# A bee in the corridor: regulating the optic flow on one side

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To work out the information flow underlying the honeybee's anti-collision system, we performed a frame-by-frame analysis of the trajectories of individual bees (*Apis Mellifera*) flying in a *wide* outdoor flight tunnel (Fig.1a,2a). Forward speed $V_X$ and distance D to one of the two walls happen to be proportional to each other (Fig.1c,2d), attesting that the angular velocity $V_X/D$ (Optic Flow, OF) of the image of that same wall is held constant. Like the landing bee holding the downward OF constant (Srinivasan et al. 1996), the bee holds either the left (Fig.1c) or right (Fig.2d) OF constant. The bee's behaviour is well accounted for by a lateral *optic flow regulator* scheme. Simulations showed that this scheme can make a (fully actuated) hovercraft automatically adjust its *distance* to a wall by regulating the OF on one side (Serres et al., *IEEE Biorob* 2006).

Fig 1-2: Two bees' trajectories in a wide 0.95x3x0.25m corridor. A digital camera (2.2m above the corridor) records the trajectory over 1.5m at 20 fps. Both walls are lined with vertical grey-and-white stripes (10cm wide, contrast 0.27). Entrance and reward locations are on the left (1) or right (2). Top recordings: bee's position; middle plots: bee's forward speed; bottom plots: forward speed versus distance to the right and left walls. Bees 1 & 2 happen to hold the OF (slope in Fig.1c and 2d) at 6.72rad/s (385°/s) and 3.80rad/s (217°/s), respectively.