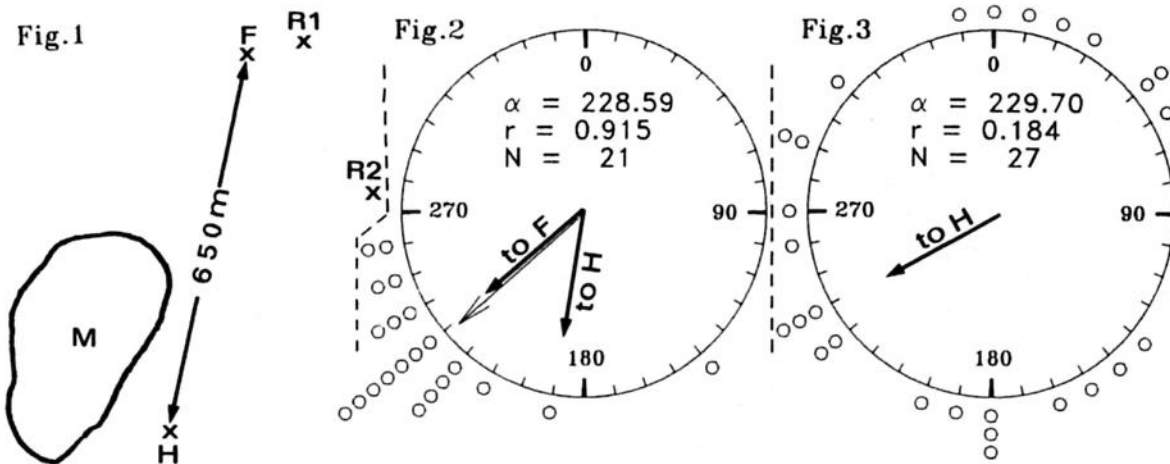


DO BEES NAVIGATE BY MEANS OF SNAPSHOT MEMORY PICTURES ?

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It has been suggested that bees store the landscape which marks the surroundings of a food source by means of two-dimensional snapshot-like memory pictures (1,2). At any point of its route, it was supposed that the "bee continuously compares its snapshot with the current retinal image and moves so as to reduce the discrepancy between the two" (2). Here, we present evidence for the use of a snapshot memory by insects that navigate on long distances in a natural landscape. Bees were trained to collect sugar water at F, sited 650m from their hive H. The flight path was dominated by a conspicuous mountain on the left side (Fig.1, M see also (3)). All tests were conducted at 100% obscured sky in order to deprive the bees of compass information. On arrival at H from a flight to F, they were displaced to a location R1 about 30m from F (Fig.1). The latter was clearly visible from R1, and the horizon profiles as seen from R1 and F were very similar. Yet, the bees were not able to fly a shortcut to H (Fig.2). Instead, they started off towards F, and only when they had reached that position, they turned off in the direction of the hive (without landing at F). Contrastingly, if bees were displaced to a location R2 where the mountain profile was visible under a different angle and no part of the flight path between F and H was directly visible, they were disoriented (Fig.3).



In a biological sense these results can be interpreted as follows: if a bee is blown off course, it first has to achieve a perfect match between the current panorama and one of its memorized snapshots; only then it is able to reconstruct the remaining part of the flight path. If the discrepancy between a given scenery and the memory picture is too big, so that no match can be accomplished, the bee will be disoriented. This, however, will be a rare case under natural conditions.

1. Cartwright BA and Collett TS. *J Comp Physiol* 151: 521 (1983) //
2. Cartwright BA and Collett TS. *Biol Cybern* 57: 85 (1987) //
3. Menzel R et al. *Z Naturforsch.* 45c: 723 (1990)