Optimal Movement Theory: Perception of energies to "up-the-odds" for efficient movement

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Movement is fundamental in life, but it is a complex phenomenon influenced by an organism's motion capacity and its environment. Using an optimality approach, animals should move in ways to exploit energy available in the physical environment that reduces movement costs (e.g., media flows) while putting in the least amount of mechanical effort to do so. However, this physical energy is notoriously difficult to locate, especially in dynamic aerial and marine environments where it is an invisible and ephemeral resource. We know that social information plays a vital role for animals locating other ephemeral resources such as food. Thus, it makes sense, that animals should have evolved a physical intelligence that allows them to perceive physical energy in the locomotion of others. Here, I will enter into the eyes of the obligate soaring bird through those of human paraglider pilots limited to move with a similar motion capacity, and consider how some of the animals most reliant on dynamic airflows may perceive energy availability in social information to inform their movement decisions. We will apply this insight to an ecological study that will establish the energetic and adaptive value of sociality for the Andean Condor (vultur gryphus), who's extreme reliance on physical energy has shaped their movement strategy. By recognising that social information likely plays a role in navigating all resource landscapes this work will develop a new unifying concept, Optimal Movement Theory (OMT). This will combine resource landscapes by their shared currency of energy and the certainty therein to predict the outcome of movement decisions for optimal movement strategies. We will explore how this phenomenon determines the ability of animal groups to respond to dynamic environments, and may reveal the social mechanism behind optimal movement that we could apply to our vehicle technologies and sports strategies.

Projektbeteiligte

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