Mob Mentality

New experiments and computer simulations have revealed that groups of animals—whether fish, insects, birds or people—move according to certain simple, universal rules. The research could transform fields ranging from architecture to security.

Participants in an experiment in Cologne, Germany, were asked to keep themselves in constant motion and always remain close to those around them. They ultimately began to circle like a school of fish.

Many species of fish are known for swimming in circles. Here, a school forms a rotating swim ring.
The convention center in Cologne, Germany, is typically a bustling, boisterous place, and today there are hundreds of people moving around. But this is not like the usual crowd: these people move quickly and decisively—and silently. No one says a word. They are, in fact, part of a trail-blazing experiment to determine how it is that humans move in a bird.

When a school of fish glides through the water, its movements seem so precise and synchronous that it appears as if a choreographer were directing the action. None of the fish dart ahead, lag behind, or drop off to the side. The school spontaneously turns—this is an unannounced change of direction that would shut down any human highway—there's no confusion, no collisions, perfect coordination. Swarms of insects and flocks of birds also move easily and elegantly, as if they're one large organism. Why are animals so good at moving together?

The goal of the 2007 convention-center experiment, which was organized by biologists Jens Krause and John Dyer of the University of Leeds in England, with the cooperation of WDR, a German television station, is to find out if a large group of humans moves using the same rules that governed groups of virtual animals in computer simulations. The scientists have made great progress recently in explaining what affects group movement.

It's the Group, Not the Leader

Before the Cologne study, the phenomenon of herding was a mystery. But studies of flocks and swarms have given scientists insight into the mechanisms that lie behind group behavior. It seems logical to credit sophisticated leadership for the patterns of movement.

A flock of birds, for instance, seems to be controlled by the bird in front, who apparently makes quick decisions and causes the flock to act as a unit. The truth, however, is that birds—and fish and insects—move so well together because each individual is making simple decisions based on simple interactions. The result is a self-organizing system that's resilient as anything coordinated by even the most brilliant leader.

In 2005, biologist Iain Couzin of Princeton University helped to restructure our understanding of collective animal behavior by studying swarm dynamics through a series of formulas and computer simulations. He wanted to find out how many informed individuals it would take to alter the direction of an animal group's movement. The virtual models obeyed certain laws. Individuals in the model maintained a minimum distance between themselves and those around them, and some were provided with information about the preferred direction of the group; this number varied depending on the scenario being tested. Couzin discovered that in the computer simulation, it takes only 5 percent of informed individuals to steer the direction of a group, and that percentage actually decreases as a group gets larger.

The Rule of 5 Percent

Dyer and Krause are in the Cologne convention center attempting to replicate Couzin's results using live subjects. The subjects receive simple instructions: They can move freely around the room, which is about 400 by 230 square feet. They may not communicate with one another in any way. They should be in constant motion and remain close to their neighbor.

Many species of fish are known for swimming in circles, so their schools come to resemble rotating swim rings. The 200 people in this experiment, as it turns out, follow the same pattern. They form two concentric rings, each rotating in opposite directions. The scientists had set out to find if Couzin's experiment would prove successful.