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Beauty in the eye, or brain, of the beholder

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Beauty exists entirely in the eye, or rather the brain, of the beholder. This is the central theme of Michael Ryan's, "A Taste for the Beautiful," which focuses specifically on perception of sexual beauty. Sexual signals, often displayed by males, are among the most beautiful and extravagant traits found in nature and have fascinated biologists for centuries. In his book, Ryan tackles the question that has long gripped evolutionary biologists: why would females evolve preferences for such costly traits?

Classic hypotheses for explaining female sexual preferences focus on fitness consequences. These traditionally suggest that females prefer elaborate male traits because such traits confer indirect benefits to offspring through good genes, render offspring more sexually attractive, or indicate a male's ability to provide direct benefits such as food or high-quality nesting sites (reviewed in Andersson 1994). Another explanation, sensory bias, posits that females prefer particular sights, sounds, and smells of male sexual signals because the associated neural processing centers became highly developed for reasons other than mate choice, such as finding food or avoiding predators (Fuller et al. 2005). As one of the primary architects for the concept of sensory bias and exploitation, Ryan falls firmly into the latter camp (Ryan and Rand 1990). He argues that sexual traits evolve by exploiting preexisting sensory biases resulting from selection for other unrelated ecological tasks. Therefore, to see the full picture of the evolution of sexual preferences, we must consider the underpinning neurological mechanisms.

While many evolutionary biologists are already familiar with the idea of sensory exploitation, this book takes a more general, engaging tack intended for nonbiologists. One of the book's main themes is that what is deemed beautiful or attractive in one species may be repulsive, or not even perceived, in another—beauty is entirely subjective. As Ryan puts it, "I find the Mona Lisa beautiful, and perhaps you don't. We both see the same arrangements of colors within the frame; we just process them differently" (p. 19). Each individual is a unique combination of neural circuitry and behavioral traits that ultimately decides what is beautiful. Using vivid imagery, Ryan makes this point by showcasing taxonomically diverse examples of animal communication across a number of sensory modalities. Readers are invited to marvel at the majesty of a Bowerbird's lair, listen to a cricket's charming song, and smell the perfume of an orchid bee, while simultaneously learning how each species' brain and sense organs process this information. The examples are enhanced by a series of stunning plate photographs. Ryan's discussion of the evolution and perception of sexual beauty also masterfully cuts across the organizational scale of living things, jumping between genes, cells, sensory systems, and organisms. This is best evidenced by his engaging description of the sexual preferences of the Túngara frog, which ranges from describing the role of genes to sensory organs to behavior as they relate to the frogs' whine-chuck system. Because this is Ryan's primary study species, he also includes interesting "behind the scenes" details to explain how the research unfolded.

Ryan tackles his argument in threefold, providing examples of visual, acoustic, and olfactory signaling systems and discussing the brain's importance in processing these signals. However, while he makes a clear case for the need to include the brain's role in the story of sexual signal evolution, only occasionally are these neurological mechanisms discussed in detail. More often than not, he simply describes examples of different animal signaling systems while the underlying reason for the sensory bias is not revealed. Certainly though, these tales of different signaling systems and female mating behaviors are fascinating and provide the reader with a deeper appreciation for the diversity of sexual beauty. Ryan also emphasizes that existing biases could lead to future exploitation and explains how there are many potentially untapped ways

to exploit these existing biases, akin to an "artist experimenting with paint on a canvas or a musician tinkering with new combinations of beats and chords" (p. 159). That last step however, of connecting a signal to its respective sensory bias origin, often remains elusive. One could argue that this shortcoming is in fact the point of his argument—that there has not been enough field-wide emphasis on the ecological basis of neurological biases to provide many strong empirical examples.

In making the case that the brain drives evolution of sexual beauty through sensory bias, Ryan downplays the importance of alternative hypotheses, asserting that the good genes and runaway hypotheses have not received the same level of empirical support as sensory exploitation. Sensory drive (an expanded version of sensory bias that includes the role of the signal transmission environment in affecting sensory and signaling traits) has in fact enjoyed substantial, albeit somewhat mixed, empirical support (Cummings and Endler 2018). However, these hypotheses are not mutually exclusive and may all at least partially contribute to the evolution of sexual signals and preferences (Andersson and Simmons 2006). For example, one of the most famous tales of sensory exploitation is that of the orange coloration of male guppies that appears to mimic a common food item. Because the female guppy sensory system is already finely tuned to prefer orange due to this foraging preference, females are also attracted to orange coloration during mate choice (Rodd et al. 2002). At the same time, other research demonstrates that the carotenoid-based orange coloration of male guppies signals indirect benefits and is correlated with offspring foraging ability (Karino et al. 2005) and success at evading capture (Evans et al. 2004). Ultimately, more research is required to understand the relative importance of and potential synergies between the different proposed evolutionary mechanisms of female mate choice.

Though "A Taste for the Beautiful" does not provide the winning case for sensory bias, this does not mean that Ryan's message fails to deliver. He makes the described concepts relatable to anyone reading the book by weaving together diverse topics from economic theory to Cinderella's Castle at Disneyworld. One particularly effective way that he makes his book accessible is by including many human examples, woven almost seamlessly into his thorough exploration of the animal kingdom. In general, the discussion of human evolution is well executed, with interesting insights into communication within our own species, from visual attributes of written languages to mate choice copying. However, discussing human evolution can be a double-edged sword. A few controversial examples of evolutionary psychology are not explained with enough nuance, such as of the oft-debunked story of exotic dancers making more tip money when ovulating. This may give such examples disproportionate weight, particularly for those unfamiliar with the controversy. The final chapter of the book also includes a section on pornography and sexual fetishes that some readers may find a rather unsettling note to seal lasting impressions of the book.

Overall, "A Taste for the Beautiful" is an engaging read that we would recommend for undergraduate Biology majors, graduate students, and others with a background in biology. Though the book is intended for a general audience, it may not be fully suited for the average reader. At times, it becomes rather technical, explaining particular genes or neural pathways in detail and using acronyms that are common for researchers in a field, but can be intimidating for others. Some of the theories discussed will be familiar to nonscientists (such as Pavlovian conditioning, best known in the context of Pavlov's dog), but are occasionally made unnecessarily complex by describing them with excess jargon. At the other end of the reader spectrum, this would be a fun read for professional evolutionary biologists, though probably not a book to cite in academic research. That said, Ryan is a masterful writer, pulling from multiple sensory modalities and an innumerable amount of species to construct the case that all roads lead to the brain. His language is both profound and relatable, with vivid imagery and casual humor that draws in the reader. This delightful and illuminating book is sure to deepen one's appreciation for how the brain shapes evolution of sexual beauty.

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