for example, have known for decades that females in some species vigorously strive for rank, mate polyandrously with multiple males and occasionally harm (or even kill) offspring born to competitors, with maternal effects and consequences for reproductive success likely to persist across generations (reviewed in [11]). Nor was such behaviour always easy to miss, as is evident from the striking photo that recently appeared on the cover of the *Proceedings of the National Academy of Sciences* [12] of a head-on conflict between two topi females competing to mate with a particular male.

By the 1980s, prominent male biologists were joining their women colleagues in identifying the 'double standard' within Darwinian theorizing [13] and raising the possibility of 'inadvertent machismo', with observational biases being most pronounced in fields where behavioural research has 'traditionally been carried out mainly by men rather than by women' [14, p. 263]. They understood that thresholds for accepting certain assumptions rather than others are coloured by individual life experiences influencing which questions interest us, what we note or even see, which individuals we most identify or empathize with, and especially which phenomena pique our curiosity and seem worthy of pursuing further rather than dismissing as theoretically insignificant flukes.

Since Darwin's day, and even since my own introduction to evolutionary theory, the Western world has witnessed a sea change in attitudes about gender roles. In combination with a more diverse community of researchers undertaking long-term studies using sophisticated methodologies, researchers were prompted or 'pre-adapted' to ask new questions and the answers are now beginning to emerge. Results of this shift are stunning, as evidenced in the papers that follow.

Endnotes

[1]For more on these distaff Darwinians and references to their work, see [2], pp. 12–24; quotes appear on pp. 21 and 22 of [3], from Joy Harvey's English translation of a manuscript by Royer suppressed prior to its publication.

[2]Introduced in 2010, Google books Ngram Viewer quickly scans more than five million digitized books published prior to 2008 and graphs how often a particular phrase appeared. Owing to limitations on the database size, only matches found in 40 or more books are indexed.

[3]On US degrees in biology, see http://www.nsf.gov/statistics/nsf08321/pdf/tab28.pdf; for behavioural sciences, see [8].

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