Hipposiderid bats emit such signals and forage close to or within the foliages. Therefore they certainly do not echolocate over long distances. In these bats the pure tone serves an entirely different purpose: it makes a wing fluttering insect hearable to the echolocating bats in the midst of echo-noise consistently returning from all the leaves and twigs. This difficult detection problem is solved by specializing the echolocation system to detection of fluttering targets.

The emitted pure tone part of the echolocation signal will again be a pure tone when it returns from non-moving or randomly moving leaves and twigs. However, as soon as the pure tone hits onto a wing beating insect the rebouncing echo will be no more a pure tone. Instead it will be frequency modulated in the rhythm of the wing beat since the moving insect wings induce a Dopplershift in the frequency of the reflected pure tone echo. Thus an echo returning from a flying insect will immediately pop out of the mass of pure tone echoes returning from the leaves by the frequency modulations recurring in the rhythm of the insect's wing beat. This wing beat detecting echolocation system is made absolutely noise resistant since each individual bat uses its own private frequency within a species-specific frequency range, *e.g.* 128–136 kHz in *H. speoris* and 150–157 in *H. bicolor*. This individual emitted frequency is matched by an extremely narrow filter in the inner ear which is precisely tuned to the individual echo frequency. This individual "carrier" frequency is modulated by a few kHz due to the Dopplershifts created when the echo returns from the moving insect wings. This narrow frequency band of about 5 kHz around the individual carrier frequency, *e.g.* 133–138 kHz is represented in the cochlea in a vastly expanded fashion. We call this an acoustical fovea. It is unique to these bats and has not been described so far from any other animal.

The examples given from our Madurai study clearly show, that echolocation systems of different bat species may indeed be intricately specialized and adapted to the very specific needs of distinct foraging areas such as the spaces within the foliages and canopies of trees and bushes. They nicely comply to the ecological constraints the bat species is living in. Such driving forces in evolution reveal themselves when behavioural field studies are combined with neurophysiological studies in the laboratories as we have tried to do in our investigations on the bats of Madurai.

1. Griffin, D. R., *Listening in the Dark*. New Haven: Yale University Press, 1958.
2. Neuweiler, G., *Naturwischenschaften*, 1984, **71,** 446.
3. Neuweiler, G., Singh, S. and Sripathi, K., *J. Comp. Physiol.*, 1984, **A, 154,** 133.

ANNOUNCEMENT

AMERICAN INSTITUTE OF BIOLOGICAL SCIENCES (AIBS)

The Smithsonian Institution in conjunction with the American Institute of Biological Sciences and the National Science Foundation will sponsor an international symposium on grass systematics and evolution at the Smithsonian in Washington, DC, from **27–31 July 1986.**

The economic and ecological importance of grasses has promoted extensive research on their structure, reproductive biology, biochemistry, evolution, genetics and systematics. At this meeting, more than 40 of the world's authorities on grass biology, including Richard W. Pohl and G. Ledyard Stebbins, Jr., will gather to summarize recent research, identify current problems, stimulate new research and facilitate the international and interdisciplinary exchange of ideas and data.

Housing for participants will be available at George Washington University, Washington, DC, and registration will cost $75.00. For further information contact Louise Salmon, Meetings Manager, AIBS, 730 11th Street, Washington, DC 20001-4584. Tel. 202/628-1500.