

Study follows the rise of individuals with the greatest influence on collective group behavior

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Who takes charge during a disaster or at an accident scene? The question has intrigued sociologists since Gustave Le Bon first studied "herd behavior" in nineteenth-century France. The question of an individual's influence over the activity of a collective has perplexed researchers, in countless studies of this behavior, ever since.

Now a new Tel Aviv University study, published in *Behavioral Processes*, looks to the animal kingdom to track the rise of group leaders in chaotic situations and pinpoint the traits that set them apart from their

followers. The research, led by Prof. David Eilam of the Department of Zoology at TAU's Faculty of Life Sciences and conducted by TAU doctoral students Michal Kleiman and Sivan Bodek, was based on experiments with [voles](#) and owls, and its conclusions may reflect on human behavior as well.

"The big controversy remains: Are group behaviors self-organized? Do they emerge spontaneously or under the guidance of a leader?" said Prof. Eilam. "The problem in studying this phenomenon among humans is the ethical consideration. One must limit the research to simulations or to after-the-fact analyses of real situations. On the other hand, [collective behavior](#) as a subject is flourishing in animal studies."

An attack from the skies

The researchers sought to establish the differential division of labor in groups by placing several small rodents called voles in a simulated life-threatening situation—an "attack" by predatory barn owls. The owls had no way of physically reaching the rodents, which were always protected by a cage barrier, but their menacing presence sparked pandemonium within the cage. Out of the chaos, the researchers discovered, vole leaders emerged.

"Our study bucks against the notion that leaders arise spontaneously," said Prof. Eilam. "There are always certain individuals who simply contribute more than others—but who they are and what traits make them leaders are the questions we've managed to answer in a limited realm."

The researchers found that, after an owl attack, larger voles calmed more quickly and smaller voles displayed greater anxiety at first, but over time the larger, older male voles assumed leadership and presented an exemplary model for the smaller male voles and female voles. As a

consequence of their larger size, experience, and physical strength, the large male voles displayed more consistent behavior to their companions, hardly changing after the owl attack. The smaller male and female voles displayed an extreme range of frightened behavior before the attack, but converged to the mid-range response of the larger males afterwards. The researchers concluded that the larger male voles were less affected by the threat and set an example for the smaller group.

To protect and stabilize

"Less affected by the owl attacks, the experienced, larger male voles set the behavioral code, leading the other voles to imitate their behavior," said Prof. Eilam. "These 'leaders' have a dual role, not just to protect but also to stabilize the behavior of the group. You can also see such leaders emerge in human societies in distress—take post-9/11 New York City, for example, or even among a family in mourning. All differences are set aside and a typical behavioral code under threat emerges, with a few dominant figures at the head."

The behavioral results were further supported by a series of stress hormone tests before and after the simulated owl attacks, revealing that the smaller voles had high corticosterone levels, while the levels in the larger voles remained stable.

Prof. Eilam is currently extending the study to larger groups to obtain a better representation of the way swarms, flocks, or crowds organize [behavior](#). "We are also trying to uncover what the 'leaders' benefit from their costly role in the group, and how information is passed on from one group to the next," he said.

Provided by Tel Aviv University

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