ANNALS OF ECOLOGY MARCH 12, 2018 ISSUE

THE NEW YORKER

WHEN TWENTY-SIX THOUSAND STINKBUGS INVADE YOUR HOME

These uniquely versatile bugs are decimating crops and infiltrating houses all across the country. Will we ever be able to get rid of them?

By Kathryn Schulz

One October night a few years back, Pam Stone was downstairs watching television with her partner, Paul Zimmerman, when it struck her that their house was unusually cold. Stone and Zimmerman live just outside Landrum, South Carolina, in an A-frame cabin; upstairs in their bedroom, French doors lead out to a raised deck. That week, autumn had finally descended on the Carolinas, killing off the mosquitoes and sending nighttime temperatures plummeting, and the previous evening the couple had opened those doors a crack to take advantage of the cool air. Now, sitting in front of the TV, Stone suddenly realized that she'd left them open and went up to close them.

Zimmerman was still downstairs when he heard her scream. He sprinted up to join her, and the two of them stood in the doorway, aghast. Their bedroom walls were crawling with insects—not dozens of them but hundreds upon hundreds. Stone knew what they were, because she'd seen a few around the house earlier that year and eventually posted a picture of one on Facebook and asked what it was. That's a stinkbug, a chorus of people had told her—specifically, a brown marmorated stinkbug. Huh, Stone had thought at the time. Never heard of them. Now they were covering every visible surface of her bedroom.

“It was like a horror movie,” Stone recalled. She and Zimmerman fetched two brooms and started sweeping down the walls. Pre-stinkbug crisis, the couple had been unwinding after work (she is an actress, comedian, and horse trainer; he is a horticulturist), and were notably underdressed, in tank tops and boxers, for undertaking a full-scale extermination. The stinkbugs, attracted to warmth, kept thwacking into their bodies as they worked. Stone and Zimmerman didn’t dare kill them—the stink for which stinkbugs are named is released when you crush them—so they periodically threw the accumulated heaps back outside, only to realize that, every time they opened the doors to do so, more stinkbugs flew in. It took them forty-five minutes to clean the place, at which point, exhausted, they dropped into bed and switched off the lights.

Moments later, something went barrelling across the room, sounding, as stinkbugs do, like an angry and overweight wasp. The couple jumped up and turned the lights back on. Looking for the stray bug, Stone pulled a painting off the wall and turned it around; dozens of stinkbugs covered the back. She opened a drawer of the dresser: dozens more. That’s when she and Zimmerman realized that they were going to have to treat their bedroom “like a hazmat situation.” “We stripped everything,” Stone said. They took the sheets and pillowcases off the bed and emptied the upstairs bathroom. They inspected the drapes by the doors and found hundreds more stinkbugs clinging to the folds. They thwacked off as many as they could, then took the drapes down to wash them. After that, they tried several more times to go to sleep, to no avail. “Literally, the instant it was dark,” Stone said, “we’d hear four or five more come out and we would turn the lights back on because they were hitting the wall above our heads and dropping onto us, which was even more horrifying.”

In the end, it took the couple almost all night to make their bedroom habitable, but since then they have never lived entirely free of stinkbugs. The day after the infestation, one flew out of Stone’s hair dryer. A few days later, she pulled a hoodie over her head, then frantically yanked it off again upon discovering multiple stinkbugs burrowed inside. Some time after that, she tacked up a horse she’d been training, jumped on, and immediately

sprang back off: stinkbugs were pouring out of every crevice of the saddle. She has flicked them off the pages of books she was reading and pulled their corpses out of her jewelry box; they have crawled across the table during dinner and, drawn to the heat of the water, edged steadily closer to her in the bathtub. As she was telling me her story, one made its way across her cutting board, while another survived a swipe from her kitten.

Pam Stone's experience is not unique. Indeed, in the annals of brown marmorated stinkbug invasions, it isn't even all that extreme. The species is not native to this country, but in the years since it arrived it has spread to forty-three of the forty-eight continental United States, and—in patchwork, unpredictable, time-staggered ways—has overrun homes, gardens, and farms in one location after another. Four years before Stone's encounter, a wildlife biologist in Maryland decided to count all the brown marmorated stinkbugs he killed in his own home; he stopped the experiment after six months and twenty-six thousand two hundred and five stinkbugs. Around the same time, entomologists documented thirty thousand stinkbugs living in a shed in Virginia no bigger than an outhouse, and four thousand in a container the size of a breadbox. In West Virginia, bank employees arrived at work one day to find an exterior wall of the building covered in an estimated million stinkbugs.

What makes the brown marmorated stinkbug unique, though, is not just its tendency to congregate in extremely large numbers but the fact that it boasts a peculiar and unwelcome kind of versatility. Very few household pests destroy crops; fleas and bedbugs are nightmarish, but not if you're a field of corn. Conversely, very few agricultural pests pose a problem indoors; you'll seldom hear of people confronting a swarm of boll weevils in their bedroom. But the brown marmorated stinkbug has made a name for itself by simultaneously threatening millions of acres of American farmland and grossing out the occupants of millions of American homes. The saga of how it got here, what it's doing here, and what we're doing about it is part dystopic and part tragicomic, part qualified success story and part cautionary tale. If you have never met its main character, I assure you: you will soon.

Of the five-thousand-odd species of stinkbug in the world, the brown marmorated kind is the most destructive, the most annoying, and possibly the ugliest. It is roughly the size of a dime, although thicker, but its head is unusually small, even for an insect, which gives it an appropriately thuggish look. Its six legs prop its shield-shaped body up in the air, as if they were pallbearers at the funeral of a Knight Templar. Its antennae are striped with bands of dark and light, while its eyes, should you get close enough to gaze into them, are the vivid red of an alarm clock at night. The "marmorated" in its name means "marbled," but "mottled" is closer to the truth. Entomologists, who have a color palette as elaborate as Benjamin Moore's, describe the underside of its body as "distinctly pale luteous" and the topside as "generally brownish cinereous, but also greyish ochraceous, ochraceous, testaceous, or castaneous." To everyone else, it looks as dull brown as its own frass, the technical term for insect excrement.

The defining ugliness of a stinkbug, however, is its stink. Olfactory defense mechanisms are not uncommon in nature: wolverines, anteaters, and polecats all have scent glands that produce an odor rivalling that of a skunk; bombardier beetles, when threatened, emit a foul-smelling chemical hot enough to burn human skin; vultures keep predators at bay by vomiting up the most recent bit of carrion they ate; honey badgers achieve the same effect by turning their anal pouch inside out. All these creatures produce a smell worse than the stinkbug's, but none of them do so in your home.

Slightly less noxious but vastly more pervasive, the smell of the brown marmorated stinkbug is often likened to that of cilantro, chiefly because the same chemical is present in both. In reality, stinkbugs smell like cilantro only in the way that rancid cilantro-mutton stew smells like cilantro, which is to say, they do not. Pam Stone compared their actual smell to the ammonia-and-sulfur stench that suffuses the air outside paper mills. Others have likened it to everything from rotten fruit to filthy socks. A for effort. In fact, the smell produced by a stinkbug is dusty, fetid, lingering, and analogy-proof. A stinkbug smells, unhappily for us all, like a stinkbug.

Along with cheap yoga pants, mass layoffs, and the recent surge in nationalism, the brown marmorated stinkbug is a product of globalization. It is native to East Asia—mainly China, Taiwan, Japan, and North and South Korea—where, kept in check by various natural predators, it has coexisted with the rest of nature in relative tranquillity for millions of years. But then, on September 21, 1998, a gentleman from Allentown, Pennsylvania, deposited several specimens of a mystery insect in the office of Karen Bernhard, an entomologist who works at Pennsylvania State University's Extension Service.

Bernhard could not immediately identify the specimens, which was not in itself surprising. In both number and variety, insects dwarf all other animals; worldwide, there are some nine hundred thousand known species, while between two million and thirty million more have yet to be catalogued. (By comparison, there are just over five thousand species of mammal.) Since the United States boasts ninety-one thousand of those named insect species, some of them quite rare, plus almost as many unknown ones, it isn't that unusual to come across a stumper. Eagle-eyed 4-H'ers have been known to go bug collecting and come home with an insect that no one in the county has seen before.

It is unusual, however, to find an insect that no one in the *country* has seen before. At first, when Bernhard sent her specimens off for identification, she was told that they were a native stinkbug, *Euschistus servus*, but something seemed off. Although those bugs do sometimes make their way indoors, they are not normally household pests, yet all the people calling Bernhard were asking about insects they had found in their homes. In the fall of 2001, armed with a new batch of identical specimens, she contacted Richard Hoebeke, an entomologist specializing in invasive species, who was then at Cornell and is now at the University of Georgia. Within weeks, Hoebeke had determined that the specimens were brown marmorated stinkbugs, the first ever identified in the Western Hemisphere.

Not long afterward, Hoebeke travelled to Pennsylvania to see the new species in situ. "It's kind of burned into my memory," he said. Hoebeke had

seen plenty of stinkbugs in his time, but never in such quantities. "They were flying everywhere—in the air, around people's window screens, everywhere. I had my windows open, and so many were getting in my car that I had to be really careful that I wasn't going to transport them back with me. I was utterly amazed at the numbers." By their sheer quantity, it was clear to him that brown marmorated stinkbugs had been in the area longer than scientists knew. Together with some colleagues, he began scouring records like those kept by Bernhard and eventually determined that the first verifiable specimen appeared in Allentown in 1996, most likely via a shipping pallet from China.

That was the beginning of the grand American journey of the brown marmorated stinkbug. The first sighting outside Pennsylvania came in 1999, in New Jersey. By 2003, stinkbugs had arrived in Maryland. By 2004, they were in West Virginia and Delaware. By 2007, they were in Ohio and New York. These days, it's considerably easier to name the states where, for now, stinkbugs *haven't* been found: Louisiana, Oklahoma, South Dakota, Montana, Wyoming, and Alaska. (That's before we even get to their global reach. In the past few decades, the brown marmorated stinkbug has also migrated to Canada, Chile, Bulgaria, Russia, Georgia, Abkhazia, Serbia, Romania, Hungary, Greece, Switzerland, Spain, Italy, and France, where it is known as the Devil's thumbtack.)

Needless to say, stinkbugs didn't arrive in these places under their own steam; indeed, as insects go they are unexceptional fliers, averaging a mile and a half a day. (Scientists know this because they glued seven hundred and thirty-seven brown marmorated stinkbugs to tiny treadmills, or flight mills, and tracked how far they flew.) However, as Richard Hoebeke learned first hand, they are impressively resourceful hitchhikers—or, really, stowaways, crossing state lines concealed in automobiles (inside, outside, crammed into the rubber sealing in between), tractor-trailers, freight containers, overhead compartments, and anything else that moves. Biologists have arrived at stinkbug conferences in distant states only to open their suitcases and watch in horror as one crawled out.

For the most part, though, the arrival of the brown marmorated stinkbug in a new place is an understated affair. Like a dance party that technically starts at nine but doesn't really get going until one in the morning, there's a long lag between when stinkbugs show up in a new place and when their population booms. Maryland had a stinkbug annus horribilis in 2010, seven years after the first one was documented there. Virginia's mass infestation, in 2011, likewise took place seven years after the first sighting in that state. Pam Stone's home was overrun in 2015, four years after the brown marmorated stinkbug was spotted in South Carolina.

Although concentrated urban areas like Manhattan have, heaven knows, problems of their own—bedbugs, subway rats, cockroaches so big they could register for kindergarten—they are seldom the target of large-scale stinkbug invasions. But smaller cities, towns, suburbs, exurbs, and rural areas all strike stinkbugs as prime real estate, because they enable the bugs to do what they do best. In the fall, winter, and spring, brown marmorated stinkbugs take up residence in private homes, sometimes by the tens of thousands. Then, in the summer, they quietly let themselves back outside, into nearby gardens, orchards, woods, and farms, and steadily set about destroying them.

You wouldn't necessarily notice from way up where we humans perch on the food chain, but it isn't particularly easy to eat a plant. Like most living things, they have evolved an impressive array of defense mechanisms to avoid becoming dinner: thick bark, tough leaves, thorns, spines, poisons. In turn, aspiring plant-eaters have had to evolve ways around those defenses—long bills to access difficult-to-reach nectar, for example, or metabolic pathways that allow them to safely ingest certain toxins. Because of these adaptive pressures, most herbivorous insects are specialists: they are very good at eating a small number of things. Thus, the emerald ash borer feeds exclusively on ash trees, and the Douglas-fir beetle, as its name suggests, prefers Douglas firs.

The brown marmorated stinkbug is not like this. It is, instead, a generalist par excellence; entomologists call it "highly polyphagous," meaning that it

will eat a stunning range of things. For instance, it, too, will eat ash trees. But it will also eat birch trees, juniper trees, cherry trees, tulip trees, maple trees (fifteen different kinds, including sugar maples, big-leaf maples, and vine maples), buckeyes, dogwoods, horse chestnuts, black walnuts, myrtles, magnolias, willows, sycamores, hemlocks, elms, and oaks. That is just a sampling, of just the trees. In other domains, it will eat a lot of things you probably eat, too: broccoli, asparagus, tomatoes, eggplants, okra, chard, cabbage, collards, bell peppers, cucumbers. It will eat pecans and hazelnuts. It will eat hops and grapes. It will eat apples and pears, raspberries and blackberries, apricots and peaches and nectarines. It will eat, like a medieval princeling, figs and quinces. It will eat, without apparent discomfort, horseradish and cayenne pepper, habaneros and jalapeños.

All of that amounts to just the hors d'oeuvres. So far, scientists have discovered more than two hundred and fifty plants that the brown marmorated stinkbug will consume. Together, those plants represent every major agricultural and horticultural sector of the American economy: vegetables, fruit trees, berries, nuts, ornamental plants, and row crops, including sweet corn, cotton, soybeans, and virtually every other legume.

What makes the brown marmorated stinkbug so impressively omnivorous is also what makes it a bug. Technically speaking, bugs are not synonymous with insects but are a subset of them: those which possess mouthparts that pierce and suck (as opposed to, say, caterpillars and termites, whose mouths are built, like ours, to chew). Yet even among those insects which share its basic physiology, the stinkbug is an outlier; Michael Raupp, an entomologist at the University of Maryland, described its host range as "huge, huge, wildly huge. You're right up there now with the big guys, with gypsy moths and Japanese beetles."

Like those two infamous insects, the brown marmorated stinkbug presents a serious problem for American crops. In 2010, Tracy Leskey, an entomologist with the U.S. Department of Agriculture, formed a task force dedicated to figuring out just *how* serious—that is, to studying the biology, ecology, and impact of the brown marmorated stinkbug, and to developing

environmentally and economically sustainable strategies for managing it. At the time, the stinkbug had just reached outbreak levels in the Mid-Atlantic, and the results, Leskey said, were "far beyond anything I had experienced working in ag for twenty years. I wish I had a metric I could give you to tell you how many bugs were in people's crops." In orchards, they were crawling by the hundreds on every tree; so many had invaded corn and soybean fields that farmers had to turn on the windshield wipers in their combines while harvesting. Afterward, it wasn't uncommon to find stinkbug damage on every single ear of corn.

In the years since then, stinkbug populations have simultaneously abated somewhat in their earliest haunts and expanded into countless new places across the country. Those fluctuations, combined with the sheer range of plants that stinkbugs eat, make it difficult to assess their economic impact. To further complicate matters, growers are not typically required to report losses and—outside of crop-insurance claims, inquiries organized by trade associations, or the rare congressional request—they seldom do so. As a consequence, there are no reliable estimates of over-all stinkbug damage to date. In 2010, federal scientists asked apple growers in the Mid-Atlantic to tally their losses; the resulting sum topped thirty-seven million dollars, in an industry whose annual profit in the region is less than two hundred million. That year, Pennsylvania peach growers lost almost half their crop to stinkbugs, a fifteen-million-dollar blow, while some in Maryland lost up to a hundred per cent. In New Jersey, which is the fourth-largest peach producer in the nation, losses ranged from sixty to ninety per cent of the harvest.

No one has quantified the total loss to sweet corn, soybeans, tomatoes, bell peppers, and green beans, but no one disputes that it is significant. And the toll will almost certainly rise as the stinkbug takes up residence in other places. Michigan, the nation's third-largest apple supplier, began to see damage to that crop by 2016, five years after the brown marmorated stinkbug appeared there. In California, South Carolina, and Georgia, where the majority of American peaches are grown, stinkbugs are a

relatively new arrival, and how much damage they will do when and if they reach a critical mass in those places remains to be seen.

Already, though, the stinkbug has demonstrated a taste not only for Georgia's peaches but also for its cotton. Out in Oregon and Washington, it has begun feeding on hazelnuts and berries. Last year, in California, it caused documented damage to the almond crop for the first time. Across the country, vineyards are facing a double threat, because brown marmorated stinkbugs eat both grapes and grapevines. Worse, they tend to migrate to the center of grape clusters late in the season, then get harvested along with them. According to one study, the threshold for detecting a flavor change in grape juice is twenty-five brown marmorated stinkbugs per thirty-five pounds of Concord grapes. On the plus side, or something, evidence suggests that fermentation makes it somewhat more difficult to notice the taste of crushed stinkbugs in wine.

In general, it's often difficult to notice the damage done by stinkbugs, at least at first. Unlike, say, locusts, which simply raze entire fields, stinkbugs wreak their havoc insidiously. The injury they do to corn, for instance, is invisible until the ear is husked, at which point certain kernels—the ones into which a stinkbug stuck its pointy mouth—will reveal themselves to be sunken and brown, like the teeth of a witch. Similarly, stinkbugs suck the juice out of apples through nearly invisible punctures, leaving the exteriors Edenically enticing; only later, when the empty cells start to collapse, does the fruit begin to darken and dimple. The resulting scars, known as cat-facing, also appear on peaches, tomatoes, and other fruits. To add insult to injury, the sugary substance weeping from those wounds attracts other noxious insects, including yellow jackets.

These damaged crops can sometimes be salvaged for juice, but that's a cold comfort to growers, because fruit loses as much as eighty to ninety per cent of its value when it's downgraded from produce to processing. Moreover, stinkbug-affected crops are often rejected even for juicing, for reasons of taste: in addition to sucking some of the sweetness out of their target food, the insects emit an aggregation chemical while they're eating

it—essentially, an enthusiastic arthropod Yelp review, meant to encourage other stinkbugs to join them. That aggregation chemical, which is different from the stinkbug's stink—in fact, it shares its basic structure with Chanel No. 5—lingers on the fruit and negatively affects the flavor of the resulting juice. (Some evidence suggests that this chemical can also cause a rash in humans, especially if it is concentrated through repeated exposure, as happens with harvesters.)

Sometimes, though, fruits from stinkbug-heavy areas are rejected by processors for a different reason: excessive pesticide use. All conventional growers use some form of chemical insect control, and, up to a certain level, the residue is deemed fine for human consumption. But growers in stinkbug-affected regions sometimes exceed those levels—because, as it turns out, the brown marmorated stinkbug is exceptionally hard to kill with pesticides. Peter Jentsch, an entomologist with Cornell University's Hudson Valley research laboratory, calls it the Hummer of insects: a highly armored creature built to maximize its defensive capabilities. Its relatively long legs keep it perched above the surface of its food, which limits its exposure to pesticide applications. Similarly, it eats from the interior of plants, where, for obvious reasons, pesticides are not meant to penetrate. Theoretically, it could inhale a fatal chemical through small breathing pores along its abdomen, but so far the only ones that reliably knock it out are broad-spectrum compounds, which farmers prefer not to use, since they also kill beneficial species. A class of pesticides known as pyrethroids, which are used to control native stinkbugs, initially appeared to work just as well on the brown marmorated kind—until a day or two later, when more than a third of the ostensibly dead bugs rose up, Lazarus-like, and calmly resumed the business of demolition.

But what is not fatal to a brown marmorated stinkbug is terrible for American farms, farmers, ecosystems, and consumers. According to Raupp, the arrival of the stinkbug in this country "basically reversed three decades of environmental and economic progress in terms of managing pests." After a long and steady decline, pesticide use in some places shot up fourfold, as growers who had previously relied on infrequent treatments in conjunction

with other pest-management strategies suddenly found themselves spraying weekly. Those high doses cut back on stinkbug damage, but they were far too time-intensive, chemical-intensive, and expensive to be sustainable. Since then, somewhat better strategies for coping with the problem have emerged, but, to date, the only force that reliably gets a brown marmorated stinkbug off a food source is one that poses a whole different kind of problem: the urge, at the end of summer, to go inside.

It is not that the brown marmorated stinkbug can't survive the winter outdoors. It has, after all, been in existence since long before the advent of human shelters, to say nothing of human beings, and it is perfectly capable of spending the season huddled beneath peeling bark or in the hollow insides of dead trees. But, given sufficient proximity to artificial structures, it will readily spend the cooler months inside instead.

It will come as some relief to homeowners to know that the stinkbug does not pass its time indoors reproducing. Female brown marmorated stinkbugs lay their eggs in the summer—twenty or thirty of them at a time, roughly once a week, for a lifetime average of two hundred and forty eggs. (As indiscriminating in matters reproductive as in matters gastronomic, the stinkbug will lay those eggs on the underside of pretty much any available leaf.) When they hatch four or five days later, the nymphs that emerge look something like ladybugs: smallish, roundish, reddish, with little black dashes on their backs. The nymphs then cycle through five life stages in as many weeks, shedding their skin each time. In as little as two weeks after entering the final phase, they themselves will have reached sexual maturity. In colder climates, that's that, but in warmer locations—or when spring sets in earlier and summer lingers longer, as is currently happening all over the world owing to climate change—those mature stinkbugs can begin reproducing right away, yielding up to five new generations a year.

Eventually, though, cooler weather arrives, and all those adult stinkbugs begin looking for places to overwinter. Often enough, they simply come in through doorways, around which they tend to congregate in autumn, but they have dozens of other ways of entering: down chimneys, around utility

pipes, underneath the flashing on roofs, beneath cracks in the siding, through the vents in air-conditioning units, via imperfectly sealed windows, in the gaps below door sweeps. Studies have shown that, despite their relative heft, stinkbugs can crawl through any crevice larger than seven millimetres, which means that, no matter how much caulk and weather-stripping and patience you possess, it is virtually impossible to stinkbug-proof a home.

After a stinkbug breaches a building and finds a spot it likes, others join it, apparently attracted by the same aggregation pheromone that the bug uses to summon its friends and relations to dinner. (Dismayingly, for homeowners, that pheromone remains detectable to other stinkbugs for up to a year.) Once additional stinkbugs start arriving, they will stick around until late spring, and can assemble not only in incredible numbers but with incredible density. The instinct to do so is known as thigmotaxis: the tendency to move toward physical contact—in this case, not only with other stinkbugs but with almost any surface. Thigmotaxis is why stinkbugs are so often found between layers (beware the quilt left folded in a window seat) and underneath seemingly flat things (brace yourself before picking up that stack of newspapers beside the recycling bin). It is why Pam Stone found so many behind her paintings, and why Doug Inkley, the biologist who counted upward of twenty-six thousand stinkbugs in his home, could pull them out of his attic by the handful, like popcorn.

Overwintering stinkbugs also display another characteristic that determines where you are most likely to find them. They are negatively geotropic, meaning that—unlike the roots of plants, which are positively geotropic and extend toward the earth—they tend to move away from the ground. In other words, like millionaires, feudal lords, and goats, stinkbugs exhibit a preference for high places. That is why you are much more likely to find them on the upper levels of your home than on the first floor or in the basement (where, indeed, they are almost never seen). In 2014, scientists at Rutgers University studied the distribution of stinkbugs in undergraduate dorms, and found that the percentage of rooms with bugs in them steadily

rose with elevation, from eleven per cent of rooms on the first floor of one dorm to almost seventy per cent on the top floor.

The most obvious characteristic of the overwintering stinkbug, however, is a deep, abiding lethargy. Once it settles down for the season, it enters a state known as diapause—a kind of insect hibernation, during which its metabolism slows to near-moribund conditions. It cannot mate or reproduce, it does not need to eat, and although it can still both crawl and fly, it performs each activity slowly and poorly. As a result of this torpor, stinkbugs remain mostly in place, so that even if thousands of them are living in your home, you will likely experience them less as a flood than as a constant, inescapable dribble. Like drunken partygoers periodically stumbling into the hallway to ask where the bathroom is, two half-asleep bugs will materialize on a door frame, a third will rest on the arm of a sofa, a fourth will pause in its exhausting journey across the floor. No sooner have you disposed of these and gone back to your life than you will find one perched on the corner of your computer screen or crouched atop a bar of soap.

It is also thanks to diapause that stinkbugs, indoors, seem inordinately graceless and impossibly dumb. But, as we all now know, being graceless and dumb is no obstacle to being powerful and horrifying. Although brown marmorated stinkbugs don't actively destroy structures as they do crops, their tendency to aggregate can cause costly problems, by clogging wells, pipes, and chimneys. (They can also prompt expensive though largely fruitless visits from exterminators, and motivate upgrades that might otherwise wait; Inkley, after his stinkbug invasion, spent ten thousand dollars on new windows.) Infested hotels and restaurants must incur the expense of getting stinkbugs out and then keeping them out, to say nothing of the reputational costs that befall hospitality businesses overrun by insects. Stinkbugs can also be pricey for companies that ship goods overseas; American car manufacturers, for instance, have to fumigate or heat products prior to exporting them to certain ports from stinkbug-prone areas. And stinkbugs can cost the owners of those cars a bundle, too, by blocking air-control valves and vent lines.

Mostly, though, the problem with stinkbugs indoors is not so much expense as disgust. Overwintering stinkbugs navigate like nine-year-olds in bumper cars, making as much noise as possible and banging into everything in sight: walls, doors, windows, humans. Unlike household pests such as ants and fruit flies, they are not particularly drawn to food and drink; then again, as equal-opportunity invaders they aren't particularly *not* drawn to them, either. This has predictable but unfortunate consequences. One poor soul spooned up a stinkbug that had blended into her granola, putting her off fruit-and-nut cereals for life. Another discovered too late that a stinkbug had percolated in her coffeemaker, along with her morning brew. A third removed a turkey from the oven on Thanksgiving Day and discovered a cooked stinkbug at the bottom of the roasting pan. Other people have reported accidentally ingesting stinkbugs in, among other things, salads, berries, raisin bran, applesauce, and chili. By all accounts, the bugs release their stink upon being crunched, and taste pretty much the way they smell. (They are also occasionally eaten by household pets, though seldom twice. One of my cats recently ate two at once, and promptly vomited them up.)

A further perversity of stinkbugs in the home is that they are simultaneously extremely easy and extremely difficult to kill. On the one hand, in the face of mortal danger they do not have the sense, or the speed, to flee. On the other hand, dispatching them by any of the traditional methods—smashing, squashing, stepping on—means that, like good Christians, they will triumph even in death, in this case by leaving behind a malevolent olfactory ghost. Worse, they will die with the sublime stoicism of a soldier who knows that ten thousand of his compatriots are lined up behind him, ready to take his place.

If you want to avoid the stench while also eliminating the stinkbug, your options are limited. "I'm probably not the only one who's thought of burning their house down just to kill the stinkbugs," one Internet commenter observed. Another suggested trying miniature silver bullets, or tiny stakes driven through the heart. What you should definitely not bother trying is insecticides approved for interior use; in the home, as in the field, stinkbugs are relatively immune to chemical assault. You can flush them

down the toilet, but that's a huge waste of water. You can vacuum them up, but the smell will be noxious; also, if not disposed of immediately, stinkbugs have been known to crawl back out again. The experts recommend building a contraption out of an empty soda bottle, filling it with soapy water, and drowning the stinkbugs inside, but I am dubious. For one thing, I have personally pulled a load of clean clothes out of the washing machine and discovered a stinkbug at the bottom, alive. For another, those same experts suggest collecting stinkbugs in Ziploc baggies, then placing them in the freezer for several weeks until they expire—somewhere, I suppose, between the pint of ice cream and the frozen peas.

As yet, the story of the brown marmorated stinkbug has no ending, so it cannot be said to have a happy one. It does, however, have something like a silver lining. Raupp, who has been studying non-native species for forty-one years, called its arrival on our shores "one of the most productive incidents in the history of invasive pests in the United States." Because the stinkbug is, as he put it, "magnificent and dastardly," it has attracted an almost unprecedented level of scientific attention. It has spawned multimillion-dollar grants, dozens of master's degrees and Ph.D.s, and a huge collaborative partnership that includes the federal government, land-grant colleges, Ivy League universities, extension programs, environmental organizations, trade groups, small farmers, and agribusiness. "From a research perspective," Raupp said, "this was and continues to be one of the major drivers in the history of entomology in the United States."

Thanks to that intensive research, the brown marmorated stinkbug is much better understood today than it was twenty years ago—and therefore better managed. For instance, entomologists now know that the stinkbug is a perimeter pest; it preferentially feeds on the edges rather than the interior of orchards and fields, a fact that enables farmers and growers to concentrate pesticide use in smaller areas while still achieving much the same results. Scientists also now know a tremendous amount about the stinkbug's most fearsome enemy back home: the samurai wasp, which deposits its eggs inside those of the stinkbug, leaving its larvae to emerge

and consume their host. In East Asia, the samurai wasp parasitizes between sixty and ninety per cent of brown marmorated stinkbug eggs, thereby almost single-handedly keeping its population under control.

Like the stinkbug, the samurai wasp arrived in the United States by accident, and a small number have lived here since at least 2014. Now, though, entomologists hope to breed and release it in sufficient quantities to curtail the stinkbug population. Their logic is compelling: the stinkbug poses a serious threat to billions of dollars of American agriculture, while the wasp, which is tiny and does not sting humans, destroys those bugs in huge quantities and, according to studies spanning more than a decade, appears to harm only one native beneficial species.

Nonetheless, it's impossible to contemplate this plan without worrying about the law of unintended consequences, which has governed the realm of introduced species before. The cane toad, brought to Australia to control the native greyback cane beetle, proved to be largely ineffective at that job but horribly effective at killing other native species (sometimes by eating them but mostly, because it is extremely poisonous, by being eaten). Today, the two hundred million cane toads in Australia constitute a pest far worse than the one they were meant to control. Similarly, the Asian multicolored ladybird beetle was introduced into the United States to control aphids; it did that, but it also displaced most native ladybird beetles and proved to be, like the stinkbug, a home invader.

Still, as Peter Jentsch points out, you have to pick your poison. Or more aptly, in the case of the stinkbug, you have to decide *whether* to pick the poison. Whatever problems the samurai wasp may cause in the United States, the current alternative for stemming stinkbug damage is extremely frequent applications of a broad-spectrum pesticide. To Jentsch, the biological control is the lesser of two evils.

It is also possible that other benign solutions will present themselves, or have already started to do so. Curiously, in places where stinkbug populations once boomed, they have recently subsided to less daunting levels. Some scientists suspect that certain native species, including the

wheel bug and the corn spider, are beginning to take advantage of the abundant new food source in town. Others think that temperature is playing a role, in both directions. There's reason to believe that stinkbugs fare poorly in winters when the temperature drops early and rapidly, as happened in North America during the polar vortex of 2013-14, after which stinkbug levels declined; there's also reason to believe that excessively warm summer weather can reduce the survival rate of stinkbug nymphs.

Many scientists, however, remain worried. Raupp compared the brown marmorated stinkbug to a slow-moving tsunami that began on the East Coast and will gradually engulf the rest of the country. "The folks out in the Midwest, the folks on the West Coast—they're going to face the same kind of economic loss that our folks did back here," he says. That is a reasonable fear. In California, the brown marmorated stinkbug has already been detected in thirty-six of fifty-eight counties. Meanwhile, laboratory studies have added two relevant foods to the long list of those it will eat: avocados and citrus fruit.

As far as Richard Hoebeke is concerned, the brown marmorated stinkbug already belongs on the shortlist of the most serious pests in the United States. Like Raupp, Hoebeke has a lifetime of experience with non-native species; in addition to being the first person to identify the brown marmorated stinkbug in the United States, he was the first to identify the Asian long-horned beetle and has extensively studied many other invasive insects as well. He is not sanguine about the likely efficacy of the samurai wasp, because he is not sanguine about any biological means of controlling the stinkbug. "The vast majority of non-native insects that have become established in the United States have not been well controlled by biocontrol efforts," he says. "I mean, look at gypsy moths. They've been an issue since the late eighteen-sixties, and we've been throwing biocontrol at it for years." Doing that is better than doing nothing, he conceded, but it is a far cry from actually succeeding.

If there is comfort to be had in any of this, it is that old, familiar refrain: things could be worse. As damaging as the brown marmorated stinkbug is

to agriculture, it has nothing on the boll weevil, which cost American cotton farmers billions of dollars in its heyday, or on the Rocky Mountain locust, which, prior to becoming extinct, could sweep through in swarms the size of California and destroy millions of acres of crops within a matter of days. Likewise, as annoying as the stinkbug is in the home, it does not bite, sting, transmit disease, or gnaw through foundations.

In a way, then, we got off easy this time. The difficulty is that there will be a next time, and a time after that, and a time after that. Prior to the era of planetwide transportation networks, species routinely took millennia to establish themselves in new places. Today, thousands move around the world every day—by ship and plane and freight and pallet and packing crate, by business meetings in Switzerland and military deployments in Pakistan and tourism in Hawaii. At present, this vast influx of new species costs the United States about a hundred and twenty billion dollars a year and is, after habitat destruction, the main reason the world has lost so much biodiversity.

In that context, the arrival of the brown marmorated stinkbug is unremarkable. What's remarkable is how much we've done to address it—a reflection, I suspect, not only of how broadly it affects our lives but of how deeply it affects our psyches. Stinkbugs scuttle and crawl and amass like enemy armies; they have a prehistoric look and a postmortem smell. They remind us that we are vastly outnumbered, that our walls are permeable, that we are vulnerable even in our own homes.

For most of us, as a result, the stinkbug is psychologically opposite from but politically identical to the polar bear. Like charismatic megafauna, revolting microfauna spurs us to action: we form committees, cough up funding, demand that something be done. The difficulty is what to do about everything in between those two biological extremes: the endangered Japanese night heron and the threatened lakeside daisy, the prairies lost, the wetlands lost, the glaciers lost, the species lost, the diminishing and despoiling of entire ecosystems. A stinkbug on your toothbrush or seven thousand in your attic is disgusting. Yet the most troubling thing about the

natural world today is not all the things we have to live with. It is all the things we have to live without. ♦

This article appears in the print edition of the March 12, 2018, issue, with the headline "Home Invasion."

Kathryn Schulz joined The New Yorker as a staff writer in 2015. In 2016, she won the Pulitzer Prize for Feature Writing and a National Magazine Award for "The Really Big One," her story on the seismic risk in the Pacific Northwest. She is the author of "Being Wrong: Adventures in the Margin of Error." Read more »