Inside JEB is a twice monthly feature, which highlights the key developments in the *Journal of Experimental Biology*. Written by science journalists, the short reports give the inside view of the science in JEB.

Inside JEB

WHAT'S THAT SMELL?

Fruit fly maggots are easy to please: just give them a piece of rotting fruit to tuck into. Matthew Cobb at the University of Manchester explains that the little larvae are 'very stupid and very simple: their only job is to eat and turn into a fly.' But their simplicity is precisely what makes them so appealing. While adult fruit flies have 1300 olfactory neurons, maggots make do with a measly 21 neurons. So for Cobb, who is fascinated by the sense of smell, maggots present a unique opportunity to get to grips with how smells are encoded by an olfactory system (p. 3483).

Maggots' olfactory systems have the same basic structure as those of other animals, so they are a perfect model system. The only problem is their diminutive size – for a long time it was technically impossible to put an electrode into their tiny 'nose'. 'Instead, we approach maggots as a black box', Cobb explains. Watching maggots respond to smells could teach us a thing or two about their olfactory system. Maggots are somewhat challenged when it comes to locomotion, but this is yet another advantage. 'They just wriggle', Cobb says, 'so it's easy to study their behaviour.'

To study how smells are coded in the maggot brain, Cobb teamed up with Jennefer Boyle. The pair examined cross-adaptation in maggots. The concept is simple: if you sniff an odour for a while, you'll stop responding to it. If you can then sniff out a second odour, you conclude that the two odours are processed by different receptors or pathways. But if you can't smell the second odour, the two odours are assumed to have similar processing pathways. Cobb and Boyle tested maggots' responses to seven fruity smells found in their favourite food – rotting fruit. To adapt some maggots to a particular smell, Cobb and Boyle placed 50 maggots on a dish and wafted one of the seven strong scents over them until the worms stopped wriggling towards the smell. Then they gave the adapted maggots a whiff of each of the six other odours and measured how the animals responded to the new smells by counting how many maggots gravitated away from or towards the new smell.

Cobb and Boyle recorded a complex mix of responses. They noted some cases of cross-adaptation, where the maggots didn't respond to the second smell, but also some cases where there was no cross-adaptation. They identified one basic odour that seemed to be detected by all pathways, and two others that had similar effects to each other. But Cobb and Boyle were astonished to find that in a few select cases, sniffing a particular odour resulted in the maggots being repulsed by a second odour that they had previously found attractive! After mulling this over for a few weeks, Cobb realised that a possible explanation is that the maggots increased the sensitivity of their olfactory system, so that the previously attractive odour became overpowering. 'It's a bit like spilling a bottle of perfume', Cobb suggests. He adds, 'it makes sense for a maggot to be sensitive to changes in the attractiveness or concentration of an everyday odour', because when the patch of fruit that a maggot is gobbling up has decayed beyond even the maggot's questionable tastes, it's a clear signal that it's time to move on to fresher chomping grounds.

10.1242/jeb.01840

Boyle, J. and Cobb, M. (2005). Olfactory coding in *Drosophila* larvae investigated by cross-adaptation. *J. Exp. Biol.* **208**, 3483-3491.

BUSY BEES

One of the perks of being a biologist is the opportunity to travel to far-flung places to study animals in their exotic homes. So when Charles Darveau, Raul Suarez and Kenneth Welch found themselves in the depths of a jungle in Panama collecting reams of information on orchid bees, it was all in a day's work. Their mission, Darveau recounts, was to 'explain the variation in metabolic rate' seen in these brightly coloured tropical insects (p. 3581 and p. 3593).