The Gloworm

To me, there is nothing more soothing than the song of a mosquito that can't get through the mesh to bite you. - M. S. Bell

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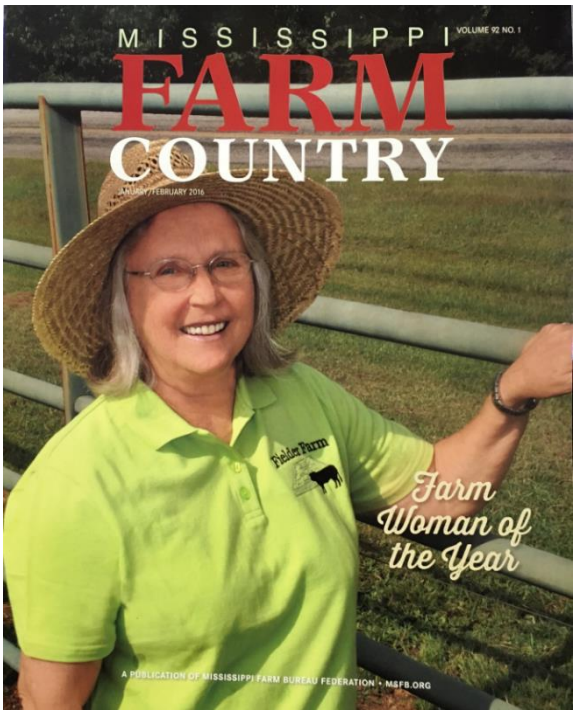
An Extension Newsletter of the Dept. of Biochemistry, Molecular Biology, Entomology, & Plant Pathology

Congratulations to Christine Fielder: Bug Camp EMT, Instructor, Ambulance Pilot, and Satirist by Dr. John Guyton

We were thrilled to see 15-year camp veteran Christine Fielder on the cover of the Mississippi Farm Bureau Federation's *Mississippi Farm Country* magazine as their Farm Woman of the Year. Way to go Christine and thank you Farm Bureau! The youth of Yalobusha County are fortunate that Christine formally retired because she remains active in 4-H today!



At the start of our first camp after Christine's retirement I remember lamenting to Mike Williams that I thought Christine came with the camp! She was already a valuable staff member before I knew what Bug Camp was, and she kept us healthy from the first camp in 1994 through 2008. As many of you will remember, she was never far from her backpack that contained the camp's hospital and pharmacy accoutrements. I always intended to empty the contents of that bag and inventory them, but she always had it with her!

Christine's farm background made her the perfect medic for a "Bug" Camp. She knew agricultural pests and was equally adept at medicine, teaching, and looking for places to lend a helping hand. She developed an innovative way to teach insect mouthparts that held campers' attention, and helped campers make bug suckers, or aspirators, from film canisters and aquarium tubing. Christine caught lots of insects and ever so quietly gave them to new campers who were a little slower with the net, thus bolstering their confidence among peers and encouraging their collecting. I think I will call this "Christine's Technique!" To me, that is the "farm girl" in our EMT, helping youngsters take part in getting the work done without excess verbage when a helping hand is all that is needed.

Irrespective of locale, we never camped farther than 18 minutes from the nearest emergency room. I remember the night when a food allergy mandated an ambulance flight from Holly Springs to Oxford. Christine deputized Karen Benson as an EMT's aide and together they transported the plant doctor to the van. They were off quicker than Santa Claus, Karen rendering inflight services, not last rites, as her patient moaned. Before I could collect my wits, I received a call that they were in the emergency room and the patient was attracting attention. Christine's response was so quick and her medicine so strong that patient and co-director Dr. Lelia Kelly was able to return to camp later that night. Dr. John Geisemann and I sampled the trail mix that sent them on this fateful trip and, finding it delicious, ate all of it (to protect other campers, of course)!

WHAT'S NEW AT THE ZOO?

• In an attempt to create more ecological interesting habitats we placed a snail in the scorpion cage and they seem to be good companions.
• We added a Mississippi carnivorous pitcher plant (*Sarracenia*) to the scorpion habitat last fall and it has just finished blooming!
• We have Madagascar hissing cockroach nymphs in one of our colonies. The nymphs in the zoo have gone unnoticed, although we see young roaches and wonder where the tiny nymphs were! We have just witnessed two, possibly three, males fighting for dominance.
• Bug & Plant Camper Andrew Sanford redesigned the desert hairy scorpion habitat during his day of shadowing Dr. Guyton. He also hung painted lady pupae with Lois. We are looking forward to having Andrew start his college education in our department next fall. He will be an asset to our education and outreach programs, and Dr. Krishnan and I look forward to helping him start an undergraduate research project.

Announcing a New District Plan for 4-H Entomology by Dr. John Guyton

We have not been getting the traction we want in 4-H Entomology and we have a plan. Youth are naturally attracted to insects and most who have participated in camp have typically become the entomologist in their families and communities. Project Achievement Days are just not working for 4-H Entomology, so we have been looking for a solution or alternative. We know we probably have at least one bug club in each district, but we are not hearing very much from them. In a conversation with 4-H Agent Gina Wills we discussed **Entomology Days in the Districts**, which may be exactly what we need. Thanks, Gina! Each day would be planned with the bug club(s) and their Extension 4-H agents in the district.

The day could begin with a quick introduction to insects (and other arthropods) and collecting techniques before heading outside for each 4-Her to collect a few. Then we could demonstrate and assist 4-H entomologists with pinning. We will probably bring a few live arthropods from the Extension Arthropod Zoo. Sometime during the day, I would enjoy hearing clubs' reports on their activities, showing/judging their collections (if this is important), and having a discussion about the bug club activities we have been publishing in *The Gloworm*. Dr. Jeff Harris and I are very interested in encouraging 4-Hers to begin keeping bees, so we could bring bees and spend some time exploring this option. Dr. Lelia Kelly likes the idea (you can't have bugs without plants), so

she is interested in joining us as well. We use a lot of entomological and plant "moments" in our teaching and could fill in any gaps in the schedule with these. We can even bring a few bug treats to sample and/or do a honey tasting! The *Grand 4-H Entomology Finale* will be a light show with black (UV) lights to collect some nocturnal insects!

Club Congress is not working well for 4-H Entomology either, so if Entomology Days in the Districts work out, we might want to change what we do during Club Congress. My first thought is to schedule a time when bug clubs can share the activities they have been doing with each other, enjoy a tour of the MSU Extension Arthropod Zoo, a night of collecting insects, snacking on bugs, and/or seeing a rendition of Dr. Lelia and Dr. John's famous (or infamous) program, 'Fun with Bugs and Plants.' (I haven't discussed this with Lelia, but she's a good sport!) We do have a huge 4-H surprise planned for Bug & Plant Camp this summer.

Extension Agents Needed to Assist with Entomology Camps and 4-H Entomology Clubs by Dr. John Guyton

We would like to invite/encourage Mississippi Extension agents with 4-H responsibility and an interest in entomology to assist with camps. Agents can gain excellent fundamental knowledge of entomology with which to guide 4-Hers' interest and answer questions in the county. Agents are actively involved alongside campers in all events, including collecting and pinning insects and working honey bees. Agents have reported enjoying having their insect collection in their office for use with clients. We always need drivers and assistance with equipment during camps and will comp agents' participation. We can also provide inservice credit.

We offer two entomology camps that were originally designed for 4-Hers. Our newest, Beekeeping Camp, covers everything a new beekeeper needs to know for what can become a lucrative life-long hobby. It is an intergenerational camp and open to all with an interest in beekeeping.

Bug & Plant Camp, our signature camp, attracts campers, teachers, and entomologists from all over the country. During this camp we cover the basics from pinning to identifying insects. Many other entomological topics are covered including medical, forensic and veterinary entomology; insect physiology; an introduction to beekeeping; using macroinvertebrates to determine water quality; insect-plant interactions; IPM; edible wild plants; and insect husbandry.

At the conclusion of these camps, Extension agents should have enough of a background to launch either an entomology club or youth-parent beekeeping. Studying arthropods, including insects, provides youth with many opportunities, including being the resident entomologist in their homes or schools. There is a wealth of material to support entomology club activities. We have routinely included activities in *The Gloworm* and the national 4-H materials are also very useful. If a bug club is interested in entomology-related science fair projects, we can assist with that as well. Arthropods are among the few animals allowed in science fair research and studying them provides a much better understanding of the earth's biological systems and interactions. As a former grand judge with the International Science and Engineering Fair, I have a vast amount of experience with science fair projects and recently assisted a teacher working with her student on a mealworm project.

A critical need that bug clubs can use to build awareness of 4-H and make an important community contribution is mosquito monitoring and abatement. Mosquito-borne diseases have been with us since the beginning and there are things we can do to minimize their impact (see *Bug Club Activity 3*).

The MSU Extension Arthropod Zoo in the Clay Lyle Entomology Building has become one of the most requested tours on campus and we enjoy nothing more than showing it to visitors. If you are planning to be on campus with your 4-Hers, give us a few days' notice and we will clear our schedules to give you a tour.

BugFest in the fall at the MSU Crosby Arboretum is all about providing campers with the opportunity to teach what they have learned. We start early Friday morning teaching students from local schools about arthropods, and that evening we introduce visitors to nocturnal insects that are attracted to black (UV) lights. On Saturday the event is open to the public, featuring educational opportunities such as tours of the pitcher plant bogs, spider tours, a cricket-spitting contest, insect edibles, introduction to beekeeping, and art along the buggy midway.

Agents, you can have a comprehensive entomology program in your county. If you have questions or are interested in participating, email me or give me a call.

BUG CLUB ACTIVITY 1

Rewriting the Lyrics to "The Ants Go Marching One by One"

While reviewing Claudia Mills's *The Trouble with Ants* and killing a few that were wandering across my desk, it occurred to me that ants might be a good insect for a spring bug club activity. [Before I forget, *The Trouble with Ants* is a good read for youth interested in science or entomology.] Nora, the young entomologist and main character in the book, is not amused with her science teacher's refrain "the ants go marching two by two, hurrah, hurrah'" when she enters the classroom to show her ant farm to her classmates. Her thought that ants in "that kindergarten song" did the most "un-antlike things imaginable" gave me the idea for this activity.

'The Ants Go Marching One by One' is a campfire song derived from the war song 'When Johnny Comes Marching Home Again.' Since it is about ants, let's make it entomologically correct. Ants don't have thumbs or shoes, but they do climb trees and they have a variety of ways to close the doors on their anthills. Of course, you will have to do a little research and a lot of creative rewording to get the proper lines to rhyme. We will enjoy publishing an entomology club's or young entomologist's revision in *The Gloworm*!

The Ants Go Marching One By One

The ants go marching one by one, hurrah, hurrah
The ants go marching one by one, hurrah, hurrah
The little one stops to suck his thumb
The ants go marching two by two,
And they all go marching down to the ground
To get out of the rain, BOOM! BOOM! BOOM!
The ants go marching two by two, hurrah, hurrah
The ants go marching two by two, hurrah, hurrah
The ants go marching two by two,
The little one stops to tie his shoe
Refrain
The ants go marching three by three, hurrah, hurrah
The ants go marching three by three, hurrah, hurrah
The ants go marching three by three,
The little one stops to climb a tree
Refrain
The ants go marching four by four, hurrah, hurrah
The ants go marching four by four, hurrah, hurrah
The ants go marching four by four,
The little one stops to shut the door
Refrain
The ants go marching five by five, hurrah, hurrah
The ants go marching five by five, hurrah, hurrah
The ants go marching five by five,
The little one stops to take a dive
Refrain
The ants go marching six by six, hurrah, hurrah
The ants go marching six by six, hurrah, hurrah
The ants go marching six by six,
The little one stops to pick up sticks
Refrain

The ants go marching seven by seven, hurrah, hurrah
The ants go marching seven by seven, hurrah, hurrah
The ants go marching seven by seven,
The little one stops to pray to heaven
Refrain
The ants go marching eight by eight, hurrah, hurrah
The ants go marching eight by eight, hurrah, hurrah
The ants go marching eight by eight,
The little one stops to shut the gate
Refrain

The ants go marching nine by nine, hurrah, hurrah
The ants go marching nine by nine, hurrah, hurrah
The ants go marching nine by nine,
The little one stops to check the time
Refrain
The ants go marching ten by ten, hurrah, hurrah
The ants go marching ten by ten, hurrah, hurrah
The ants go marching ten by ten,
The little one stops to say "THE END"
Refrain

BUG CLUB ACTIVITY 2

Guide to Embedding Bugs in Resin by Wesley Campana, with help from Don Campana

Editor's Note: Wes Campana, Bug & Plant Camper from Panama, has been camping with us for several years and is known for his slideshows of insects from Panama, as well as his teams' prize-winning insect-plant interaction photos. He was also featured in the June 2014 *Gloworm* for finding a rare beetle on the Sam D. Hamilton Noxubee National Wildlife Refuge. Wes is back, and this time he has contributed an article for *The Gloworm* that would make a great bug club activity. Thanks Wes and Don!

There are many ways of preserving insects. The most common way for some of us is pinning or putting them in alcohol. However, there is another less common way called embedding in resin. With this method of preservation you can not only preserve the bugs, but can take them everywhere you go to share your new creation or souvenir. If you buy a resin kit, there are a couple things you need to keep in mind while preparing and finishing your project.

Things you need for the making of resin

1. **Resin kit** (well, duh, can't make resin-coated bugs without it). You can find resin in craft stores or on eBay or Amazon. They will have it for sure! There are two types of resin: Epoxy (expensive and strong, not that you would care if is strong or not) and polyester (1/3 cheaper than epoxy resin).
2. **Container**. There are infinite, well close to infinite, options for containers to use for the resin. One of the most common is an ice cube tray. It can be easily found and is inexpensive. Do not use a styrofoam container!

3. **Cups and mixing supplies**. Clear cups are important because you need to add the exact same amount of resin in one cup to the hardener in the other. You might be wondering what difference it makes, but this part is critical. If there is not the same amount of resin as hardener, the mix will come out bad. As for the mixing supplies, you can use popsicle sticks.
4. **Laquer thinner**. This is not necessary in the making of the resin, but it is in the cleanup. If you get resin or hardener on your fingers, lacquer thinner dissolves it.
5. **Hypodermic syringes or disposable plastic cups**. You can use the syringes, or two cups, to get equal amounts of both resin and hardener. (Remember, don't use the same syringe, or cup, for both because it will get messy.)

6. **Syringe needle**. Useful for popping bubbles in the resin. Try to not get air in the mix. You can also use a propane torch to gently heat the resin, driving out the bubbles.
7. **The bug**. Nothing needs to be said, except do not use your favorite bug in your first attempt!

Mixing the resin

1. As I said in 3 above, you need to get equal amounts of both hardener and resin. To make this easy you can use syringes. Put the resin and hardener in two different clear cups, make sure they are equal, then pour both into one big clear cup. Mix thoroughly with the popsicle stick for 5 min. Do not beat air into the mixture.
2. After mixing the resin, place a bug in the container of your choice. Pour just enough resin to cover. The bug will float to the top it too much resin is used. My technique is to get a group of bugs for resin then pour a little of the mix onto each bug. Let it cool (and I don't mean put in the fridge because that might damage it, just leave it alone in a safe place.) After 10-15 min. come back with the syringe needle, or just a needle, and start popping as many resin bubbles as you can.
3. If you have time to spare, you can make a vacuum chamber to eliminate most of the resin bubbles. You can find plans to make a vacuum chamber at http://www.instructables.com/howto/vacuum+chamber/
4. After a day of waiting, the insect in resin will be ready.
5. If you have a buffing wheel, you can use it to polish the resin to make it look more interesting. Or you can use 1000- or 2000-grit sandpaper.

Well, that's the basics and techniques for preserving insects in resin.

BUG CLUB ACTIVITY 3

Ideal Disease Vector, the Yellow Fever Mosquito, Has Added Zika Virus to Its Arsenal! by Dr. John Guyton

Yellow fever mosquito (*Aedes aegypti*), the primary vector for yellow fever as well as dengue and chikungunya, is also the vector for Zika virus, sustaining its reputation as the most deadly animal in the world. The World Health Organization estimates 84,000–170,000 cases and up to 60,000 deaths due to yellow fever and 390 million cases of dengue fever globally each year. Zika, an emerging mosquito-borne virus, first identified in Uganda in 1947, has recently reached the Western Hemisphere, following chikungunya's arrival in 2013. Earth's warming will provide additional habitats for mosquitoes and portends the need for more vigilant monitoring and proactive prevention measures.

Mosquitoes have always been a problem in Mississippi and they remain a problem. Everyone needs to take precautions, including using protection and removing or controlling breeding habitats. Therein lies a very important bug club activity for EVERY spring and a service project for the community.

The Zika virus has arrived in the Caribbean, representing our newest threat. The Mississippi State Department of Health informs us that mild symptoms lasting from several days to a week may include fever, rash, joint pain, and conjunctivitis (red eyes). Hospitalization is uncommon. The really scary part is that the Centers for Disease Control suggest that Zika virus may be related to birth defects, so pregnant women need to systematically dress appropriately and make sure the area around their homes is inhospitable for mosquitoes.

The July 2014 *Gloworm* contains a story about and by Bug Camper Dr. Savannah Duckworth, M.D., who led a medical mission trip to Haiti and became infected with chikungunya virus. That edition was built around mosquitos. The bug club activities included 'Learning to Recognize Mosquitoes' and 'Using Integrated Pest Management to Make Your Neighborhood Unfriendly for Mosquitoes.' There are suggestions for surveying your neighborhood to find places mosquitoes use for breeding and how to eliminate their threats. **We are beginning to understand that mosquitoes have discovered humans are quite good at providing habitat for them, making mosquitoes a cosmopolitan problem!**

Download the newsletter at http://msucares.com/newsletters/pests/gloworm/2014/201407.pdf and engage your bug club members in monitoring their neighborhoods for mosquito breeding sites. If you have a community newspaper, your bug club could write an article about reducing habitats for mosquitoes

and offering to check neighborhoods that request help. They will find plenty of material here and in the July 2014 issue to get started on their article. They can even use pictures from *The Gloworm*, if they wish. Consider writing and producing public service announcements and spots for local radio stations.
Author's note: For counties that have an Entomology 4-H Club working on mosquito awareness, I will send you a pdf of *The Mosquito Manual* by Ed Boles, recently edited and updated by Peggy Guyton, John Guyton, and Wendy Varnado.

The Insect Study Merit Badge by Eagle Scout John Guyton

As an entomologist, I have come to understand that a better knowledge of insects, the most numerous and most diverse animals on the planet, is of the utmost importance for everyone. Insect Life, now Insect Study, was my favorite merit badge on my path to Eagle. Over the years, I have enjoyed assisting many scouts with merit badges including Insect Study. Today we have many more resources in our department with which to assist scouts interested in insects. If you have or know scouts who are interested in insects, tell them about us!

In earning the Insect Study merit badge, scouts will learn about the fascinating world of insects. They will meet small but incredibly strong arthropods and insects with the ability to catch others while flying. They will learn about the seemingly magical process of metamorphosis, where insects undergo radical changes in feeding and body structure as they grow, and how this enables large colonies to live in the same habitat.

Scouts must rear an insect for this merit badge, a requirement that prevents many scouts from working on Insect Study. Here is where our resources may be most useful. We raise painted lady butterflies for our arthropod zoo. Before a scout begins rearing an insect, we can provide him the opportunity to assist us in rearing butterflies from egg to egg, better preparing him to meet the requirement, "Raise an insect through the complete metamorphosis from its larval stage to its adult stage (e.g., raise a butterfly or moth from a caterpillar)." We will take this one step further by providing scouts with eggs and artificial diet to enable them to rear butterflies from eggs to adults (or from eggs to eggs if they so choose).

Beekeeping Camp Covers Everything From A to Z! by Drs. John Guyton and Jeff Harris

Keeping bees is a lot of fun and can be profitable. Starting with the basics, learn everything you need to know in our 5-day intergenerational camp. We bring enough hives to our building so that every 2-person team has a hive to work with after each lesson. We are particularly interested in getting 4-Hers involved in beekeeping. You can learn alone or with a parent at camp.

A – Allergies: Anaphylaxis
B – Bee communications
C – Cooking with honey
D – Diseases: pests, and parasites
E - Extracting honey; Equipment
F – Finding bees to purchase
G – Gustation of honey in bees and humans
H – Honey processing
I – Italian bees; IPM; Industrial agriculture
J – Jargon
K – Killer bees (Africanized bees)
L – Langstroth, L.L.
M – Marketing
N – Nutrition: honey & pollen for humans & bees
O – Overpopulation
P – Personal protective equipment; Purchasing bees; Propolis
Q – Queen finding, marking and clipping
R – Rearing queens: quality, grafting, and requeening; Robbing; Regulations
S – Smoker training; Swarm management
T – Tasting
U – Urban Beekeeping
V – Visiting a bee yard
W – Wax processing; Wax worms & moths
X – Xenophon (Greek historian who referred to poisonous honey)
Y – Yearly agenda in the bee yard
Z – Zoning laws

The Waiting Season by Lois Connington

It's that time of year again. Some of our favorite critters in the Arthropod Zoo, many of them with us since Bug and Plant Camp in June, are dying. Over winter break we lost our last bush katydids, all but two of our stagmomantids, and our Brunner's mantid. Our orb weavers (lichen, golden silk, and yellow garden) have died off in quick succession. The large *Schistocerca* grasshopper expired last week, following a suspiciously long "drink" at the water dish. The Chinese mantid's eyes are cloudy and brown, no longer their mesmerizing green. Is she next in line?

But life goes on. We have entered the waiting season, a time when we hover over the oothecae laid by the Carolina and Chinese mantids. We watch the katydid eggs, inserted neatly in overlapping lines along privet twigs, and speculate on whether any of the mutant katydid's offspring will have her strikingly green eyes and yellow body. We look forward to a beautiful garden with nectar-filled blossoms for the painted ladies, honey bees, and other native pollinators.

During this in-between season, the rose hair tarantula and the curly hair tarantula have molted successfully, away from prying eyes. Almost daily we see pale Madagascar hissing cockroaches and find unusually intact cast skins, where normally we see no trace of the exuviae. Are they a cohort from a single ootheca or are environmental conditions just right to trigger molts across the colony? Are the adults not eating their own molted exoskeletons because we are providing sufficient nutrition for them to forgo the nitrogen bound up in those cast skins? Is the whole colony so well fed that nobody else needs to eat the abandoned exuviae? [Does anyone else see "science fair project" written between these lines?]

In the observation bee hive in the lobby, the queen laid a fair amount of brood this winter. Unlike most other years, the gladiolas sprouted, the blueberries budded out, and the phlox bloomed—in early January. Are we really waiting for spring to come or is it already here?

Reference

Mira, Alex. 2000. Exuviae eating: A nitrogen meal? *J. Insect Physiology 46*: 605–610.

Author's Note: Since this article was written, the Chinese mantid, Mantie, died, but nymphs hatched out of one of our six oothecae, the bagworm larvae have hatched out and spread everywhere, and the black widow's jar is full of spiderlings from her first egg mass.

Budget cuts have reduced *The Gloworm* to 4 issues/year but we hope to be blogging soon.
FYI, Dr. Guyton has moved to Room 225 in Clay Lyle (same hall, closer to the front door).

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