3.2.6 Geotaxis

The response of flies to gravity can be assayed using a geotaxis maze (22) (see *Figure 2*). A series of 'Y'- and 'T'-tubes (0.32 cm i.d.) interconnected by Tygon tubing present flies with eight, sequential, binary 'up or down' choices. The arm of each 'Y'-tube is 1 cm long. The total size of the maze is 25 cm long and 25 cm high. Openings around the perimeter of the maze are sealed with silicon glue. Flies are drawn phototactically through the maze by a 15 W fluorescent light, placed 30 cm from the exit holes of the maze. Flies are placed in a 12 cm Tygon start tube and given ten minutes to rest. The start tube is then placed at the entrance to the maze (12.5 cm high) and covered. Flies are drawn from the dark start tube into the illuminated maze. At the end of the maze, flies enter one of nine end tubes. These are made from plastic culture tubes (75 × 10 mm) into which the wide end of a pipette tip has been inserted. These pipette tips are cut so that their narrow end forms a 0.32 cm i.d. opening. Thus, once flies enter end tubes, they cannot re-enter the maze. Flies are given three hours to complete the task, but typically do so in less than one hour. Tests produce a fractioned population of flies, based on their geotactic performance. Flies in each end tube receive a score ranging from zero to eight. Flies in the bottom end tube score zero, indicating that all of their choices within the maze were downward, while flies in the top end tube are given a score of eight, reflecting the fact that all of their choices within the maze were upward. For a given genotype, a mean geotaxis score is calculated from the number of flies in each end tube. The *cut*, *thread*, *aristaless*, and *spineless-aristapedia* mutants show defective geotactic performance (22).

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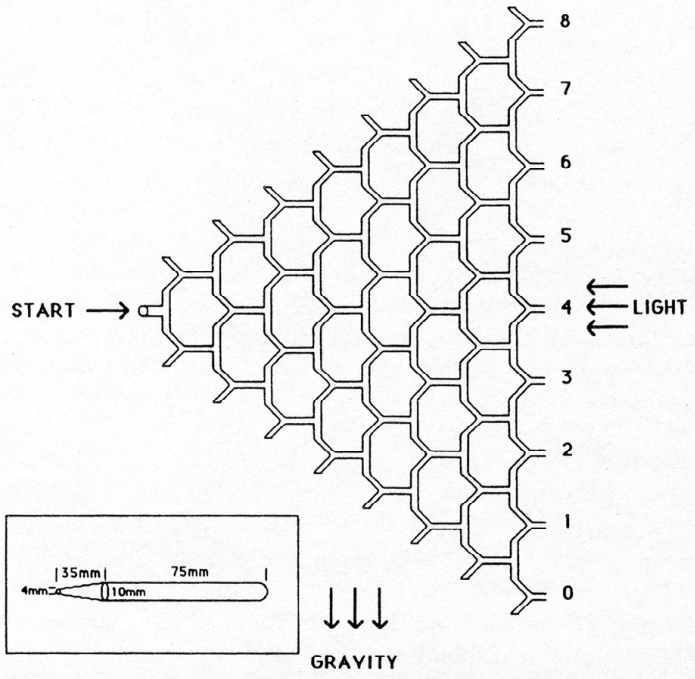

Figure 2. The geotaxis maze. The boxed insertion illustrates the design of one of the end tubes of the maze. See text for further details. Reproduced with permission from ref. 22.