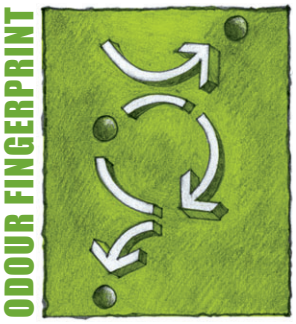
OUTSIDE JEB

Seals scent their relatives



Many people go to great lengths to make sure they smell good. Aftershaves and perfumes may smell great, but they don't tell you too much about the individual's health, hometown or how friendly they are likely to be. In the animal kingdom, however, things are slightly different. Their world abounds with smells and olfactory communication is one of the commonest forms of interaction. These natural fragrances, such as pheromones and strong-smelling urine, might not always smell as good as our eau de toilette, but they do contain information about the physiological state of the individual. They can be used for communication between members of the same family, territorial rivals and potential mates, and the intricate details contained within such chemical fingerprints have now been revealed in a recent study published by Martin Stoffel and colleagues from Bielefeld University, Germany. By studying colonially breeding Antarctic fur seals (*Arctocephalus gazella*), the team discovered that the chemical cues between a mother and her offspring contain a multitude of information about relatedness, genetic quality and colony membership.

The study, published in *PNAS*, took place on an isolated island in the Southern Atlantic Ocean. Over 65,000 fur seals breed there each year, packed into dense colonies. One of the key questions that inspired the researchers was just how do mothers locate their pups amongst thousands of other individuals when returning from foraging trips at sea? Does olfaction play a role? Communication by smell is an incredibly tricky matter to study, because of the huge mixture of chemicals on an animal's skin. Moreover, the chemical composition of the skin can be affected by external factors such as microbial flora and internal determinants like hormones and body condition. The team gathered data on the chemical compositions of the odours of 44 mother–offspring pairs by rubbing a cotton wool swab under the eye and behind the snout, in addition to taking minute skin samples. Through the use of mass spectrometry, the team investigated the compounds in the scent samples and calculated the genetic relatedness of the animals using total genomic DNA extraction.

When the analysis was complete, it was evident that the chemical footprints of the pups were significantly more similar to their mothers than could be expected by chance. A follow-up experiment demonstrated that this similarity wasn't just a function of spatial proximity, and that this unique scent profile allows mothers to recognise their pups. It is also likely that other close relatives could use the same mechanism for recognition because the chemicals present in the skin are genetically encoded, which could be highly significant when it comes to choosing a mate, as it would enable you to avoid breeding with relatives. As genetic diversity is frequently linked to survival, this scent-identification mechanism could help preserve genetic diversity through the avoidance of inbreeding.

The study shows just how much vital information can be contained within a chemical signal and how detailed these fingerprints are. From an evolutionary perspective, this makes perfect sense – the ability to smell is the first sense to develop and, for the parent, the ability to recognise offspring by olfaction is paramount, as mistaken identity can result in wasted energy and loss of offspring. It is also highly likely that this ability to recognise relatives by olfaction is not unique to fur seals and is prevalent throughout the animal kingdom. So next time you cover yourself in your fragrance of choice, think carefully about the chemical signal you are sending to those around you.

10.1242/jeb.112714

Stoffel, M. A., Caspers, B. A., Forcada, J., Giannakara, A., Baier, M., Eberhart-Phillips, L., Müller, C. and Hoffman, J. I. (2015). Chemical fingerprints encode mother-offspring similarity, colony membership, relatedness, and genetic quality in fur seals. *Proc. Acad. Nat. Sci. USA.* **112**, E5005-E5012.

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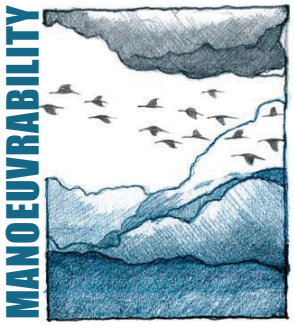
For hummingbirds, nature is not a wind tunnel



Hummingbirds are aeronautical wonders. They hover, zoom, dive and halt with arresting speed and accuracy. Most of what we know of their flight capabilities comes from studies in the lab – wind tunnel experiments that test maximum flight speeds and force. However, Katherine Sholtis, of the University of North Carolina at Chapel Hill, USA, and her collaborators wanted to understand how the birds' fantastic maneuverability in the lab related to what they were doing in more real-world circumstances. That is, how the patterns that were recorded in the lab match what we see out of our windows or in the wild.

The authors used multiple high-speed camera videography to film wild male and female Ruby-throated hummingbirds (*Archilochus colubris*) as the birds fed at a hummingbird feeder adjacent to a wooded area. They recorded the flying behavior of hummingbirds as they fed alone and as they interacted with another competing bird at the feeder. They also recorded differences between when the birds were approaching the feeder from a nearby perch and when they were flying in from elsewhere. The team was interested in how flying speed,

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