Fumigants & Pheromones

Insects Limited, Inc.

Employee Spotlight

James Feston

Director of Product Research

How long have you been working at Insects Limited?
Oct. 2015

What is your favorite thing about working at Insects Limited?
That every day is a little different

What do you enjoy doing when you're not at the office?
House projects

How would you describe yourself in three words?
Helpful, Curious, Distractible

If you could learn to do anything, what would it be?
Play piano

Where is your favorite place you've traveled to and why?
New Zealand. Great scenery, far away.

What's your favorite sports team?
Springfield Isotopes. Go 'Topes

What is something about you that might surprise people?
I can wiggle my pointer toe by itself.

President of Insects Limited, Pat Kelley, stated:
"James is a perfect fit as our Director of Product Research from multiple standpoints. From an entomology standpoint, his formal training of having received a bachelors and a masters in entomology from Purdue University have paved the way for making him a top stored product pest researcher in the field. From a product design standpoint, his affinity for thinking of problems from an engineering perspective allow him to make improvements on trapping systems, designing new traps and lures, and be a driving force in developing our SightTrap remote pheromone monitoring system."

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Patrick Kelley, BCE

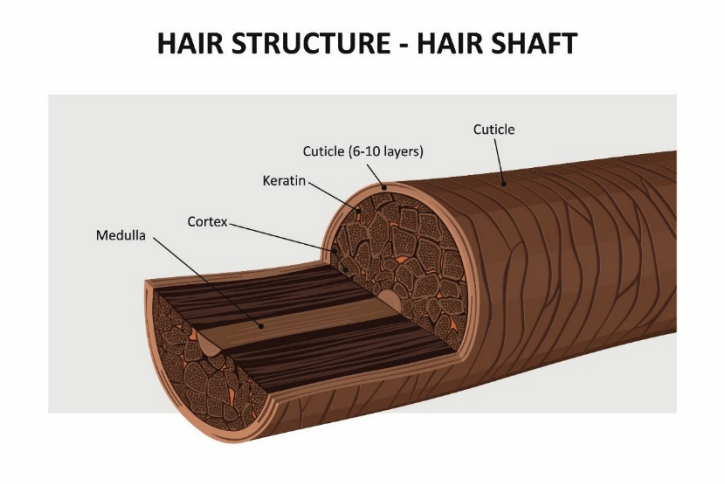
Keratin: That's Tough to Chew

Common keratin consuming insect pests: Clockwise from top left: Varied Carpet Beetle, Casemaking clothes moth, Black carpet beetle and Webbing clothes moth

When an animal dies outdoors, after about one month, all that is left of the poor creature is a pile of hair, skin, and bones. The reason that these parts remain is the simple fact that Mother Nature has very few participants willing and able to consume these materials. The large amounts of keratin in the hair, feather, skin, nails, hooves, horn and the enamel on teeth make it extremely difficult to digest for nearly every species in our world.

Hooves, horns, fingernails and the outer layer of skin also contain keratin

Keratin is composed of polymers of amino acids making it an extremely stable and strong substance. Polymers are simply large chains of molecules composed of many similar smaller chains linked together (*Think of chainmail armor*).



Human and animal hair is made up of 95% keratin

In the case of keratin, the most common chain is the amino acid called cysteine. Cysteine contains a high amount of sulfur and the disulfide bonds in cysteine are a key factor for keratin's durability in nature and a big reason why it is difficult to digest. Think about a time that you may have accidentally burnt or singed your hair. The high amount of sulfur in keratin is the reason why burnt hair smells strong to us.

The strong sulfur odor that emits from burnt hair comes from the sulfur compounds in keratin

Just how difficult is keratin to ingest? Consider house cats and wild cats alike that constantly clean, lick and ingest their fur. Even in the highly acidic digestive tracts of these predatory animals, their ingested hair does not break down. Instead it accumulates into hair balls that need to be coughed up or even removed for the health of the cat. This shows that keratin is one tough compound!

Hair does not break down in the highly acidic digestive tracts of cats

A few select insects have evolved to be able to break down the keratin for their own benefit. The digestive tracts in the larvae of clothes moths and several species of carpet beetles have adapted to be able to disassemble the disulfide bonds in the keratin and utilize the protein in the hair, skin and other natural materials. In this sense, these insects are beneficial and quite frankly, without this set of insects we would have large numbers of partially decomposed animal carcasses lying all around the place. Mankind's only real problem with these insects occurs when we want to preserve certain wools, furs, hides, hooves, antlers or other keratin-based material in our homes and museums. The same insects that help us in nature can be a curse in these locations as they feed on our woolen sweaters and rugs and destroy our precious goods.

Clothes moths like this webbing clothes moth larva feeding on a feather are one of the few insects able to break down keratin

Take a moment to soak in all the specialized biological processes that goes into breaking down these complex animal proteins. While you're at it, get a haircut. Your keratin polymer chain is getting long!

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Tom Mueller

What's Buggin' You – Home Edition

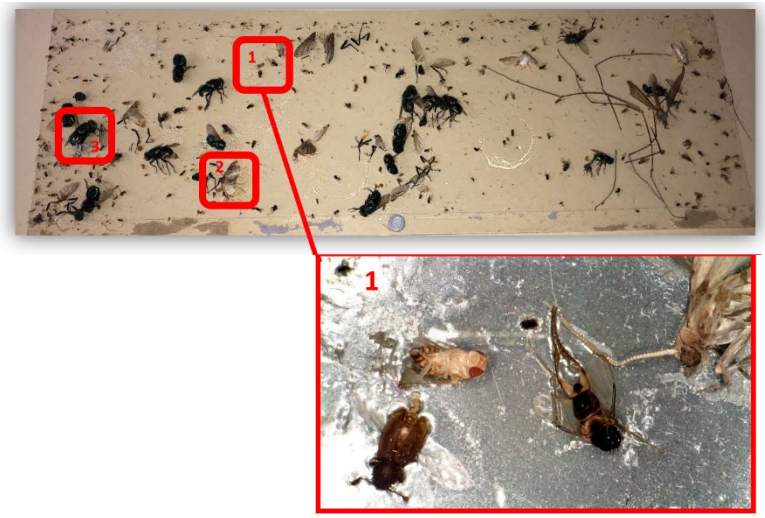
If you think you don't have insects in your house, you are wrong. Insects Limited's sub-brand, GreenWay, sells a Window Fly Trap. All you do is peel off a plastic strip and stick it to your window in a non-obvious place in your house. There are no pheromones or attractants. The glue board uses the insect's attraction to light against them. The insects come to the window and eventually find themselves stuck to the glue.

I put this easy-to-install glue board on my window every year when the weather turns warm for three reasons:
1.) It is fun to nerd out about the insects getting trapped.
2.) I always test our products.
3.) They work! Inevitably, if a fly has gotten into my house, it will get stuck on the Greenway Window Fly Trap. I'll prove it.

Pictured throughout this article are just a few of the insects that were invading my house during the warmer months. Keep in mind, these are only the ones that were attracted to light. This does not include the crawling insects.

Let's take a closer look…

In the following image there are 6 insects. Focusing only on the larger insects from left to right we have Foreign grain beetle, Red eyed fruit fly, Phorid fly, and Indian meal moth.



Pictured here from left to right: Foreign Grain Beetle, Red Eyed Fruit Fly, Phorid Fly, and Indian Meal moth

Image 1 - Foreign Grain Beetle *(Ahasversus advena)*

This insect has two distinguishing features that help with its identification: the last three segments of the antennae are clubbed, and the thorax has two lobes; one on either side, just behind the eye. It gets its name because it can often be found feeding on moist grain in danger of losing quality, but do not let the common name fool you. This insect is feeding on the fungus forming on that moist grain. This leads me to the possible reason the insect is appearing in my house. I have a new build which means the wood used to construct the framing of my house went through many weather changes as it was erected. At some point, it was exposed to rain and the wood became moist. That moisture caused microscopic fungus to form. Don't be alarmed because it happens to all new builds. Because of this fungus, thousands of Foreign grain beetle have made my home their home. We can

certainly count on the presence of this insect going away once the wood dries and the fungus disappears.

Image 1 – Red Eyed Fruit Fly *(Drosophila spp)*

No, it is not a gnat! These flies come into your house with harvested fruits and vegetables from your garden. You don't have a garden? These pests can be found all over the "fresh" produce section of any grocery store. They will simply hitchhike on your produce to get to your house. It is the overly ripe fruits and vegetables they seek. If you do not have any fruits and vegetables, then look for decomposing organic material in your house. Some common areas will be the drains of your shower that have gunk buildup due to hair, under-mounted sinks where the seal is deteriorating, your trashcan, and your garbage disposal. Fruit flies may come in on your produce but can thrive in the areas of organic matter buildup. I attribute their presence in my house to the fruit and vegetables I purchase. Side note: GreenWay also has a very effective Fruit Fly Trap. Between that trap and my Window Fly Trap, I rarely see the presence of fruit flies around my kitchen.

Image 1 – Phorid Fly *(Phoridae)*

Like the Fruit fly, Phorid flies have a wide range of food possibilities most commonly feeding on gunk (organic matter). With three distinguishing features, the Phorid fly is easily identifiable. One feature is a "humpback." This is the reason another common name for the Phorid fly is the Humpback fly. In my image, the "humpback" is hard to detect so I move on to the second distinguishable feature: the legs. Not getting too wrapped up in the anatomy of insects, the thigh of the Phorid fly is noticeably thicker than the rest of the leg. These insects have a strong ability to move and scuttle around quickly. Therefore, they have another common name, the Scuttle fly. The third identifying feature is their distinct wing venation as seen in Figure 1. I cannot give you an exact reason for the presence of the multiple Phorid flies on my GreenWay Window Fly Trap, but I assure you I will be looking as they are often an indication of a fractured pipe leaking water somewhere unseen.

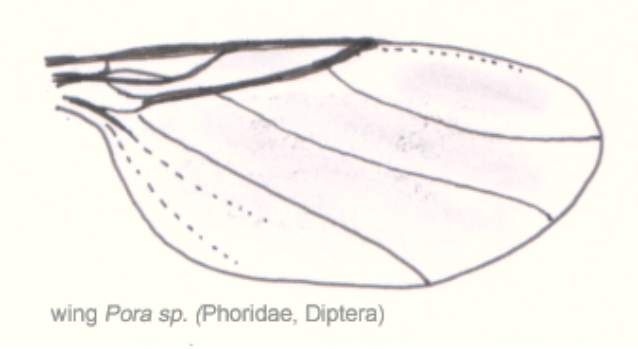


Figure 1: This image from Wikipedia clearly shows the 3 veins running diagonally across and downward.

Male Indian Meal Moth

Image 2 – Indian Meal Moth *(Plodia interpunctella)*

While this stored product insect can often be found in many residential pantries feeding on grain-based products, which is what the larval stage of this insect does to survive, this is not the reason the Indian meal moth is present on my Window Fly trap. This specimen is a male. I know this for many reasons. As it pertains to my house, this male Indian meal moth came in because it sensed the female sex pheromone emitted from my clothes and body. I work with and am around this insect's pheromone every day. My belongings have become a pheromone lure.

I know this is an Indian meal moth because of its bi-colored wing. The outer half of the wing is covered with copper-colored scales while the top portion is tan. Fortunately, for the sake of our business, I will never escape them.

Female Green Bottle Fly releases eggs as she dies

Image 3 – Common Green Bottle Fly *(Lucilia sericata)*

The common green bottle fly is categorized as a blow fly. It is a beautiful metallic green with three lines running across its thorax. While not completely covered, the common green bottle fly has hundreds of tiny hairs spread throughout its body. Their wings have brown veins, and their legs are black. This specimen is a female. If you look closely at her abdomen you will see what is known as an egg dump. It is her last attempt to contribute to the increased population of her environment, and it is a common occurrence when a female insect is dying.

Like many houses, the architectural design of my home is set so my garage is very close to my kitchen, and the kitchen is where this Window Fly Trap was placed. Within my garage are my trashcans which are taken to the curb once per week. I can point the presence of this fly to those trashcans, and if I want to reduce the number of common green flies getting into my house, I could simply move my trashcans and store them outside of my garage. I could also conduct a thorough cleaning of the waste containers regularly to rid them of filth build-up. However, if I were to do that, I would not be able to include them in my newsletter article about the insects that invade my house during the warm months.

While planning this article, I had the grand idea to try and count the insects stuck to my GreenWay Window Fly Trap, but it turned out to be nearly impossible. Counting the easily visible insects was challenging enough, but once I put the glue board under a microscope, there were hundreds of almost undetectable flies rendering my counting attempt too frustrating to continue.

We all have insects in our house. If they are bothering you, figure out why they are there and fix it. They will die or go away.