

Urban bees using plastic to build hives

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Once the snow melts, Canada's bee population will be back in business—pollinating, making honey and keeping busy doing bee things. For at least two urban bee species, that means making nests out of plastic waste.

A new study by a University of Guelph graduate and a U of G scientist reveals that some [bees](#) use bits of [plastic bags](#) and [plastic building materials](#) to construct their nests. The research was published recently in the journal *Ecosphere*.

It's an important discovery because it shows bees' resourcefulness and flexibility in adapting to a human-dominated world, says lead author Scott MacIvor, a doctoral student at York University and a 2008 U of G graduate.

"Plastic waste pervades the global landscape," said MacIvor. Although researchers have shown adverse impacts of the material on species and the ecosystem, few scientists have observed insects adapting to a plastic-rich environment, he said.

"We found two solitary [bee species](#) using plastic in place of natural nest building materials, which suggests innovative use of common urban materials.

Figuring out that the bees were using plastics in place of natural materials took some detective work by U of G's Andrew Moore, supervisor of analytical microscopy at Laboratory Services.

Moore analyzed a grey "goo" that MacIvor discovered in the nests of one kind of bee, *Megachile campanulae*, which uses plant resins to build its nests,

"Scott thought it might be chewing gum originally," Moore said. His team uses a scanning electron microscope to take highly detailed pictures of items, x-ray microanalysis to determine the elements in the sample and infrared microscopy to identify polymers. They can distinguish the finest detail on the surface of an animal hair.

Turns out that *M. campanulae* was occasionally replacing plant resins with polyurethane-based exterior building sealant, such as caulking, in its brood cells—created in a nest to rear larva.

The researchers also discovered another kind of bee, *Megachile rotundata*, an alfalfa leafcutter, was using pieces of polyethylene-based plastic bags to construct its brood cells. The glossy plastic replaced almost one-quarter of the cut leaves normally used to build each cell.

Markings showed that the bees chewed the plastic differently than they did leaves, suggesting that the insects had not incidentally collected plastic. Nor were leaves hard to find for the bees in the study.

"The plastic materials had been gathered by the bees, and then worked – chewed up and spit out like gum – to form something new that they could use," Moore said.

In both cases, larvae successfully developed from the plastic-lined nests. In fact, the bees emerged parasite-free, suggesting plastic nests may physically impede parasites, the study said.

The nests containing plastic were among more than 200 artificial nest boxes monitored by MacIvor as part of a large-scale investigation of the

ecology of urban bees and wasps, a project involving numerous citizen scientists.

The nest boxes are located in Toronto and the surrounding region in backyards, community gardens and parks and on green roofs. They are used by a variety of bee species.

"The novel use of plastics in the [nests](#) of bees could reflect the ecologically adaptive traits necessary for survival in an increasingly human-dominated environment," MacIvor said.

Provided by University of Guelph

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