The Flower and the Fly

Long insect mouthparts and deep floral tubes have become so specialized that each organism has become dependent on the other.

By Laura A. Sessions and Steven D. Johnson

The meganosed fly *(Moegistorhynchus longirostris)* of southern Africa, like its literary counterpart, Pinocchio, has a bizarre appearance that reveals an underlying truth. Its proboscis, which looks like a nose but is actually the longest mouthpart of any known fly, protrudes as much as four inches from its head—five times the length of its bee-size body. In flight the ungainly appendage dangles between the insect's legs and trails far behind its body.

To an airborne fly, an elongated proboscis might seem a severe handicap (imagine walking down the street with a twenty-seven-foot straw dangling from your mouth). Apparently, though, the handicap can be well worth its aerodynamic cost. The outlandish proboscis gives the meganosed fly access to nectar pools in long, deep flowers that are simply out of reach to insects with shorter mouthparts.

But that poses a conundrum: why would natural selection favor such a deep tube in a flower? After all, nectar itself has evolved because it attracts animals that carry pollen, the sperm of the floral world, from one plant to another. And since pollinators perform such an essential service for the flower, shouldn't evolution have favored floral geometries that make nectar readily accessible to the pollinators?

Yet the story of the long proboscis of the meganosed fly and the long, deep tubes of the flowers on which it feeds is not quite so straightforward. There are subtle advantages, it turns out, to mak-

Tangle-veined fly* (Prosoeca ganglbaueri) *visits a small flowering herb called the mountain drumstick* (Zaluzianskya microsiphon) *in the Drakensberg Mountains of southern Africa. The flower and the fly are caught in a cycle of coevolution: plant pollination benefits from long floral tubes, because nectar-seeking insects must press their bodies closely against pollen-bearing floral parts to reach nectar pools at the end of the floral tube. As floral tubes become longer, however, insects with longer proboscises, or mouthparts, are also favored by natural selection; those flies are the most efficient at gathering nutrients. The result is a cycle of lengthening organs in both flower and fly; moreover, each species can become dependent on the other, to the exclusion of other, less specialized organisms.