

Flight Plan

It's the most obvious thing you see, sitting in front of a bee hive: foragers taking off into air, each a solo pilot heading to a place she's never been, following a flight plan she's just received in a language spoken only by bees. Flight instructions are given in the dark vertical halls of the hive, distance and direction coordinates communicated in code as new recruits crowd around and touch the wagging forager. Directions are referenced to sun position in the sky outside; if clouds block view, the reference is to angle of polarized light.



And then, each bee heads for the door and, following the instructions she's now memorized, takes to the skies, following her mind map to a distant nectary or pollen field. For some, this is their first flight very far from the hive entrance, their youth having been spent in the warm darkness of the hive, building comb and keeping it in order and caring for the colony's young sisterhood. As you watch, each bee disappears into the distant sky.



Looking out, you can also see the other part of this remarkable feat of insect navigation: there in the sky, zipping in, putting on the airbrakes as they approach their own hive, honeybees return, one by one, from many distant fields, some miles away, following a beeline home. Hovering at the entrance, they land and enter with what they have gathered from afar.

That each honeybee does all this without a map, with a 1 mm^3 brain is incredible. As they fly, sun position is their reference point. In addition, however, each bee has an onboard compass of sorts. Specialized cells in the abdomen of the honeybee contain super-paramagnetic magnetite, which provides magnetoreception, and ability for these small animals to orient themselves with respect to earth's magnetic field. This ability is used inside a new hive cavity - as the colony quickly builds new comb with strict parallel precision and, perhaps, this compass is also used to assist as they navigate the strange, bright skies of the world outside the hive.