Leg Proposes, Antennae Disposes: Antennae Ultimately Determine the Turn Direction of the Pill Bug

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The isopod, Armadillidium vulgare, or pill bug, is about 1 cm long, has 14 legs and no wings. Isopods tend to turn in alternating directions—that is, to turn in the opposite direction of the preceding turn. This is currently thought to be due to bilaterally asymmetrical leg movements (BALM). However, I noticed that one antenna always touches an obstruction just before the pill bug turns. The likelihood of either antenna contacting an object depends on the angle of contact between the bug and the obstruction. To understand the role of antennae in the alternating turning behavior, pill bugs were released in a maze of consecutive T-junctions, which were modified to manipulate the angle of contact. At oblique contact angles, where one antenna is more likely than the other to contact the wall, alternating turning behavior was observed. However, when both antennae were equally likely to contact a wall (body orientation at 90° to obstruction), the alternating turning behavior did not occur. Antennae therefore appear to be involved in determining turn direction. However, I do not entirely reject the BALM hypothesis because I also observed that the body axis of the pill bug turned toward the wall before the antenna touched it. Consequently, alternating turning may be initiated by BALM and ultimately determined by antennae. Better understanding of the movement of organisms such as the pill bug could lead to improvements in the programming of autonomous robots, such as those used for domestic cleaning, search and rescue, and related areas.

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