The Gloworm

If you want to live and thrive, let the spider run alive. - American Quaker saying

MISSISSIPPI STATE UNIVERSITY EXTENSION SERVICE

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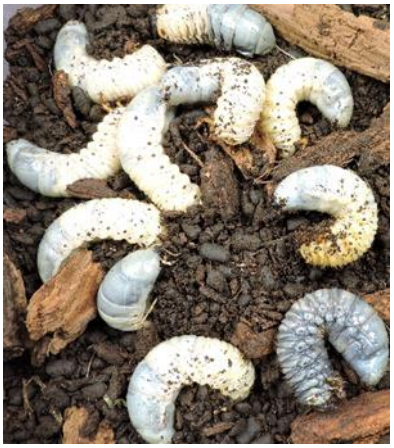
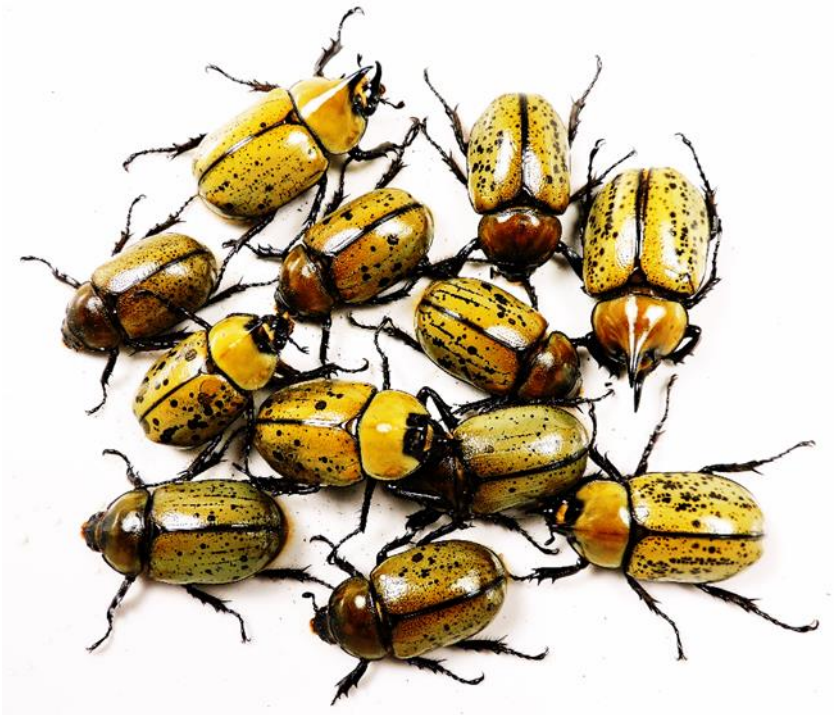
Ada Fulgham's Gift of 23 Hercules Beetles Will Delight Arthropod Zoo Visitors by Dr. John Guyton

We do not see a Hercules beetle every summer. In fact, we sometimes go for 3 or 4 years without a camper collecting one, and we collect in habitats where you would expect to find them. So imagine our surprise when Ada Fulgham, whose older sister Lilli has attended Bug & Plant Camp and Beekeeping Camp with their father, nonchalantly walked in with a critter keeper full of beetles and a bucketful of host material. We saw a couple adults and a couple larvae on the top of the substrate, but after Ada left, we emptied out the material in the critter keeper and counted 12 adults and 11 larvae. Wow! She was not kidding when she told us she had found a lot of beetles.

Our small arthropod zoo features a collection of exciting exotic species as well as common local species that are currently active. We almost always have something interesting showing up, so the zoo is continually evolving. We have already reviewed our guidelines to raising insects and made a quick trip around the internet as we discussed our plans for all of these beetles. Watch for updates as we learn to care for Hercules beetles.





Clockwise from left: Ada Fulgham, her gift of 12 adult beetles, and 11 grubs. Photos by J. Guyton.

New Glow Worm Photo on The Gloworm Masthead by Dr. John Guyton

As Dr. Blake Layton and I were discussing the glow worm illustration on *The Gloworm* masthead, he called it a good illustration of the "railroad worm," a common name for the female beetle larva (Phengodidae family) derived from what appears to be lit windows in a train at night with a red headlight. He went on to say he had taken a good picture of one. Dr. Layton is an excellent photographer so when he showed me his picture, I quickly secured his permission to use it on our newsletter.

Dr. Layton's photo is our third glow worm depiction. The first was a bookworm Dr. Mike Williams used in the early days of computer graphics. David Held and I continued using his illustration when we became the editors, but I later changed it to a more realistic graphic courtesy of Florida Center for Instructional Technology. That image is from their ClipArt ETC collection, a part of the Educational Technology Clearinghouse that was produced by the Florida Center for Instructional Technology, College of Education, University of South Florida. We are thankful for their permission to use this image and we periodically use other images from their collections. You can find their site at http://etc.usf.edu/clipart/.

As technology has changed it is easy to use color photos in the newsletter and a growing number of our subscribers now elect to receive it electronically. The cost of printing the newsletter in color is prohibitive, so those who receive it by snail mail do not get to enjoy the colorful images. However, past editions of *The Gloworm*, in color, are archived on the MSU Extension Service website. The URL appears at the bottom of all our newsletters.

Binominal Courtesy Extended to Insect Common Names by Dr. John Guyton

There are good reasons for using common names—common being number one, and the lack of a Latin literate populace number two! In the big picture, the use of common names is not such a great problem. Only a couple thousand insects have common names accepted by the Entomological Society of America (ESA), which is responsible for insect names, out of the million or so identified of an expected 30 million total. So, allowing the use of common names for 0.01% of the estimated insect population doesn't really sound so bad. But ESA even has requirements for these common names, what I call the "binominal courtesy." Just as the scientific names for insects are composed of two words, the common name for insects with an appropriate "order reference" in their name are required to have two words. Butterfly cannot be written "butter fly" because the word "fly" would be a reference to the order Diptera. Sawflies are wasps (Hymenoptera) not flies; similarly, dragonflies (Odonata) and fireflies (Coleoptera) are not true flies.

Now, for the binominal courtesy there is a convention. Entomologists accept two-word names *if the insect's common name contains a reference to the order* in which the particular insect belongs. True flies have only 2 wings (one pair). Flies are in, and the term flies refers to, the order Diptera. So a house fly or horse fly is correctly spelled as two words. Because butterflies and dragonflies have 4 wings and are not flies in the order Diptera, binominal courtesy is not extended to them. It is thus acceptable to use a one-word name. Likewise, bed bugs, kissing bugs, and stink bugs are true bugs in the order Hemiptera. Pillbugs and sowbugs are not even insects (they are crustaceans), so they do not qualify for binominal courtesy and are relegated to one-word name. Fire ants, honey bees and paper wasps are in Hymenoptera with a lot of ants, bees, and wasps. These are properly spelled as two words.

While working on this piece, I thought ESA probably had an article about the two-part common names that reflected the insect order rule. As it turned out, Communications Program Manager Richard Levine wrote one, and it seems we used almost identical insects in our examples. I thought about changing mine, but Richard had beaten me to the good ones. Good job, Richard. I award you credit in my references.

Levine encourages us to use the short rhyme, "If true, then two," as a memory aid.[1] He goes on to point out, and I had not thought of addressing this, that one interesting source of confusion is the *Merriam-Webster Dictionary*, where "honey bee," "house fly," and "bed bug" appear as single words, misspellings according to entomologists. To make matters worse, Levine states, the *New York Times* and *Washington Post* use the *Merriam-Webster Dictionary* instead of consulting the prime source, the Entomological Society of America Common Names of Insects Database.[1]

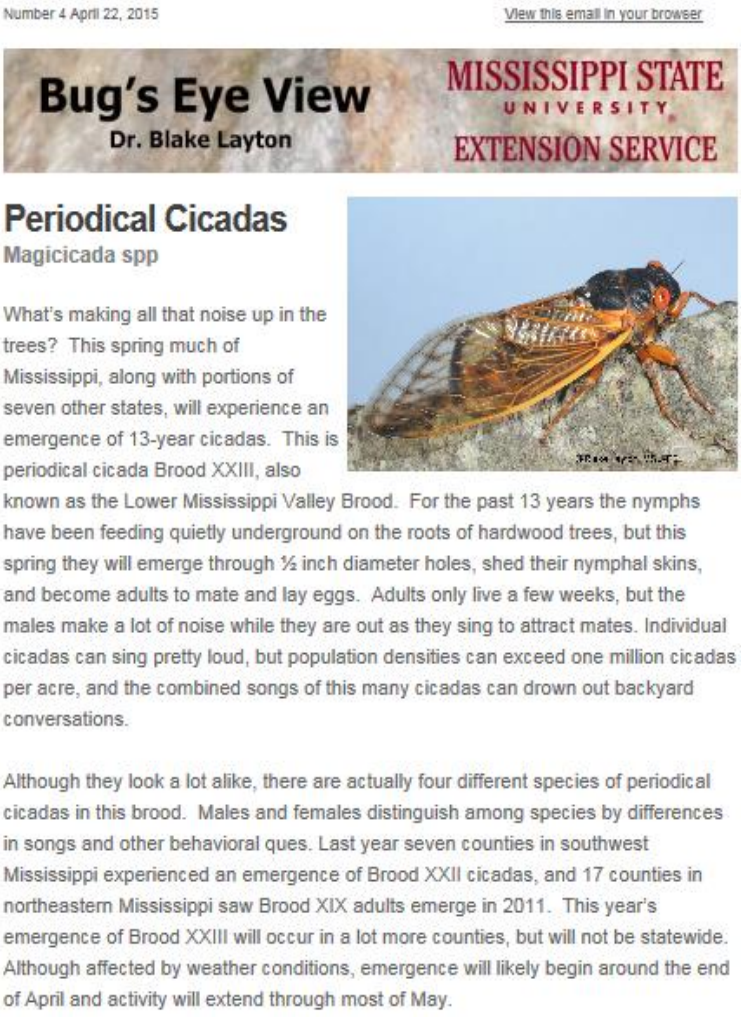
I suspect by now you may be wondering, How does one give an insect a common name? I am glad you asked. On the Entomological Society of America website there is a "Use and Submission of Common Names" page. See http://www.entsoc.org/pubs/use-and-submission-common-names if you are interested. The International Commission on Zoology Nomenclature maintains the guidelines and standards for assigning scientific names. ESA's job is to approve additions to their Common Names of Insects Database, slowly building up that 0.01% of the estimated insect population with common names.

[1]Levine, R. 2014. Is it honey bee or honeybee? Bed bug or bedbug? House fly or housefly? *Entomology Today*. May 6, 2014. http://entomologytoday.org/2014/05/06/is-it-honey-bee-or-honeybee-bed-bug-or-bedbug-house-fly-or-housefly/

Sign Up to Receive the Bug's Eye View Newsletter by Dr. Blake Layton

If you are interested in insects and related arthropods, you may want to sign up for this. *Bug's Eye View* is a new weekly electronic newsletter I write as an Extension Entomologist. It consists of a single photo of an insect/arthropod and 200–500 words about that insect. About half the featured insects will be pests. The other half will be "miniature wildlife." Management and control recommendations are included for those that are pests.

To sign up to receive *Bug's Eye View*, and to see examples of previous newsletters, go to: www.msucares.com, click on "Newsletters", select "Bug's Eye View", then click on "View archived issues or subscribe" (this link is near the bottom of the site).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Bug's Eye View
Dr. Blake Layton
MISSISSIPPI STATE UNIVERSITY EXTENSION SERVICE

Periodical Cicadas
Magicicada spp

What's making all that noise up in the trees? This spring much of Mississippi, along with portions of seven other states, will experience an emergence of 13-year cicadas. This is periodical cicada Brood XXIII, also known as the Lower Mississippi Valley Brood. For the past 13 years the nymphs have been feeding quietly underground on the roots of hardwood trees, but this spring they will emerge through ½ inch diameter holes, shed their nymphal skins, and become adults to mate and lay eggs. Adults only live a few weeks, but the males make a lot of noise while they are out as they sing to attract mates. Individual cicadas can sing pretty loud, but population densities can exceed one million cicadas per acre, and the combined songs of this many cicadas can drown out backyard conversations.

Although they look a lot alike, there are actually four different species of periodical cicadas in this brood. Males and females distinguish among species by differences in songs and other behavioral ques. Last year seven counties in southwest Mississippi experienced an emergence of Brood XXII cicadas, and 17 counties in northeastern Mississippi saw Brood XIX adults emerge in 2011. This year's emergence of Brood XXIII will occur in a lot more counties, but will not be statewide. Although affected by weather conditions, emergence will likely begin around the end of April and activity will extend through most of May.

Editor's note: This resource should be extremely useful to Bug & Plant campers. An appropriate subtitle could have been: *Learn a Bug a Week*. Lois and I had talked about doing this with twitter, but we waited just long enough that Dr. Layton is saving us a lot of time! This

year we are bringing back an old camp activity, the Linnaean Games, a competition to see which campers have learned the most entomology. Some questions will come from *The Bug's Eye View* newsletter, so keep up with the issues as they come out.

All that Smells like Death and Attracts Flies Is Not Dead: Plant Mimicry of Dead Animals by Dr. John Guyton


Photo by J. Guyton.

Some plants are masters of deception, using trickery to survive. Examples include pheromones that mimic insects; the red leaves of the cardinal flower (*Lobelia cardinalis*) that attract hummingbirds for pollination without producing nectar; some orchids' flowers that resemble females to lure male insects for pollination or produce sex pheromones that attract males to assist with pollination; plants that look so much like small stones you would never notice them.

The devil's tongue arum or voodoo lily's (*Amorphophallus konjac*) bloom smells like rotting flesh and is thought by some to be the worst smelling plant on the planet. Almost needless to say, it is effective at attracting flies. Unimaginably, this east Asian native's scientific name refers to its use as a high-fiber diet food. I can imagine if this was all you had to eat, you would eat very little! It is also said to have the medicinal property of reducing blood sugar levels. The corm or bulb, reminiscent of potato, can be pulverized and used in yam cakes. Someday I plan to start a tradition to celebrate its flowering by eating delicacies made from the plant such as Shirataki noodles and konnyak cakes, found in Asian grocery stores.

My devil's tongues have just finished blooming. Interestingly, the devil's tongue is known for having the largest unbranched inflorescence in the world. These plants were a gift from a son-in-law with who I share an interest in unusual plants. Friends who have stood downwind of these plants while they were blooming have questioned my relationship with my son-in-law.

Wasps Are Emerging from Fallen Oak Apple Galls by Dr. John Guyton

Regular walks along the country road where we live often reveal new mysteries and seasonal reminders. Recently we have been enjoying picking up the paper-thin-shelled, golf ball–sized oak apple galls with their spongy interiors produced by a small wasp (*Amphibolips confluenta*). These wasps do not sting and the galls do not harm trees so they have not been studied as much as insect pests. These gall wasps, in the Cynipidae family, are common is the eastern U.S.

The life cycle of this wasp is interesting, featuring sexual and asexual components. Adults emerge in June or July, mate, and fall to the ground. The females burrow into the soil at the base of an oak tree and inject eggs into the roots. The larvae munch on roots and emerge as only wingless females in the early second spring. These unmated females follow the roots to the tree trunk and crawl up the trunk to deposit eggs in stems, leaf buds, petioles, or the veins of developing leaves. Chemicals from the egg and later larvae cause the tree to produce the gall that is initially green and later turns brown. The egg develops in the center of the spongy gall where the larva then eats gall tissue, metamorphoses into a pupa, and emerges as a male or female.

Like most available protein sources, these wasps have their predators. Woodpeckers, chickadees, and other birds easily poke holes in the thin galls for a snack. Predatory wasps prey on wasp larvae. Squirrels, raccoons, and other mammals also seem to enjoy these small treats.

In preparing for an Arthropod Zoo tour the other day, I grabbed a canister of oak apple galls. They were a huge hit as many of our visitors had been seeing them and were glad to learn more about them. We will make an exhibit with these items in a Riker mount and use it again next spring!

Left to right: Gall on red oak, gall wasp (greatly magnified), and cross-section of an oak apple gall (note the hole in top right corner of the central mass where a wasp emerged). Photos by J. Guyton.

Reference: Oak apple gall wasp (*Amphibolips confluenta*). Available online at http://www.fcps.edu/islandcreekes/ecology/oak_apple_gall_wasp.htm

Editor's note: This is an excellent resource. The site was designed for elementary-aged students in northern Virginia to learn about their local ecology.

BUG CLUB ACTIVITY

Make Oak Apple Gall Ink by Dr. John Guyton

Photos by J. Guyton.

Into a bowl containing about 10 oz. water (rain or distilled preferred), add 2 ounces (20 or so galls) of thoroughly crumbled oak apple galls and let the mixture sit for 24 hours. When you think about it, give it a stir. You will notice the water turning dark immediately from the tannin in the galls. Oak bark naturally contains high levels of tannin and was traditionally used to tan animal hides. Dip your pen into the ink and write a few words. Is it dark enough? Well, keep going. Next, filter the liquid, discarding the gall, and add 1 oz. of iron sulfate (Hi Yield Copperas—from the co-op or garden supply store). You should notice the ink turning noticeably darker. Add a quarter ounce of gum Arabic, from an art or business supply store, to thicken the ink and help it adhere to the paper. If the ink is still too light, gently heat it to reduce the water and make it darker. Oak apple gall ink is also known as iron gall ink.

Much of Our History Is Preserved, or Not, by Iron Gall Ink by Dr. John Guyton

Iron gall ink, as it has come to be called, was the standard for writing and drawing from around the 4th century to the 20th century. The earliest surviving documents utilizing iron gall ink were written on papyrus during the first centuries after Christ.[1] Because of its indelibility, it was the ink of choice until the 20th century. It was used to ink the Codex Sinaiticus, Leonardo de Vinci's notes and sketches, Bach's compositions, Van Gogh's drawings, the Dead Sea Scrolls and the U.S. Constitution. Pliny the Elder (23–79 AD), Roman naturalist and natural philosopher, author, and an army and naval commander during the early years of the Roman Empire, recorded his experiments with gall ink in his 37-volume encyclopedia, in which he describes the state of knowledge about nature.

Inherent in this wonderful ink that has recorded many centuries of our history are the seeds of its destruction. The essential ingredients, tannic acid and iron (II) sulfate, interact to compromise the ink's long-term preservation. Iron gall ink is corrosive and tannin's and iron's interactions, acid hydrolysis and iron-catalyzed oxidation, complement each other in forming a relatively indelible ink, to the detriment of the paper. The iron-catalyzed (redox) reaction is the most destructive, with the excess iron contributing to the oxidation and breakdown of the paper. The reaction of acidic tannin and iron sulfate produces sulfuric acid that gives the ink its color and migrates through the paper, attacking the cellulose and leaving it brittle.[2]

There are numerous other factors that influence the rate of chemical reactions and ultimately degrade documents, including original formulation of the ink (there is an ideal ratio of tannin to iron [3.6:1] that is relatively stable), thickness of the paper, temperature, humidity, changes in atmospheric pressure, storage conditions, and handling. Many ancient documents appear to be relatively stable and safe, however the fact that so many are in degrading status suggests even currently stable documents may not be safe forever.

References

[1] The Iron Gall Ink Website. http://ink-corrosion.org/igi_index.html
[2] Iron gall ink. 2013, March 21. Traveling Scriptorium: A teaching kit by the Yale University Library. http://travelingscriptorium.library.yale.edu/2013/03/21/iron-gall-ink/

Note to teachers and extension agents: Because making iron gall ink is so easy and so important to our history and science, all students should have the opportunity to experiment with making ink. Social Studies teachers could engage students in the history of inks and dyes while the science teacher could lead experimentation with different ink formulations. Agents anxious to get into the classroom should experiment with oak apple galls and I would venture a guess that many teachers would welcome a presentation on the history of iron gall ink, especially when it comes with a demonstration that would develop over several days.

What a Difference a Day (length) Makes by Lois Connington

How important is circadian rhythm for an arthropod? Well, as important as we were taught it was in introductory biology. When we last visited the painted lady 'butterwalks' in February, they were kicking back on the floor of their cage during the day, taking in the rays from the heat lamps and sucking down Gatorade. Once I shortened the light cycle in the display cabinet to 14 h light: 10 h dark and draped their cage at night with a room-darkening curtain to block out the 24/7 overhead lights in the lobby, they shifted their peak flight time to midafternoon (rather than from 6:30 pm and into the night) and started climbing the walls (literally). Interestingly, the shift took place over several days, with the peak moving forward about 30 to 60 minutes per day. I also noted that adding the curtain in front and a lightweight cloth over the back opening did not appreciably raise the temperature or the relative humidity in the cabinet. Documenting the effects of draping over time has been made more difficult by the high turnover rate in the display cabinet, as I hang new pupae several times per month, and the emerging adults live only about three weeks.

But what goes on behind those closed drapes during the evenings and weekends? Whenever I peek in before removing the curtain for the day or just for fun on the weekend, there is usually at least one painted lady soaring through the air. As soon as I remove the curtain, the flight stops. What gives? Is there something special about the light in the cabinet (two Exo-terra 75-watt Intense Basking Spot bulbs) that is disrupted by the introduction of fluorescent light from the lobby passing through the window? If so, why do the butterflies in the rearing room downstairs fly actively throughout the day under their fluorescent lights? Could it just be the movement of the white

backing on the curtain that startles them into flight? It may be time to rig up a camera behind the drape.

After observing the positive and immediate effects of controlling the painted ladies' circadian rhythm, we've decided it's curtains for everyone in the Arthropod Zoo. I have just started draping all of the cages at night to see if locking in a distinct photoperiod will benefit some of our other arthropods (e.g., induce them to mate and reproduce). In particular, our blue death feigning beetles have lived in a group of 7–10 individuals for almost 2 years, yet they have never produced any young, or even mated that we have seen. Likewise, our large Madagascar hissing cockroach colony has lacked nymphs. By controlling the photoperiod in the display cages, we may also see increased activity from some of the critters, as with our painted lady butter*flies*.

Rosehair tarantula (left) and her cast skin. Photo by J. Guyton.

Perhaps we are seeing results already. After just two nights under wraps, the Honduran curlyhair tarantula molted. The Chilean rosehair tarantula molted after four nights in the dark. Coincidence? Stay tuned to *The Gloworm* to learn what a difference a day(length) makes.

The Sweet Success of Catching a Honey Bee Swarm by Lillian V. Fulgham

Yesterday afternoon, my dad and I checked on my new honey bees. In the month I have had them, the colony has filled almost seven frames with honey, brood of all different stages of development, and lots of pollen. The queen was on one of the last frames I pulled out. She is a fairly large queen with a yellow abdomen, an identifying feature of Italian bees, which makes her easy to see among the worker bees. She seems to be healthy and a good egg layer. One of the best things about this hive is that the bees are exceptionally nice. I hardly had to use any smoke while working with them—they were so calm that I was more than halfway done checking the hive when I realized that I had forgotten to put on my veil.

Checking my new colony with my dad, Fritz Fulgham. Photos by Bonnie Renfroe.

This colony is special because it is my first successful attempt in capturing a swarm. I have always been interested in obtaining a hive this way, but have never had a good opportunity (the few swarms I have found have been dangerously high up in trees). This April, my family and I spotted a swarm about eye-level on a crepe myrtle just off of Main Street in Starkville. Having just moved to town, I didn't have any of my beekeeping equipment on hand, so I called Ted Dobson, a local beekeeper I know from church, and Lois Connington from the MSU Beekeeping Camp, a fun and highly educational program led by Jeff Harris and John Guyton. Lois met me with some beekeeping supplies, but when we arrived back at the scene, the swarm, which was already starting to leave when we first saw it, was gone. We were all truly disappointed.

A few days later, Ted received a phone call from David and Sherrie Van Landingham, also friends from church, with news of a swarm of honey bees in their front yard on Tanglewood Drive, just up the street from our house. Not needing any more hives and knowing my interest, Ted contacted us. I grabbed a veil (borrowed from Lois) and an empty wooden cheese box, then jumped in the car with my mom and sister. Ted was to meet us with a hive box, bee brush, and spray bottle full of sugar water. As we arrived, I scanned the trees and bushes along the side of the street, but saw no bees. When we got closer, we realized that the swarm had landed in a cluster right in the middle of the street.

I put on the veil and approached the swarm to get a closer look. As the bees were spread out on the asphalt, it wasn't hard to find the queen. Using a piece of paper from the car, I carefully scooped the queen and the bees attending to her into the cheese box. Most of the bees migrated to the

Left to right: moving the queen and her attendants to the cheese box, watching the swarm move in, and enticing the rest of the swarm into the hive. Photos by Ada Fulgham.

cheese box within an hour, during which time Ted arrived, we diverted traffic, a Cooper's hawk flew over, a barred owl watched us from the top of a nearby pine, and we located the old hive in a nearby sweetgum tree. Ted sprayed the remaining bees with sugar water, brushed them onto a piece of cardboard, and shook them in. We then put the cheese box full of bees into the bee box and strapped it onto the back of Ted's pick-up for the ride home.

As I have learned, capturing (or attempting to capture) a swarm can be a rewarding and educational experience for everyone involved and a fun and economical way to obtain a hive. I can't wait for the first honey harvest.

Editors' note: Lilli and her dad attended the inaugural MSU Beekeeping Camp in 2014. While she had helped her dad with hives at home before camp, her confidence as a beekeeper in her own right was strengthened through her camp experience.

Visit *The Gloworm* archives at http://msucares.com/newsletters/pests/gloworm/index.html.

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