The Economist

Olfactory communication

Spot the difference

Hyenas talk to each other, as it were, through their backsides

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TO TELL a hyena it stank would not be an insult. It has been known for decades that these animals communicate using a pungent material called hyena butter. This forms in pouches next to their anuses and they smear it onto plants for other hyenas to sniff and draw conclusions about the depositor.

It has also been long suspected that the smell—mainly the result of small fatty-acid, ester and alcohol molecules—is generated not directly by hyenas themselves, but rather by bacteria that live in the pouches. The details, however, are obscure. They are less obscure now, though, thanks to the work of Kevin Theis of Michigan State University, who has spent much of his career analysing the contents of hyena pouches. And, at a session at this year's meeting of the American Association for the Advancement of Science, he shared his conclusions with an eager audience.

There are four species of hyena, three of which are solitary and one gregarious. Dr Theis compared one of the solitary species, the striped hyena, with the gregarious one, the spotted hyena, which lives in clans that have as many as 90 animals in them. Spotted-hyena society is a dominatrix's dream: the girls are very much in charge, and even have pseudopenises which they show off to cow the males.

One of the things Dr Theis was looking for was systematic differences in the butter of the two sexes, and of female butter in various phases of their reproductive cycle. He also compared the social species with the solitary one.

Striped-hyena butter was chemically simpler than spotted-hyena butter. Dr Theis looked at nine fatty acids. The butter of striped hyenas was dominated by one, iso-pentanoic acid (the source of the odour of human feet). Butter from spotted hyenas, by contrast, generally had all nine, in varying proportions. That makes sense if, as seems plausible, a social animal needs to convey more complex and nuanced information than does a solitary one.

Germ theory

This chemical complexity was matched by the intricacy of the bacterial ecosystems believed to be generating it. Modern genetic techniques allow these to be sampled far more effectively than by the old approach of culturing on agar plates. Spotted pouches turned out to contain more species than striped ones did, and Dr Theis was able, in some cases, to work out which bacteria were responsible for generating which fatty acid.

Spotted hyenas did indeed seem to use the extra complexity of their scent for signalling. First, each clan had a perceptible collective odour (or, at least, a recognisable and consistent underlying pattern of fatty acids which was different from that of other clans). Second, superimposed on this basic signal each animal had its own recognisable scent. Third, female and male scents did differ, and the scents of females also varied according to whether they were lactating or pregnant.

Exactly what the animals are saying to each other, Dr Theis has yet to determine. The clan-identity scent is probably a keep-out sign marking the clan's collective property. Female scents might act as come-hither or stay-away signals, depending on an animal's reproductive status. But there are probably a lot of more subtle messages—about an individual's state of health, perhaps, or its position, particularly if female, in the hierarchy.

There is also the question of how a hyena tells its bacteria what to do—and, indeed, how the whole bizarre system evolved in the first place. Outsourcing your conversation with your friends, mates and rivals to several dozen other species of organism, each with its own agenda for survival and reproduction, is a strange way of doing business.

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