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### [要約]

ハエは1つ極めてうまくできることがある一飛ぶことである。最近、イギリスの科学者チームが、ふつうのイエバエは、地上で最も有能な空気力学者で、いかなるル、コウモリ、ハチにも勝ると発表した。イエバエは1秒に6回転し、空中で静止し、上下、後ろへ直線飛行をし、天井に着地し、そのほかさまざまなかれみよがしのパフォーマンスをやっている。それなのに、脳はゴマ粒よりも小さい。カリフォルニア工科大学の実験室で、ハエの飛行について研究しているマイケル=ディキンソンは、実はイエバエは最高の飛行家ではないと言う。90度の方向変換のようなある種のパターンが、視覚的な手がかりとハエの背中にあってジャイロスコープのように機能している2つの平衡器官によって引き起こされることを彼は発見した。また、頭の上部に3本の光センサーを備えていて、どちらが上なのかわかるようになっている。ハエの全神経系統の約3分の2が、専ら視覚イメージの処理に使われている。ハエはこのようすべての感覚データを取り込んで、それを「左折」、「右折」のような数個の基本命令へと集約させるのだ。情報処理はあっという間に行われる。このような操作形態は、「大量感覚フィードバック制御系」と呼ばれている。ハエが数億年にわたって進化してきたことを考えると、ハエがこれほどの飛行の名手であっても、驚くにはあたらない。「私たちのような脳を持っていないだけです。ハエの研究は、まるで別の惑星に旅行するようなものですよ」とディキンソンは言う。



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  
5 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  
10 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  
15 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  
20 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.

25 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."