

What's
the

by Sue Heavenrich

BUZZ?

CITY BEES ARE USING PLASTIC TRASH TO BUILD THEIR NESTS.

ACTIVITY:
BUILD A NEST
BOX. ONLY IN
THIS MONTH'S
DIGITAL EDITION!



Ecologist Scott MacIvor wanted to know how urban landscapes influence bee diversity and behavior. So he installed close to 200 nesting boxes around the city of Toronto, Ontario. The boxes provide homes for bees that normally build their nests in cavities, like logs or plant stems.



Scott MacIvor installs a nest box.



Two years ago when MacIvor opened his nest boxes he found a surprise: plastic! One bee had substituted bits of shopping bag for leaves when constructing her nest; another had used plastic “goo.”

Birds incorporate plastic in their nests, and hermit crabs sometimes adopt plastic bottle caps as a temporary shell. But this is the first time anyone has documented insects using human trash as a construction material.

A SOLITARY LIFE

Of the 4,000 or so species of bees in North America, most are solitary. They don't have a worker **caste**, nor do they live in colonies like honeybees. Instead, each female builds her own nest.

One species MacIvor finds using his nest boxes is the Alfalfa leafcutter bee (*Megachile*

rotundata). The female uses her large **mandibles** to snip semicircles from leaves and flower petals, which she carries back to her nest. There she overlaps them and glues them together with saliva to make a cigar-shaped brood cell. She fills the cell with a mix of pollen and nectar, lays an egg, and seals it shut. Then she builds another and another, until she has a long line of brood cells—up to a dozen—tightly packed into the nest tunnel. The developing bee spends most of the year in its brood cell, emerging the following spring.

EMBRACING THE URBAN LIFESTYLE

City bees, like their country cousins, have a grocery list of the things they need, says MacIvor. The essentials include food (pollen and nectar), water, and nesting materials. Alfalfa leafcutter bees aren't very choosy when it comes to nesting materials; they snip leaves

from beans, box elder trees, and at least 50 more kinds of plants.

Now add plastic to their list. In one nest, the bee used pieces of glossy white shopping bag to help build the cell wall. Did she turn to plastic because there weren't any leaves available? No, says MacIvor, because after using plastic she finished off the last couple of cells using just leaves. It's not like she just picked up a bit of plastic by accident either; there are bite marks around the pieces showing that it was intentionally cut from the bag. It's more like she was trying this new "leaf-like" material, MacIvor muses.

MYSTERY GOO

A different bee, *Megachile campanulae*, normally collects resins from pines and other plants to build its brood cells. But when MacIvor opened one of these nests, he found something that resembled chewing gum.

MacIvor needed help identifying the mystery goo, so he sent a sample to Andrew Moore at the University of Guelph. The first thing Moore did was examine the goo under a microscope to see whether it was sticky or brittle. "It was still flexible," he says, "a bit like the stuff used to seal an aquarium."

Next, Moore shaved a piece from the goo sample and mounted it on a thin transparent square of salt, something that looks a bit like a microscope slide. He placed the sample in his printer-sized Fourier Transform Infrared (FTIR) Spectrometer—a machine that measures how materials absorb different wavelengths of light. After shining infrared light through the goo, Moore compared the read-out—a series of peaks and valleys—against a computer database of known materials. The goo contained silicon-based resins.

Moore also did an X-ray analysis in a scanning electron microscope and discovered that the mystery goo contained calcium, titanium, sulfur, and carbon. "Then we asked



A nest site is established at the Gainesville, Florida, Downtown Farmers' Garden.

what bees would have access to," says Moore. "The most likely candidate is **polyurethane** caulking used on the exterior of buildings." Plastic!

PLANT OR PLASTIC?

Are city bees turning to plastic in the absence of natural nest-building materials? No, says Scott MacIvor. In both nests, the bees reverted to natural materials after experimenting with plastic to build brood cells.

The plastic didn't seem to harm developing larvae, as all the bees in the nest emerged. But the bees used only small amounts, MacIvor points out, and only in a few cells. If plastic provides an advantage—like protection from mites—the behavior might spread. Is this evolution in action? It's too soon to tell. For now, MacIvor plans to keep tabs on the bees in Toronto.

Sue Heavenrich grows sunflowers and weeds for the bees in her neighborhood. One spring she fenced off a section of her dirt driveway so no one would park on the digger bee nests.