Bluebird fathers favor pink over blue

The difference between the sexes takes a strange twist in the world of bluebirds. Scientists have discovered that father bluebirds favor their newborn daughters, perhaps because they view male nestlings as future competitors.

The eastern bluebird, *Sialia sialis,* is a much-loved member of the thrush family. Preferring open space to forests, it nests in natural or artificial cavities in trees, or in boxes mounted 3 to 20 feet off the ground. Unlike other birds, male and female bluebirds show a distinct gender difference at a very young age: The females appear paler and duller than the males, which already sport the bright blue feathers characteristic of the adult male.

Avian biologists Dale L. Droge and Patricia Adair Gowaty of Clemson (S.C.) University took advantage of that fact to study bluebird nestlings. Using videocameras mounted next to 15 bluebird nests, they observed that both mothers and fathers left the nests to gather spiders, grasshoppers, cherries and other tasty treats for their young. The cameras also revealed a striking sex-related difference: Father bluebirds fed female nestlings more often than they fed male nestlings — in some instances feeding daughters twice as frequently as sons. Mother bluebirds fed sons and daughters equally.

Why would daughters get preferential treatment? Gowaty theorized that the female nestlings might need more food because they use up more energy than their brothers during the feeding process. Gowaty, Droge and Wesley W. Weathers of the University of California, Davis, tested that hypothesis by studying 14 male and 14 female nestlings at different nest boxes in South Carolina from March to August 1990. Using blood samples obtained from the baby birds, the researchers calculated the amount of carbon dioxide produced during respiration — a measure of nestling metabolic rate and thus energy expenditure. In the current (November) issue of THE CONDOR, they report that male and female nestlings do not differ in carbon dioxide production.

That finding disproved the energy-expenditure theory but left the mystery of the sex-biased behavior unsolved.

Gowaty told SCIENCE NEWS she now suspects that bluebird fathers may favor daughters at dinnertime in order to give them a survival edge after they leave the nest. A bluebird daughter does not compete with her father; to the contrary, she spreads his genetic influence far afield by selecting a mate whose territory lies well beyond that of her father, Gowaty notes. Sons, however, remain close to home and may compete with their fathers for mates, food and nesting sites during the next breeding season, she says.

Judy Stamps, a zoologist at the University of California, Davis, disagrees with the idea that bluebird sons rival their fathers for mates. "Females prefer older males," she says, noting that older male bluebirds have experience raising young and often get the choice territories. Stamps suspects that having a young male relative nearby may actually benefit a bluebird father, perhaps by reducing the potential for conflict.

Male nestling (brighter blue) may lose out when father serves dinner.

Photos by Joe Cuin

Stamps thinks bluebird fathers may treat their daughters preferentially in order to instill high standards for selecting a mate. Bluebird females often are the choosy ones when it comes to picking a mate. Those who have been favored as nestlings might look for more generous mates that can provide plenty of food for a hungry brood, she says.

Stamps' own work dovetails with the Clemson team's observation that some father birds favor daughters over sons. In 1987, Stamps and her colleagues reported that male parakeets feed daughters more frequently than sons. Indeed, those findings spurred Gowaty and Droge to look for the same pattern in bluebirds.

While the Clemson and Davis researchers caution against drawing direct comparisons between avian and human behavior, they say studies such as these may offer insights into the interactions in human families.

— K.A. Fackelmann

Silicon cocktails: Whipping up a glow

Now that the initial novelty of teasing visible light from acid-etched wafers of porous silicon has started to subside, researchers are rapidly broadening the conditions under which this surprising glow appears. In the latest development, chemists have shown that microscopic particles of silicon suspended in a liquid also luminesce, giving off an orange-red light.

Michael J. Sailor and his collaborators at the University of California, San Diego, have developed what they call a "convenient" procedure for breaking porous silicon into tiny particles and generating luminescent suspensions in a variety of liquids. The particles retain their ability to give off light even when subsequently embedded in a flexible, transparent plastic film.

"This method of preparation opens up a new area of study for luminescent porous silicon and provides greater options for exploiting its properties," the researchers say. They detail their methods in the Jan. 3 SCIENCE.

The San Diego group prepared porous silicon by letting a hydrogen-fluoride solution electrochemically eat away parts of a wafer of pure, crystalline silicon. When illuminated by ultraviolet light, the resulting porous material glowed, emitting light visible to the naked eye as red-orange or orange-yellow.

"We observed visible luminescence immediately upon removal of the samples from the electrochemical etch," the researchers report.

The next step involved immersing the acid-treated wafer in a liquid such as toluene or methylene chloride, then placing the mixture in an ultrasonic cleaner for up to two hours. The cleaner's high-frequency sound waves caused the fragile silicon wafer to fragment into fine particles, which dispersed into the liquid and luminesced when exposed to ultraviolet light.

Electron microscope images revealed that the silicon particles present in the liquid had irregular shapes and that their diameters ranged from several microns to a fraction of a nanometer. These findings are consistent with the known structural properties of bulk porous silicon (SN: 8/31/91, p.135).

Sailor and his co-workers also made luminescent plastic films by adding polystyrene to a suspension of silicon particles in toluene, then pouring the mixture onto a glass slide and letting it harden in air. Although the film glowed with noticeably less intensity and its luminescence had shifted to shorter wavelengths than that of a silicon dispersion in toluene, the light remained visible to the naked eye.

— I. Peterson