

For Review
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**413**WORDS    RTO **-3**-min /RA **-4**-min

A fly can do one thing extremely well: fly. Recently a team of British scientists declared that the common housefly is the most talented aerodynamicist on the planet, superior to any bird, bat, or bee. A housefly can make six turns a second; hover; fly straight up, down, or backward; land on the ceiling; and perform various other show-off maneuvers. And it has a brain smaller than a sesame seed.

Michael Dickinson, who studies fly flight in his lab at the California Institute of Technology, says the housefly isn't actually the best flier. "Hoverflies are the be-all and end-all," he says. They can hover in one spot, dash to another location, and then race back to their original hovering point — precisely.

Scientists, engineers, and military researchers want to know how creatures with such small brains can do that. Maybe they could reverse-engineer a fly to make a robotic device that could reconnoiter dangerous places, such as earthquake zones or collapsed mines.

Dickinson's laboratory works with fruit flies. Researchers put them in chambers and manipulate the visual field, filming the flies in super-slow motion, 6,000 frames a second. Dickinson is interested in knowing how flies avoid collisions. He has found that certain patterns, such as 90-degree turns, are triggered by visual cues and two equilibrium organs on their backs that function like a gyroscope.

Flies have only a dozen muscles for maneuvering, but they're

loaded with sensors. In addition to their compound eyes, which permit panoramic imagery and are excellent at detecting motion, they have wind-sensitive hairs and antennae. They also have three light sensors on the tops of their heads, which tell them which way  
30 is up. Roughly two-thirds of a fly's entire nervous system is devoted to processing visual images. They take all this sensory data and boil it down to a few basic commands, such as "go left" and "go right."

Imagine if you didn't utter an opinion until you had read  
35 hundreds of books, magazines, newspaper articles, and blogs, and then issued a statement based on a few basic notions. That's how a fly approaches flying. Only the fly is a speed reader. The information processing takes a fraction of a second. This mode of operation is called a "sensor-rich feedback control paradigm."

40 Given that flies have evolved for hundreds of millions of years, we shouldn't be surprised that they're such good fliers. "They just don't have brains like ours. Studying flies," says Dickinson, "is like traveling to another planet."