Selected Abstracts of Publications

JAMES L. GOULD
Professor of Ecology
Department of Ecology and Evolutionary Biology, Princeton University, Princeton, NJ 08544-1003

Sensory bases of navigation

James L. Gould, ***Current Biology*** *8*, 731-738 (1998)

Navigating animals need to know both the bearing of their goal (the "map" step), and how to determine that direction (the compass step). Compasses are typically arranged in hierarchies, with magnetic backup as a last resort when celestial information is unavailable. However, magnetic information is often essential to calibrating celestial cues, and repeated recalibration between celestial and magnetic compasses is important in many species. Most magnetic compasses are based on magnetite crystals, but others make use of induction or paramagnetic interactions between short-wavelength light and visual pigments. Though odors may be used in some cases, most if not all long-range maps probably depend on magnetite. Magnetite-based map senses are used to measure only latitude in some species, but provide the distance and direction of the goal in others.

Female preferences in a genus without female choice

James L. Gould, Samuel L. Elliott, Casson M. Masters, & Joya Mukerji, ***Current Biology*** *9*, 497-500 (1999)

The evolution and adaptive logic (if any) of female mate choice are subjects of lively debate. While most researchers believe that females have evolved to recognize signs of male "quality" (the ability to provide females or their offspring with direct or indirect genetic or material benefits), there is intriguing evidence that males can evolve to appeal to preëxisting female preferences. Evidence for these preëxisting biases is often ambiguous because phylogenetic reconstructions fail to establish conclusively whether the female preference or the favored male traits evolved first. This potential difficulty is minimal in the mosquitofish genus *Gambusia*, none of whose 45 species appear to have a female-choice mating system in the wild, nor the male behavioral and morphological traits characteristic of female-choice. Nevertheless, female *G. holbrooki* readily choose between models of males in the lab, and demonstrate significant and reliable preferences for a variety of exaggerated male traits not seen in their species or genus. Other morphological alterations are not preferred. The latent willingness of females to choose traits in a genus without such traits or evident female choice in the wild is remarkable, and may indicate a preëxisting bias in females that is ready to drive male evolution should the social system or the ecological variables that control it change.

The Origins of Female Mate Preferences in *Poecilia sphenops*

James L. Gould, Tanja S. Zabka, Robert W. Malizia, Albert Park, Joya Mukerji, ***Anim. Cog.*** *2*, 91-95 (1999)

In many species females choose a mate from among several available males; in other species, the social system provides no opportunity for making a decision among alternative suitors, and decision-making capacity is assumed to be minimal at best. The origins, bases, and logic of female mate choices are contentious questions with important cognitive implications. Female short-finned mollies, *Poecilia sphenops*, do not choose mates in the wild, where instead a male-contest social system prevails. Nevertheless they readily choose between models of males in the laboratory. Some of their decisions anticipate features found in males in more recently evolved species where the social system permits female choice. The willingness of females to choose traits in a species without such traits or evident female choice in the wild is remarkable. These observations suggest that choice behavior can be latent in a species, and may direct or bias the development of behavioral preferences.

Innate Learning

James L. Gould, ***Stevens' Handbook of Experimental Psychology, 3rd ed***., ed. R. Gallistel (New York: Wiley), pp. 239-257 (2002)

During the modern development of the study of behavior, Behaviorists maintained that all behavior was learned, and instinct was a myth. Ethologists for their part considered instinct the main factor in behavior, with learning serving as a kind of annoying adjunct; they believed that lab studies were irrelevant to the behavior of animals in nature. In retrospect both groups were right up to a point: most of the main phenomena studied by Behaviorists turn out to be at work in a wide range of "real" animals, while even humans depend on an enormous array of innate programming to survive. The synthetic view outlined here sees most learning as based on general processes but customized through the operation of natural selection in context- and species-specific ways to solve particular problems

Preadaptation and the evolution of female preferences

James L. Gould, Eugene Choi, Joya Mukerji, & Andrew P. Choi *(in review)*

The evolution and adaptive logic of female mate choice are subjects of lively debate. While most researchers believe that females should have evolved to recognize signs of male quality or health, females in certain species without female choice exhibit preëxisting mate-choice preferences that seem to predate any opportunity for selection to have acted to produce quality-based mate-choice behavior. The adaptive logic of these preëxisting biases, with their potential for later sensory exploitation, presents an important mystery. The mosquitofish *Gambusia holbrooki*, is a member of a genus of 45 species, none of which appear to have a female-choice mating system, nor exhibit the male behavioral and morphological traits characteristic of female-choice species. Nevertheless, female *G. holbrooki* readily choose between models of males in the lab, and demonstrate reliable preferences for a limited variety of exaggerated traits not seen in their species or genus. Choice tests show that the preëxisting biases observed in this species reflect an innate ability to avoid infectious companions. Preadaptations to recognize healthy conspecifics could be critical in the early evolution of female choice.

The role of eye color and spacing on death feigning (tonic immobility) in domestic chickens

Benjamin T. Pecht, David Yan, & James L. Gould *(in preparation)*

A new technique involving computer-generated images is described for studying death feigning. Independent of "predator" head size, domestic chicken chicks responded significantly more to models with relatively narrowly spaced "eyes" than to those with relatively widely spaced eyes. Models with yellow or red eyes yielded significantly enhanced responses, whereas neither green- nor blue-eyed models were effective. Models with two eyes, whether oriented horizontally or vertically, were effective; models with one or three eyes were ineffective.