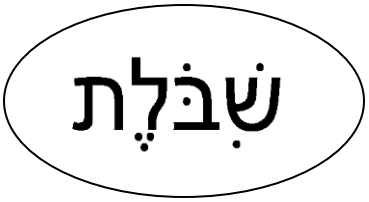

ScienceWatch - A Shibboleth in the Shell

"Parents and others attending the nestlings will only feed them if their begging calls contain the learned password." – S. Kleindorfer.

The Hebrew Bible records an internecine war between Giliadites and Ephraimites. Even though both groups were descended from the tribe of Manasseh, they spoke different dialects. When the besieged Ephraimites attempted to cross the Jordan, controlled by their enemies, "… the men of Gilead would ask him, 'Are you an Ephraimite?'; if he said 'No,' they would say to him, 'Then say *shibboleth*'; but he would say '*sibboleth*', not being able to pronounce it correctly. Thereupon they would seize him and slay him …" (Jud. 12:6).

Although the Hebrew word "shibboleth" is usually translated as "stream", it has come to mean a test word or password—something we use constantly in our technological society. Now a report in the November 20, 2012 issue of *Current Biology* says that even birds use it.

A team of scientists headed by Sonia Kleindorfer, Flinders University, Adelaide, Australia, looked at the host-parasite relationship between the Australian superb fairy-wren (*Malurus cyaneus*) and its brood parasite, Horsfield's cuckoo (*Chalcites basalis*). Typically the cuckoo lays a single egg in the fairy-wren's nest, and if undetected, the larger cuckoo hatchling ejects the host's eggs, leaving the parents to feed a chick that is not their own.

As in all such ongoing biological arms races, each side periodically develops a new strategy or weapon that must be countered by the other, and Kleindorfer *et al*. have discovered the latest defense used by the fairy-wren host to ward off the parasite. Female wrens teach their young a shibboleth while they are still in the egg, and later they only feed hatchlings that utter the correct password when begging for food.

While making audiovisual recordings of fairy-wren mothers at their nests, the scientists discovered that the females were making a previously undescribed vocalization they termed the "incubation call". Each female of the 15 nests studied sang a unique note within the call. Females made this call every few minutes to their unhatched eggs during the last 4-5 days of the ~15 day incubation period. They also taught the call to their mate and any brood helpers. Upon hatching, the females stopped calling and only fed chicks that repeated the unique note when they begged for food.

Cross-fostering experiments in which newly laid egg clutches were switched among nests showed that the hatchlings' begging calls closely resembled the incubation call of their foster mothers and not their genetic mothers, proving that the passwords were learned and not inherited.

This prenatal learning scheme adopted by the superb fairy-wren allows parents and helpers to discriminate between their chicks and those of the Horsfield cuckoo. Cuckoo eggs hatch after only 12 days of incubation, while fairy-wren eggs require 15 days. Since female fairy-wrens begin making the incubation call on the 10^{th} day, the cuckoo embryo doesn't have time enough to learn the "password". Upon hatching, the cuckoo chick tries to match its begging call to the host species. But after two days of not hearing the right call fairy-wren parents abandon the nest and begin making a new one. By doing this they avoid investing ~50 days feeding the cuckoo chick and have a chance to raise their own brood.

Since the password used by fairy-wrens is different for each nest, cuckoos cannot just learn a single key note and should have a hard time surmounting this latest defensive strategy. But as the arms race between these two species continues, it may be that fast-learning cuckoo embryos will counteract the latest fairy-wren weapon and one day will be able to say "shibboleth".