

## Driven batty, katydids change tune

Female katydids are all ears when it comes to finding a mate. The cricket-like insects locate potential mates by moving toward the sound of male katydids rubbing their forewings together. In tropical regions populated by insect-eating bats, however, a male's chirping may attract more than the bug bargained for. Indeed, bats are quite good at locating tasty katydids by their mating calls, and the resulting selective pressure has brought about a variety of changes in katydid mating behavior, new research suggests.

Jacqueline J. Belwood of the University of Florida in Gainesville and Glenn K. Morris of the University of Toronto in Mississauga, Canada, report in the Oct. 2 SCIENCE that Panamanian katydids living in bat-infested areas adjust their mating calls in ways that minimize the possibility of being overheard by bats. Katydids in bat-free neighborhoods have conspicuous calls, characterized by frequent repetitions of chirpings over a broad band of frequencies. In contrast, the researchers find, katydids in bat-infested areas have higher pitched, purer tones that are more difficult to locate, and they tend to spend a lot more time simply

Commentary

being quiet.

The altered behavior makes sense, Morris told SCIENCE NEWS, "given the fact that from the point of view of the insect, every time you open your mouth — so to speak — or every time you make a noise, you're attracting predators."

To evaluate the actual risk of katydid talkativeness, the researchers put individual katydids in large, screened flight cages with insect-eating bats. Among the males, infrequent chirpers (less than one call per minute) survived an average of 34 minutes before becoming bat food, while frequent chirpers (60 calls per minute) survived an average of 26 seconds. Totally silent females went completely unnoticed.

The problem, of course, is that the less chirping that male katydids do, the more difficult it is for a female katydid to find herself a mate. This difficulty is addressed, the researchers suggest, by another mode of katydid behavior that has been observed for some time but is only now becoming well understood. Male katydids supplement their shortened songs with complex, vigorous body vibrations called tremulations. These are inaudible to bats, but female katydids on the same plant stem or twig can recognize the vibration characteristic of their own species and can follow the vibration to its romantic source.

"It turns out that the number of katydids that are sending signals by bouncing up and down on vegetation is very large," Morris says. Depending on the plant she's resting on, a female may be able to feel and respond to the vibrations from several meters away. "So the systems are sort of integrated," he says, "with the sound being more of a long-range thing, and the vibrations helping out at shorter ranges."

One final mystery remains, however. Of the katydid species examined in the current research, only males exhibited any chirping behavior — leading the researchers to expect that bats would find — and eat — more males than females. The researchers decided to confirm that theory by examining "leftovers" in the nests of katydid-eating bats. It seems that bats pluck the wings off of katydids before eating ("From the bat's point of view it's like throwing away peanut shells," Morris says), and male wings are easily differentiated from female wings in the bottom of the nest.

Much to their surprise, the researchers found that approximately half of the bats' diet consists of female katydids, even though the females do not chirp. They are unable to explain this finding. But it's possible, they say, that females may get caught while making their way toward the sporadically calling males. — R. Weiss

## Sputnik 1 plus 30 years: The long and the short of it

Does the Space Age make you feel old? Or young?

There are many people old enough to have families and established careers who were not even born when Sputnik 1 was launched on Oct. 4, 1957. If you are among their number, artificial satellites have always been in your sky, and it would not be surprising if you view the intervening years as "nearly a third of a century" — an only slightly time-stretching phrase for a span that is, after all, greater than your lifetime.

Yet whether the Space Age seems to have begun only yesterday or in the ancient past is as much a matter of attitude as it is of age. You do not have to be a very senior citizen, for example, to remember how recently human beings walked on the moon, or to notice the "blink of an eye" during which robot spacecraft have visited most of the known planets in the solar system.

Despite the accelerating pace of technological and social change that Alvin Toffler appropriately dubbed "future shock," the road ahead in time has both fast lanes and slow, just like the one that led us here from the past. The United States has not sent a spacecraft from earth toward another world since 1978 — nearly a decade, or less than half as long ago as the appearance of the Beatles.

Timed to accompany Sputnik's anniversary, an international gathering of space scientists is taking place in Moscow. U.S. and Soviet participants have cooperated in various ways in recent years with one another's planetary missions, and discussions are now under way about the possibility of a major joint endeavor to send human beings to Mars. Yet that goal is at best decades away, and issues such as technology transfer can becloud even the most sensitive of crystal balls over such a distance. The situation is not unlike that of a time machine with a zoom lens, swooping in and out to take a look from nearer and farther away, and changing at wildly varying rates.

It is an increasingly common quandary — the matter of whether one's "time sense" needs to be stretched or compressed in the search for a true view of reality. Often I recall a conversation I had in 1976 with Leslie Orgel, a distinguished scientist who had spent more than a decade as part of the quest to synthesize amino acids (inevitably dubbed "the building blocks of protein"). Our chat was well after that effort had proved successful — indeed, the synthesis itself had turned out to be almost easy. But what I remember most clearly is his acknowledgment that it

had been impossible to know, before the process was understood, whether the prize would be right around the corner or at the far end of some pathway of incalculable length.

Will human beings travel to the realms of other stars? A case can be made for either opinion (though I believe that "no" would be a far more difficult one to defend — about as bad a bet as most uses of the word "impossible"). Yet even if you simply assume the affirmative, the question of "when" raises exactly the same uncertainty as that faced by Orgel and countless others.

So think about Sputnik 1. Did it appear in the firmament a long time ago, or just yesterday? Then tackle a much more difficult, and surely more provocative, question: Regardless of what your calendar (or stopwatch) says, might it also have been inevitable?

Then take a look back across the Space Age, as afflicted now as it has ever been by budgets, politics and towering stacks of paper, with events seeming either to overtake one another or to stretch maddeningly from delay to delay, and muse once more: When is tomorrow? For whether the time feels long or short, it *will* arrive.

— J. Eberhart