Physics of the Peacock's Dance

Suzanne Amador Kane, Haverford College, Haverford, PA

Peacocks are the textbook example of an elaborate mating display--and hence of sexual selection in evolution. To seduce females, male peafowl perform a complicated dance in which they tilt, pivot and shake their elaborate, iridescent train feathers to present a dazzling visual display accompanied by mechanical sounds. Physics plays a surprisingly important role in these behaviors. Resonance determines the frequencies with which they shake their feathers and how those feathers move. The eyespot ornaments that decorate these feathers are structurally-colored: their vivid hues change with viewing angle because they arise from interference of light with photonic crystals of melanin nanorods. Furthermore, like many birds, peacocks have exceptional color vision, including the ability to see into the ultraviolet. This means that we need to explore the spectrum of reflected light in detail to understand how these birds experience such visual signals. I will explain how we are using a combination of field studies of displaying peacocks, biomechanical measurements, reflectance spectroscopy, computer modeling, bioacoustic methods and multispectral imaging to capture the dynamics of the peacock's multimodal signals. Our goal is to understand how peacocks exploit their feathers' biomechanical and optical properties, and ultimately how these displays evolve.

Bio: Suzanne Amador Kane received her B.S. in physics from MIT and her PhD and MS in Applied Physics from Harvard University. After a postdoctoral research appointment at University of Pennsylvania she joined the faculty at Haverford College's, where she is a professor and chair in their Physics and Astronomy department. Prof. Kane's research interests lie at the interface of biological physics, soft condensed matter physics and statistical physics. Recent projects have included studies of how animals use visual guidance during predator pursuit and prey evasion, the biomechanics and optics of peacock mating displays, the kinematics of raptor take-off flight, and how birds signal by calling during flocking, computer modeling of bacterial diversity in ecosystems. Her group approaches these problems using a combination of experimental techniques, including high-speed and stereometric 3D video, bioacoustics and computational modeling. She also has worked on a variety of physics education issues, including most recently reforming introductory physics for life science students to meet new premedical standards and developing resources for teaching physics to blind and visually-impaired students