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The fascinating world of the physics of animal navigation

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Most of us have been captivated at some point by how migratory animals can return to their starting point after traveling vast distances. For many years, scientists have sought to understand the underlying factors that drive animal navigation. Naturally, the field of animal navigation is a broad and complex area of research that involves numerous disciplines. Not surprisingly, physics plays a significant role in explaining how different animals orient themselves and navigate. Therefore, it is no wonder that ideas from physics strongly contribute to scientific explanations of animal navigation.

Although interdisciplinary research has great value in science, few researchers have pursued this approach. A recent study on the physics of animal navigation has sought to explore this fascinating interdisciplinary field of research by examining the role of physics, with the main purpose to increase physicists' knowledge of this field and encourage more interdisciplinary research in this area.

The physical mechanisms behind animal navigation are of a very diverse nature. On the one hand, we have magnetoreception in animals, especially birds, and the effects are derived from the Earth’s magnetic field. Nevertheless, there are other mechanisms related to the field of acoustics, including infrasound, ultrasound, as well as echolocation, as in the case of bats. Likewise, light and visual systems are extremely important for insect vision and bird navigation.

Another topic of special importance is celestial navigation, by which certain birds and insects find their orientation using a solar compass by detecting the pattern of polarized light in the sky. In recent years, it has been found other mechanisms on the magnetoreception derived from quantum physics, such as the hypothesis of quantum entanglement in the cryptochrome that may have some relevance for navigation, especially for birds.

Also, in the field of fluid mechanics, it seems that turbulent flows in the atmosphere and oceans may play a relevant role. We can even find thermal effects within the scope of thermodynamics, where thermal boundaries have been found, as well as energetic and efficient movements or infrared radiation that affect animal navigation. Finally, hypotheses have also been raised about possible effects due to gravitational variations.

Although most of the mechanisms of animal navigation are founded on principles and ideas from physics, they still remain rather unknown to the physics community. In summary, the role that physics plays in understanding animal navigation highlights the vast potential for interdisciplinary research on numerous open research problems that are far from being understood. It would be delightful to stimulate and inspire future research collaborations among physicists in this interdisciplinary research area where physics has much to contribute.

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