

**L'usage de tout système électronique ou informatique est interdit dans cette épreuve**

*Traduire en français le texte ci-dessous.*

Man has always tried in vain to get around without bumping into his fellow man. We cram into the subway at rush hour, freeze freeways into parking lots, elbow our way out of football stadiums. Isn't there a better way from here to there? Physicists intrigued by the migratory skills of allegedly less evolved species may finally be getting a clue about how to manage human traffic. By analyzing how birds fly in flawless formation, they are getting closer to figuring out why Canada geese make Florida without a hitch while we're stuck on I-95.

The secret was not revealed through a birder's binoculars, but in math. For more than a decade, physicists and computer animators have been trying to simulate flocking behavior. Among the mysteries that may help with human crowd control: Why don't fast-moving birds crash into each other? If one birdbrain tries to go astray, why don't others follow? This month, a paper in the journal *Physical Review* provides another clue to the mystery by thinking in terms of fluid dynamics — the behavior of gases and liquids. Four years of number-crunching by two American physicists showed that birds flock in the same way that fluids flow, with a propensity to absorb "errors," like a rogue sea gull that wants to go north for the winter. This breakthrough builds on work pioneered by software designer Craig Reynolds, whose 1986 program *Boids* simulated real-life flock patterns. *Boids* quickly went Hollywood, inspiring the computer-generated bat hordes in "Batman Returns" and the stampeding wild beasts in "The Lion King."

*Boids* was fine for the movies. But the ideas behind it didn't explain why, when one member of a flock breaks formation, the flock as a whole keeps going, unperturbed and on course. In 1998, a Hungarian physicist noticed that colonies of bacteria — a flock of another kind — lined up like atoms in a magnet. Atoms in a bar of magnetic iron have a remarkable way of self-correcting when some get out of line.

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