

Sexual Conflict

By **Göran Arnqvist and Locke Rowe**

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In *Sexual Conflict*, behavioral ecologists Arnqvist and Rowe set out to destroy the romantic notion that mating is a cooperative venture between two individuals of the opposite sex. This is accomplished on page 1. A barrage of examples of sexual conflict in insects, birds, spiders, and fish usher in the reality that the evolutionary interests of males and females are often in conflict. In fact, sexual conflict occurs in every sexually reproducing species, with the rare exception of those that practice strict life-long genetic monogamy.

There are two varieties of sexual conflict: intralocus sexual conflict and interlocus sexual conflict. Intralocus sexual conflict can occur between traits common to males and females on which there is opposing selection. For example, beak morphology differs between the sexes in serins (a finch) due to differences in food utilization between the sexes. Interlocus sexual conflict, however, occurs when a conflict trait is encoded by different genes in males and females, producing conflict over the outcome of male-female interactions. This form of conflict, which is the primary focus of the book, encompasses much of what we think of when we think of sexual conflict—sexual cannibalism, grasping and anti-grasping traits, and toxic seminal fluid. Roy Orbison was right: Love hurts.

Following a thorough review of the history and theory behind sexual selection and sexual conflict, the book is appropriately divided into chapters that discuss conflict that occurs prior to mating (e.g., adaptations for persistence and resistance), conflict that occurs after mating (e.g., sperm competition), and conflict occurring after conception (e.g., mate desertion). The remaining chapters tackle such topics as genomic imprinting, sexual conflict as a mechanism of speciation, and even sexual conflict in plants.

Sexually antagonistic coevolution is a reoccurring theme throughout the book. Sexually antagonistic coevolution is the process by which adaptation in one sex can lead to counter-adaptation in the other, such as when males evolve persistence traits which are met by resistance traits in females, which are then countered by further adaptations in males and so on. Arnqvist and Rowe detail three comparative studies of sexually antagonistic coevolution in action. That is, many traits in males and females suggest an evolutionary history of adaptation and counter-adaptation, but the authors cite three case studies that use phylogenetic relationships between

closely related species to provide direct evidence of a coevolutionary arms race between the sexes.

Missing from the book, however, is a discussion of the constraints on sexually antagonistic coevolution. Although sexual conflict is certainly ubiquitous across species, coevolutionary arms races arising from sexual conflict are probably less common due to the costs of counter-adaptations and available genetic variation, for example (Chapman, 2006). The authors do not explicitly suggest that sexual conflict inevitably leads to sexual antagonistic coevolution, but their reasoning for the paucity of research on explicit sexually antagonistic coevolution is limited to difficulties in identification and quantification, and not constraints on the process itself. This, of course, does not subtract from the book's overall message and rich content.

Although intended for graduate students and researchers in the evolutionary sciences, *Sexual Conflict* is surprisingly accessible due to the book's clear organization, lucid writing, engaging examples, and section summaries. Even sections discussing mathematical models of sexual conflict are explained without equations and include minimal technical language. At times, the writing is even casual: One section's title warns us to "Never trust a penduline tit!" due to both sexes' readiness to desert the nest, leaving the other to care for the eggs and young. And when discussing how hermaphrodites cannot overcome intralocus conflict because the two sex roles often require different adaptations, Arnqvist and Rowe joke that "hermaphrodites may be doomed to be an evolutionary compromise between a Ferrari sports car and a John Deere tractor" (p. 195).

As this review is written for readers of the *Human Ethology Bulletin*, it would be remiss not to discuss sexual conflict that occurs in our own species. Humans are mentioned about half a dozen times throughout the book, but the discussions are largely superficial (e.g., it is noted in passing that genomic imprinting underlies many human genetic diseases). The one exception is their coverage of the chemical properties of human semen. Seminal fluid includes enzymes, hormones, peptides, amino acids, zinc, fructose, cholesterol, and dozens of other compounds, and the authors suggest that this complex and costly mix of chemicals might serve a function beyond reproduction. Specifically, they speculate that this chemical cocktail suggests a coevolutionary arms race between aggressive ejaculates and defensive reproductive tracts (but see Burch & Gallup, 2006 for alternative hypotheses). The authors label this a highly speculative hypothesis and conclude the section on a somber note, stating that this hypothesis is difficult to test without careful experiments that would be too difficult or unethical to conduct in humans. Indeed, this cautious skepticism is probably why plants receive more attention than humans.

The evolutionary interests of human males and females are certainly asymmetrical, so there is no reason to doubt that sexual conflict occurred throughout our evolutionary history. Indeed, sexual conflict in humans is a growing field of study among evolutionary psychologists. Many researchers have studied conflict arising over sexual access (e.g., Thornhill & Palmer, 2000), conflict that occurs during and after mating (e.g., Shackelford & Goetz, in press), and conflict occurring after conception (e.g., Platak, 2002), for example. Moreover, Buss (2007) is scheduled to present a keynote address on "Sexual Conflict in Human Mating" at the 2007 Human Mind - Human Kind conference.

Arnqvist and Rowe's reluctance to discuss sexual conflict in humans is probably due to the different empirical approaches employed by behavioral ecologists and evolutionary psychologists. The authors outline six research methods that have been used to document sexual conflict, such as genetic experiments, phenotypic manipulations, experimental evolution, and comparative studies, and only a couple of these are applicable to human populations. Evolutionary psychologists are unable to use experimentally evolution techniques and genetic engineering to study sexual conflict in humans, for example. These methodological limitations, however, have not dissuaded many researchers from making important discoveries in human sexual conflict.

To conclude, *Sexual Conflict* is a thorough and accessible resource for those interested in sexual conflict, sexual selection, and the evolutionary biology of sex. Because sexual conflict and sexual selection are theoretical tools applicable to our own species, researchers studying human mating would also benefit greatly from this book despite humans being given little attention. The book is well-organized, well-written, and full of extraordinary examples of conflict that occurs when the evolutionary interests of males and females diverge.

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