The Maine Entomologist

A forum for students, professionals and amateurs in the Pine Tree State

The Official Newsletter of the Maine Entomological Society

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PRESIDENT'S CORNER

BY HILLARY MORIN PETERSON

(Due to unforeseen circumstances, there is no President's Corner this issue.)

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Hemlock woolly adelgids on the underside of a hemlock twig from coastal Maine. (Maine state photo)

Was There a Silver Lining to Last Winter's Extreme Cold Snap?

by Colleen Teerling

Much of Maine had unusually cold periods this past winter. In some areas, the temperatures were close to the freezing mark, and then suddenly dropped into the double digits below zero (Fahrenheit) within 12 hours. What effect did this weather have on hemlock woolly adelgid (HWA)? Was there a silver lining to that cold weather?

The relationship between cold weather and winter mortality of HWA is not as straightforward as, "at X temperature, Y% of adelgids die". There are several things that affect winter mortality rates. One is the timing of the cold. Cold spells in the late winter, when adelgids are starting to become more metabolically active, tend to cause more harm to the insects than early winter cold snaps. The duration is also important: a longer cold spell will cause more death that a brief cold spell. Also, when the temperature drops suddenly, there tends to be a higher death rate than if it slowly gets colder.

So, what does that mean for HWA this year?

Every year, in the early spring, the Maine Forest Service surveys permanent plots to evaluate the winter mortality of HWA. Over the past several years, our winters have been fairly mild, and winter mortality of HWA has been fairly low, often averaging around 60-65%. That might sound like a high mortality rate, but when you remember that there are two generations of HWA on our hemlock trees every year, that all of them are female and are capable of laying eggs without mating, and they can lay up to 300 eggs per female, a mortality rate of 65% doesn't do much to slow down the rate of spread.

This year, we saw extremely high winter mortality rates at some of our sites, ranging from 98-100%. However, there were some anomalies. In some sites, mortality was much lower, as low as 57% and 60% in two sites. Overall, the average mortality of HWA was just under 84%, lower than we had expected. We are not entirely sure why we saw lower HWA mortality in those sites.

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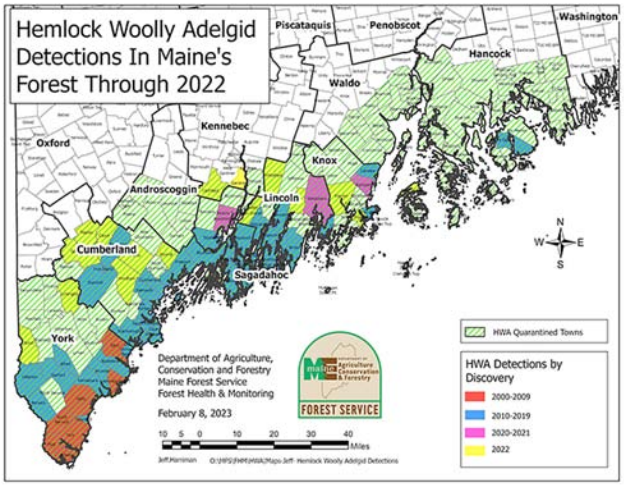

Map of the known distribution of HWA in coastal Maine. (Maine state map)

If you are curious about how many HWA survived the winter in your area, you could try something I call the 'thumb test'. If you see white ovisacs on a twig and you aren't sure if the insects under that waxy 'wool' are alive or not, run your finger over the ovisacs. If most of them are alive, you will see many greenish-brown smears on your finger from the hemolymph. If most are dead, you will see only one or two smears on your finger, and if everything is dry and crumbly, you know all of them are dead. This will give you a rough estimate of how many survived the winter.

Watch your hemlock trees this spring and summer. Infested trees in many areas may have a brief respite from HWA due to high HWA winter mortality, but the insect populations will likely rebound quickly.

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A Predatory Caterpillar? No Way! *Yes, WAY!*

by Gail Everett

The butterfly world can get pretty weird, once you start looking into it. From the mating plugs created by Parnassians to the way caterpillars of Blues seduce ants into caring for them, to tasting with their feet, to the species that feed on rotting fruit and other disgusting things, their real lives can be far from the simple beauty we associate with them. Take, for instance, the Harvester. The Harvester eats meat.

The Harvester (*Feniseca tarquinius*) is a member of the Lycaenid family (blues, hairstreaks, and coppers). It is the only representative of its subfamily in the New World, and is found all over the eastern half of the U.S., including Maine. Its Latin name means "cruel harvester." *Feniseca* is the Latin word for a mower or harvester, and *tarquinius* references Lucius Tarquinius Superbus, the legendary last king of Rome, who was notorious for his cruelty.

Although apparently its favorite food wasn't known when it was named (by Fabricius), the butterfly's upperside does have a vaguely death's-head pattern. The underside is beautifully marked with chestnut brown and whitish gray. The pupa is said to resemble a monkey's face, but in fact it is patterned supremely well to camouflage itself among the alder buds. Like the caterpillar, it is so well camouflaged that it can be hard to see even up close.

The pupa of *Feniseca tarquinius*.
- photo by Jay Cossey, used with permission.

An adult Harvester butterfly, *Feniseca tarquinius* (Fabricius)
- photo by William M. Ciesla, Forest Health Management International, Bugwood.org

The Harvester caterpillar feeds on woolly aphids, primarily woolly alder aphids in Maine. It actually ties aphids to itself with silk, presumably for camouflage, but also just to immobilize the aphid prior to dinner. Not only do the caterpillars feed exclusively on aphids, but even the adults forgo nectar for the honeydew that the aphids produce. Their proboscis is unusually short, so they rarely feed on flowers but may use dung, carrion, tree sap, etc.

Finding a Harvester – and you will probably only find one or two at a time - can be quite a quest. While not exactly rare, they are very restricted to their alders. The adults stick close to the alders and often just fly around within the alder clump, making it very difficult to catch

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Predatory caterpillar (cont.)

them. The best way to find them is to look for the fluffy aphids, a large enough infestation that you can see it from a distance. Although the aphids are a rich food, the caterpillars still need a good many of them. Unfortunately, Harvester colonies move around from year to year, since the aphids suck on young twigs and need new ones each year. I have never found a Harvester/aphid colony that stayed in the same place two years in a row.

I highly recommend an August 13, 2013, online article (https://uwm.edu/field-station/harvester-butterfly/) by The Bug Lady, at the College of Letters and Science Field Station, University of Wisconsin/Milwaukee, for more interesting information on this little carnivore. Another one from August 5, 2014 (https://uwm.edu/field-station/woolly-alder-aphid/), on the woolly alder aphid is great for background information, such as that the aphids start off in the spring on silver maple and only fly to colonize alders later in the spring. This raises the possibility that when alder thickets don't yield aphids, it may be because they lack nearby silver maples.

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Remember the "Beach Guk" of 2021?

Hemlock woolly adelgid sexuparae on Wells Beach in southern Maine in July, 2021.
- Photo by John Lillibridge, retired NOAA Oceanographer; downloaded from Havill, et al., 2022*.

People may remember how in the summer of 2021, there were reports on southern Maine beaches of significant accumulations of dark brown, apparently organic materials of unknown origin. A recent note has been published in the *Journal of the Acadian Entomological Society** (JAES) that reports on the results of careful analysis of this material.

It turns out, the beach-encrusting material consisted of the remains of countless trillions of Hemlock woolly adelgids (HWA), *Adelges tsugae*, an Asian import which has infested native hemlock trees on the Maine coast from York through Hancock Counties (see map, p. 2).

More information on HWA in Maine can be found at **https://www.maine.gov/dacf/mfs/forest_health/insects/hemlock_woolly_adelgid_overview.htm** .

Bob Nelson also has a pdf copy of the JAES note for those who'd like one; this publication was brought to our attention by Charlene Donahue.

* Havill, N. P., *et al.*, 2022. Mass deposition of hemlock woolly adelgid sexuparae on New England beaches. *Journal of the Acadian Entomological Society*, v. 18, p. 14-17.

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Thank You! You Paid Taxes and Maine Researchers May Rescue Raspberries

by Cathie Murray

These two Maine kids want to thank you for paying your taxes. They thank you for many reasons, but one has to do with raspberries (and blueberries and other soft-bodied fruits). What's the connection?

Last October my grandkids spent a glorious afternoon picking raspberries in blazing autumn colors. Delicious! Can you imagine how these kids would feel if they got their harvest home and found it reduced to a pulpy mess? It

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happens! In fact, in a recent national survey, raspberry growers lost an average of 41% of their crop, right around harvest, to the critter responsible for that pulpy mess: *Drosophila suzukii*, the Spotted Wing Drosophila ("SWD").

Here's the tax connection: researchers at the University of Maine, and other public universities from California to Cornell, are using your tax dollars to collaborate and find a non-toxic biological control to minimize SWD damage and "save the raspberries!"

***Drosophila suzukii* - photo by Hannah Burrack, North Carolina State University, Bugwood.org**

The SWD is a relative newcomer to North America (2008 in the continental US), but its attributes have allowed it to spread widely and fast, and to wreak havoc, especially with berry crops. Like any "good" pest, it has some super powers. It can tolerate cold, overwinter as an adult, travel up to 5 miles on its own and migrate on produce, allowing it to expand its geographic and seasonal range beyond our common fruit fly, *D. melanogaster*. Although it thrives on berries, in their absence the SWD has successfully reproduced using a variety of hosts such as fungi and even goose poop! And the serrated ovipositor on the female SWD makes it the only known fruit fly that can lay eggs in unripe fruit. Our common fruit fly has to wait until fruit, e.g. a banana, is overripe to insert its ovipositor. Not the SWD!

The SWD's ability to use alternate hosts, tolerate cold and exploit unripe fruit leads to multiple generations per year with an expanded range in time and space. Since the larvae develop deep inside the fruit, pesticides are not very effective. And the damage to the farmer and consumer is harsh, as the larvae mature and destroy the fruit just as it's ready for market and consumption. Annual national crop losses were estimated at about $500,000,000 - including blueberries, blackberries, strawberries, raspberries and grapes, according to a recent review in the *Journal of Economic Entomology*.

Now…back to our tax-supported researchers. Recently the University of Maine's Dr. Phil Fanning, Assistant Professor of Agricultural Entomology, and grad student Ben Johnson, shared their team's progress on biological control of the SWD at the Maine Entomological Society webinar series and the Maine Invasive Species Network conference, respectively. Research teams around the country have been collaborating on this for over 12 years. Unfortunately they quickly learned that our native parasitic wasps do not successfully reproduce in the SWD because it has another "super power." It can encapsulate the wasp eggs and live on.

Since native parasites can't help, researchers painstakingly collected and reared parasitoids that co-evolved with the SWD in its home base of Asia. This is no easy task. Keep in mind that the SWD is smaller than our common fruit fly and the parasitic wasps are even smaller! Research showed that *Ganaspis brasiliensis* could successfully parasitize SWD with little risk to other native species. *Leptopilina japonica* was also successful, but impacted a few other hosts, so the focus was on *Ganaspis*.

After years of due diligence, the USDA approved *Ganaspis* for release trials last year. Dr. Fanning's team at the University of Maine reared the wasps and released them at four sites in Maine in the summer of 2022. Early indications are that the *Ganaspis* wasp can successfully parasitize SWD and reproduce in Maine. And a surprise finding is that the team found *Leptopilina* individuals in the test fields, in an apparent case of voluntary migration.

Now my grandkids want to know, will we have a non-toxic solution that saves their raspberries? Keep paying your taxes, support science research and we'll find out!

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The Rise and Fall of *Argiope aurantia*

by Frank Woodard

In his 1905 book, *Natures Riddles,* or *The Battle of the Beasts*, author H. W. Shepheard-Walwyn believed Nature is fond of riddles. While the riddle he attempted to address was insect survival strategies, he cited as an example the riddle of why insect and other arthropod populations wax and wane. In the case of the rise and fall of the Zig Zag spider, *Argiope aurantia*, here on the farm, I think it's all my fault!

It was during a transition period on the farm when the rise of *Argiope aurantia* began. That year I'd started mowing the fields once a year in the late autumn, after the flowers had gone to seed and the bees had gone to ground. I used the harvest of wild flowers and grasses for compost. Yet before I mowed, I checked for *Argiope* spider sacs. I enjoyed having occasional specimens of these big yellow and black spiders and their giant webs, and I wanted to help them survive my mowing. The first year I collected about seven sacs and kept them in a wire cloth basket in the woodshed.

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Argiope aurantia (cont.)

The next spring I hung the basket out on the south side of the deck in early spring. That summer there were more *Argiope* spiders around. They like to build about four feet up on plants and structures with a southern exposure. That second autumn I collected about twenty four egg sacs before I mowed.

A small male zigzag spider, *Argiope aurantia*, cautiously approaches a female in her web prior to mating. The species is also known as the black-and-yellow garden spider, and by as many as a dozen other common names.
- Photo by Frank Woodard

The third year, late summer brought many large webs clinging to high stems in the fields, the garden, or leaning against the south side of structures. I had one that liked the south door of the woodshed so much that after the second time I walked through the web, it built a web that perfectly matched my outline. That third autumn I collected over sixty egg sacs. That winter I dissected the previous year's empty egg sacs. About a third never made it much past the egg stage, but two thirds of the sacs were empty and one held a colorful perfectly smooth scarab pin... how did that Egyptian jewelry get in there?

In early spring of the fourth year I accidentally dissected a recent egg sac while cleaning. It was filled with hundreds of tiny spiders starting to twitch as soon as the microscope light hit them. So many of the sixty egg sacks survived that in summer every surface of the fields, the gardens and the sunny bits of structures were covered with *Argiope* webs! There were about four to five webs per square meter! Yet that autumn, I could only find six egg sacs. Oh no, I'd killed off all the spiders by helping along too many for the food available!

I've stopped interfering with nature. I think perhaps that while I may have contributed to creating an imbalance, nature left to its own devices has found a balance in spite of my efforts to “help”. These days there are always a few *Argiope*s around.

An egg sac of the zigzag spider.
- Photo by Judy Gallagher, from https://www.flickr.com/photos/52450054@N04/10531828645/ Used via Creative Commons - https://creativecommons.org/licenses/by/2.0/deed.en

Now, I don't mow anything but paths. I do preserve the few egg sacs that show up near the driveway where I mow for snow plowing, but I let Nature take care of the rest. Last season I was rather upset with the *Argiope* spider that built a giant web on the south side of the deck and wiped out the cool softball-sized nest of bald-faced hornets on the underside of the deck. But that's Nature! She left behind a couple egg sacs tangled in the milkweed stems below. Whether they will succeed is just another of Nature's riddles.

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Keep Nature Opinion Free!

By Esther L. Merry

Two years ago I was excited about joining the M.E.S. Facebook group! I found local like-minded people and was ready for my new hobby of collecting insects and learning what I could about the micro world we unknowingly interact with on a daily basis. However, my bubble soon burst when I clashed first with aggressive vegans, then insect rights activists, and finally the ignorantly opinionated. Perhaps I am being too harsh here, but seeing as there is a loose word limit, I must cut to the chase and eliminate the poetic fashion in which I had originally described those keyboard warriors.

After mortifying a few patrons of the group with pictures of my new skill: moth pinning, I shared pictures of a local business covered in *Euproctis chrysorrhoea* (browntail moths) during the great onslaught of 2021. My plan for helping the owner was simple; take a Shop Vac and suck the little buggers off the front of the building.

What opinion prompted my rant, you ask? "That won't do any good, only males stay at the light." Hold on! What?! I do not need to hold a degree in biology to know that it takes two to tango, so to speak. With the exception of asexual species, you must have a male and a female to reproduce, so wouldn't culling the males help slow their reproduction rate? Scratch the side of your head with me.

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Keep Nature Opinion-free (cont.)

It occurred to me that what I might have witnessed were poorly informed people imposing their social construct on nature. Though I did, indeed, log out after that (and refused to return), I didn't leave it at that. I started asking questions and seeking answers.

1. What is the maximum number of times a single male *E. chrysorrhoea* can mate?
2. Does each mating lead to reproduction, or does only the first copulation lead to offspring?
3. What is the ratio of male:female offspring?

I started answering these questions in 2022 by first collecting specimens from the building during the day. And wouldn't you know it, but a third of the specimens I observed resting were females! I then housed the specimens and tracked them with colorful dots each time they mated. All of the males mated more than once, and one mated at least 3-4 times. That answered Q1 but what about Q2? I saved all the egg sacks with the intent of raising 500 browntail caterpillars to continue the experiment this summer, but sadly they all died, so I will have to start the project over.

My final thought is this: the concept that one sex of any non-asexual species holds value over the other, is dumb. People have a tendency to impose themselves where they don't belong, especially their opinions. And social media is ripe with imposed opinions. Nature is not subject to opinions; nature is conducted by facts. We have to be very careful that we do not impose our social constructs on nature because it does not apply.

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How Insects Breathe, Illustrated!

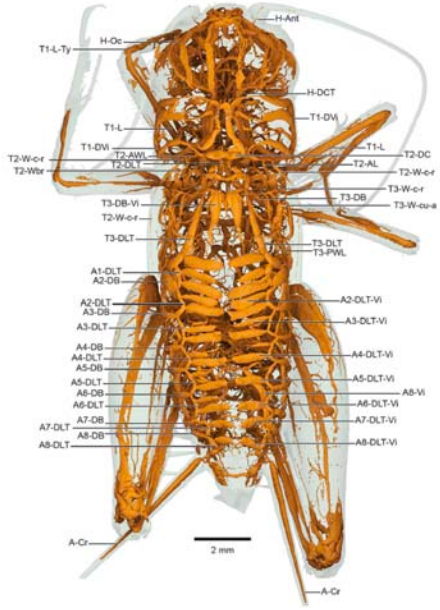
By Anna Court

A research article from the American Museum of Natural History, "New Atlas of Insect respiratory Systems Produced Using CT Scanning" notes that previous studies of insect tracheae relied on dissection and focused on smaller numbers of insects. However, a new study* -- conducted over six years -- used high-resolution micro-CT scanning to visualize the respiratory systems of 13 insect orders including grasshoppers, mantises, and roaches.

Using high resolution micro-CT scanning, researchers identified pathways of air in each specimen, indicating the shape and structure of that species' respiratory system. A dynamic map of each insect's respiratory system was created in a complex, manual process in which the tracheae were filled in using 3D tracing software. The team then examined differences among respiratory systems and morphological traits, such as flight and thermoregulation. A summary of the article can be found at the AMNH web site, via **tinyurl.com/bdzf5wnd** .

Bob Nelson has a copy of the full technical article (184 pp.) for anyone who would like one.

* Herhold, H. W., S. R. Davis, S. P. DeGrey, and D. A. Grimaldi, 2023. Comparative Anatomy Of The Insect Tracheal System; Part 1: Introduction, Apterygotes, Paleoptera, Polyneoptera. *Bulletin of the American Museum of Natural History,* v. 459; 184 pp.



The complete respiratory system of a cricket, *Gryllus* sp., as revealed by computer-assisted tomography scan (CT scan). Image from Herhold *et al.*, 2023*.

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A tomato hornworm, the caterpillar of the five-spotted hawk moth, *Manduca quinquemaculata*, that has been parasitized by the braconid wasp *Cotesia congregata*.
- Photo by Sherry Monteith.

Meet the wasp that mummifies and kills the tomato hornworm

by Julia Bayly, Bangor Daily News

Common visitors to gardens in Maine are tomato hornworms. It's the caterpillar stage of the five-spotted hawk moth, *Manduca quinquemaculata*, and among its favorite treats are eggplants, pepper plants and tomatoes. There are many ways to remove them from a garden, and friends of insects will gently hand-pick them from plants and relocate them elsewhere.

But these hornworms do have a sworn enemy -- a braconid wasp, *Cotesia congregata*. This tiny, parasitic insect can kill hornworms almost as fast as the worms themselves destroy a tomato plant.

The adult female wasp will sting the hornworm and lay her eggs inside its body, according to Jim Dill, pest management specialist with University of Maine

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Tomato hornworm wasps (cont.)

Cooperative Extension. The wasp larvae develop inside the caterpillar and eat their way out, killing the hornworm in the process.

"While they are developing inside the caterpillar, the wasp larvae are slowly making it incapable of doing anything," Dill said. "They are basically turning it into a mummy."

Once the wasp larvae break free of their hornworm host, they spin tiny cocoons on its body.

Dill said people often mistake those white cocoons on a hornworm for the larvae themselves.

"Eventually the new wasps emerge from those cocoons and go looking for a new hornworm host," he said.

Hornworm caterpillars are bright green with white diagonal stripes on their bodies. They have a small, pointed horn-like structure at the base of their body which gives them their name. They can grow to nearly 4 inches in length.

"A lot of people know what they are, but there are also a lot of people with new backyard gardens seeing them," Dill said.

Dill urges anyone who sees hornworms with the telltale white cocoons on their bodies to leave them alone so the wasps can emerge and live to fight the pests another day.

The wasps themselves are harmless to humans, he said.

"They are so tiny if one was to land on you or try to sting you, you would probably not even know it," Dill said. "But they are definitely parasitic on the hornworm that ends up dying."

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The Accidental Zookeeper

by Kathy Claerr

This season, with snowfall coming so late and often, I'm longing for spring weather, garden beds free of snow, and warm sunshine. Recently, a friend, also pining for spring, cut forsythia and lilac branches which she brought inside. In a few days she noticed lovely, tender leaflets on the lilac. But a bit later, she absentmindedly brushed away some little pepper-colored specs from her windowsill. Even later, she noticed some lilac leaflets seeming to disappear. Finally, one morning, in place of the leaves she found three bright green, small but fat caterpillars. Knowing my affinity for insects, she called to ask for an identification.

I pulled out my *Caterpillars of Eastern North America* by David L. Wagner. This tome sports tons of full-color photographs, as well as fact-filled descriptions and first-hand testimonials. Some discussions are charmingly humorous -- not your usual dry identification guide! Looking so much like a tomato hornworm relative, that's where I started with my search. But no sphingids fit the photo my friend provided. Then, I recalled that this super-useful guide includes a food plant index, which usually subverts my otherwise page-by-page search. Sure enough, the lilac clue yielded the ID, the Copper Underwing Moth, *Amphipyra pyramidoides*, a hornworm look-alike if I ever saw one!

With the who-is-it questions solved, the next question was what to do with these three lovelies. My friend is quite tender-hearted when it comes to animals of all sorts, and was saddened when I reminded her that March in Maine is not the season for this moth. Even if we tried to rear the caterpillars to adults, a process complicated by the lack of greens outside, releasing the adults might mean they would succumb to cold, early spring temperatures if not lack of food. We decided the best course of action would be to proffer the tender caterpillars at her bird feeder as a hopefully-welcomed winter surprise snack for a chickadee.

Copper Underwing caterpillar
- photo by Greg Hume
https://commons.wikimedia.org/w/index.php?curid=1509310

Inadvertently, my friend had become a keeper of wildlings. Perhaps the lesson is to inspect cuttings we bring inside for tell-tale masses of insect eggs? The incident reminds me of my own inadvertent zookeeper escapade.

Somehow as a kid I knew what a Praying Mantis egg case looked like, probably from paging through one of the various Golden Guides we kept on hand. On one of my family's outings, I found and brought home an egg case. Somehow that egg case became forgotten in my bedroom clothes closet. Well, imagine my surprise a few weeks later when miniature Praying Mantids swarmed from my closet and up the yellow bedroom walls! This stunning scene was not fully appreciated by my mother. I think I was sent outside while she deployed the vacuum. That was a sad way to learn a lesson: warm indoor temperatures hasten nature's progress, and we easily become accidental zookeepers.

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June 24th Field Day: Oak Hill Conservation Area, Fayette (Rain Day June 25th)

Join us at 10:00 a.m. on June 24th for a great day of exploring on a new Kennebec Land Trust (KLT) property in the NW corner of Kennebec County. The 134-acre Oak Hill Conservation Area includes a ridgeline just above Echo Lake, a mature hardwood-conifer woodland adjacent to Hales Brook and significant Inland Wading Bird and Waterfowl Habitat, mapped by the Maine Department of Inland Fisheries and Wildlife. This beautiful property near KLT's Surry Hill, Baldwin Hill and Echo Lake properties features forestland, fields, valuable wetlands, and phenomenal scenic views.

From I-95, take the Augusta/Route 202 exit (#109B) and head west. In Manchester, turn right onto State Route 17. Continue here to Fayette - bearing left in Kents Hill where State Route 41 splits off to the right. From this fork,

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it's approximately 1.6 miles to the Fayette general store, which will be on your left. From the Fayette general store, continue north on Route 17 for 2.5 miles. Turn left on the Fayette Corner Road and then take an immediate left on Norton Road (unpaved). Continue for half a mile to a temporary parking area marked with a KLT sign.

Dress for the weather and bring lunch, drinks, collecting gear, cameras, insect and tick repellant, etc. - all the "normal stuff." There are no restroom facilities on-site.

Dana Michaud (djmichaud1@gmail.com or 872-7683) is coordinating this trip. Please do let him know if you're planning to attend.

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Justin Schmidt – "The King of Sting"

by Anna Court

Do you know of Justin Schmidt, expert in the chemical and behavioral defenses of ants, bees, wasps and spiders? He was the American entomologist who created the Schmidt Sting Pain Index and won the Ig Nobel Prize for this work (2015, Physiology and Entomology). He died on February 18th at age 75 and the obituaries about him (e.g., in *The Economist*, *Atlas Obscura* – the sources of this summary) enthusiastically described his unique area of study, and his evocative way of communicating this science to the wider public. Let's take a closer look.

Schmidt grew up in Pennsylvania roaming the Appalachian woods. Insects fascinated him and by his early 20s, he was on the road observing, collecting, and experiencing insects' life with passionate curiosity. He began collecting data for the Pain Index in 1973 with a research colleague, Debbie, who would eventually become his wife. Over 35 years, 150 species of insects stung him, and he made notes about each experience. Most of these encounters were deliberate, his efforts fueled by an insatiable curiosity.

Schmidt wanted to include in the Sting Pain Index the "ouch factor" – how it felt to be stung. The honey bee was his anchoring value, since most people, he thought, knew what a bee sting felt like. It was rated a 2 (on a scale of 1-4). After rating the sting, Schmidt included a few lines after each entry (78 in all) to describe the sting "ouch" factor in a way that ordinary people could understand and act on. For example, the sweat bee sting (1) was "light and ephemeral, almost fruity. A tiny spark has singed a single hair on your arm." The honey wasp (2) was "Spicy, blistering. A cotton swab dipped in habañero sauce has been pushed up your nose." The red-headed paper wasp's sting (3) was "irrationally intense... the closest you will come to seeing the blue of a flame from within the fire." And if stung by an insect that rated a 4, Schmidt advised that you stop what you are doing and seek medical help.

Schmidt also studied the medical implications and biochemistry of venom, so that he could include in the Sting Pain Index, the physiological harm of insect sings. No collecting task was too difficult. He harvested the venom of hundreds of one species of ant to compare it with the venom of other ants; 200 ants would get you one-thousandth of a teaspoon of venom.

Schmidt's list was a way to explore why inflicting pain was more necessary for some insects than others. Solitary insects tended to have a much milder sting than those organized into complex colonies. From this he deduced that colonial insects needed strong stings in order to get more food for the colony and to defend the nest. The greater the danger, he said, the higher the venom's potency. Most stings were highly effective. Predators thousands of times larger than the stinging insect remembered the stings and kept their distance. Only bears, skunks and honey badgers acted as if the pain was worth the reward.

Although he was fundamentally an entomological free spirit, Schmidt had three institutional homes in his career. He was a biologist at the Southwestern Biological Institute, a researcher in entomology at the University of Arizona, and for 25 years, senior scientist at the Carl Hayden Bee Research Center in Tucson. His most famous book is *The Sting of the Wild*, published in 2018 (which contains the Schmidt Sting Pain Index), and he edited *Insect Defenses: Adaptive Mechanisms and Strategies of Prey and Predator*, published in 1990.

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"Unintended Consequence"

by Cathie Murray

Last May (2022) I was doing yard work under the Sugar maples, Red oaks and Black and Choke cherries that border our yard. We are gradually adding native understory plants like False Solomon Seal, May apple, American Hop hornbeam and Witch Hazel, and coddling volunteers like hawthorns and hazelnuts.

The assassin bug nymph (*Zelus* sp.) enjoys a "smoothie with a straw." *Photo by Cathie Murray, ID by Dana Michaud.*

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Unintended Consequence (cont.)

A sudden sunbeam illuminated a small, light green caterpillar, dangling from a thread right where my work tools would bother it. Focused on my work and not taking time to ID it, I tenderly took the thread and draped it higher in a sapling, out of the way. As I worked my way along the border a gleam of bright green with a touch of gold caught my eye, an immature assassin bug (*Zelus* sp.). By the time I retrieved my phone from my zipped pocket this jeweled predator had moved about 2 meters through the sapling branches and had the caterpillar in its grasp! Seconds later the assassin was enjoying a "smoothie with a straw" as you can see in the picture.

At that moment, it felt like the maxim "no good deed goes unpunished" was happening right before my eyes. But of course, the assassin bug is part of the web of life too! And we must be doing our part to create a healthy habitat for it and its relations. This April, as I searched for spring ephemerals in the understory, I found another assassin bug, this time with a click beetle (pictured). This time I celebrated the circle of life.

Another assassin bug nymph (*Zelus* sp.) enjoys a click beetle meal. *Photo by Cathie Murray, ID by Dana Michaud.*

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Florida Lake Field Trip - Freeport

Saturday, June 3, 2023 (rain date Sunday, June 4)

10:00 a.m. to 4:00 p.m.

After a fantastic visit to Florida Lake last September, we decided to return to explore this varied habitat in Spring. Florida Lake has a mixed deciduous forest, a hemlock stand, and streams, marshes and shallow lakes, all of which result in an amazing diversity of insects. We will be creating an iNaturalist Project for this event, which means that any photographs that are uploaded to iNaturalist from this location and date will automatically be collected into the MES Florida Lake Project. Participation by novices is encouraged for this educational event.

There are no facilities. Bring cameras, collecting gear, water, insect repellant, and lunch. A folding chair for lunch and hip boots are optional. Parts of trails can be wet if we have rain —boots might be a good choice.

From I-295, take Exit 22, the Freeport-Durham Exit, and get onto Route 125/136 North towards Durham. At the blinking yellow light, turn right onto Route 125 (Wardtown Road). Drive 2.4 miles to a blue Florida Lake sign on the right. Follow the dead-end access road (Frenchs [sic] Run on Google Earth) to the parking area. There is also an entrance off Baker Road, but we will meet at the parking area at the end of Frenchs Run.

Contact Roger Rittmaster (roger.rittmaster@gmail.com) to confirm your participation and for notification of any last-minute changes.

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What Do Insects Think?

By Margie Patlak

Did you ever wonder what, if anything, an insect thinks about? Does it have fond memories of a previous meal and plan its next moves? With many insects having heads not much bigger than the period at the end of this sentence, we probably shouldn't expect too much. But could there be something beyond the instinctual drives usually given to explain bug behavior?

Since all brains evolved from a common ancestor, the mammalian brain should share some similar functional brain traits with insects, some scientists point out. But many of us are biased such that we think that something looking so different from us couldn't possibly think and feel the way we do. However, as the animal behaviorist Jonathan Balcombe noted in his book *Superfly,* "Science has been exposing the frailty of such a belief, and a once bold line drawn between vertebrates and invertebrates has become blurry."

If anything can provide a window into the mind of an insect, it would be the humble fruit fly, the workhorse of experimental biology. For over a century, researchers have been plying this tiny bug for big insights into early animal development, aging and everything in between. Although we think ourselves high above on the evolutionary scale of those flies circling our ripe bananas, we still share nearly two thirds of the same genes with them. And although human brains have nearly a thousand times as many neurons as fruit fly brains, their functional organization and chemistry is similar, in some respects, to what is seen inside the noggins of fruit fly brains, recent research reveals.

You may think flies live from one moment to the next with no memories, but when investigators paired smelling an odor with receiving a shock, fruit flies given the shocks steered clear of the odor for long periods of time. Taking that research further, scientists at the University of California in San Diego amazingly were able to replace the exoskeleton above the brains of fruit flies' heads--an area about as big as a few grains of salt--with see-through panels that, along with various fluorescing markers, allow them to eavesdrop on their brain activity while they are going about their business. This research reveals that the part of their brains thought to process short-term memories blink on when memories are made with the type of conditioning experiment previously described. Other studies monitoring the electrical or chemical activity of fruit fly brains show that like us, flies pay more attention to novel stimuli, can anticipate a repeating pattern, and tend to suppress or ignore

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What do insects think? (cont.)

irrelevant stimuli. Intriguingly, the kingpin brain chemical dopamine plays a key role in flies learning, just as it does in human brains.

All this research suggests that there may be something (dare we say conscious thinking?) going on in the fruit fly's brain in response to certain stimuli. "The fly continues to amaze in how smart it really is," said Dhruv Grover, who led one of the UC studies.

Gero Miesenbock of the University of Oxford agrees. His team's research found that fruit flies took less time to distinguish between dissimilar odors than they did between similar ones, suggesting that they think before they act. "Freedom of action from automatic impulses is considered a hallmark of cognition of intelligence," Miesenbock stressed in an Oxford University publication, adding "Our findings show that fruit flies have a surprising mental capacity that has previously been unrecognized."

So the wheels do seem to be turning inside the heads of fruit flies, as well as in other insects, including ants that recognize their reflections in a mirror. When Belgian researchers painted blue dots on the front of the heads of ants and then placed them before a mirror, the ants tried to clean off the dots. But they ignored them if they couldn't see themselves, or if the dots were placed on the back of their heads and hidden from their view.

Ants and other insects also use tools that require some premeditation. Funnel ants use bits of leaf, wood or mud that they hold in their mouths to sponge up nourishing fluids they carry back to their nests. Although some scientists claim they are doing this by instinct without any conscious planning, one study countered that supposition by finding the ants were flexible in which tools they used to do this when given the option of superior manmade sponges. They even broke the sponges into smaller pieces to enhance their usefulness for the task.

All this suggests insects probably have some sort of self-awareness and ability to think and plan. But can they also have feelings? That I'll tell you about in another MES article.

References:

Dhruv Grover, Jen-Yung Chen, Jiayun Xie, *et al*., 2022. Differential mechanisms underlie trace and delay conditioning in *Drosophila*. *Nature*, vol. 603 (7900), pp. 302-308.

Shamik DasGupta, Clara Howcroft Ferreira, and Gero Miesenbock, 2014. FoxP influences the speed and accuracy of a perceptual decision in *Drosophila*. *Science*, vol. 344, no. 6186, pp. 901-904.

P. Sareen, R. Wolf, and M. Heisenberg, 2011. Attracting the attention of a fly. *Proc. Natl. Acad. Sci. USA*, vol. 108, pp. 7230–7235.

Marie-Claire Cammaerts Tricot and Roger Cammaerts, 2015. Are Ants (Hymenoptera, Formicidae) Capable of Self Recognition? *Journal of Science*, vol. 5, no. 7, pp. 521-532.

Maak, Istvan, *et al*., 2017. Tool selection during foraging in two species of funnel ants. *Ant Behaviour*, vol. 123, pp. 207-16.

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Don't Worry - Bee Happy!

By Bob Nelson

According to an April 6th article in the *Bangor Daily News*, New York-based artist Matthew Willey is going to be undertaking a project this coming July to paint a large honeybee-themed mural on the exterior wall of Pepino's Mexican Restaurant at 47 Park Street in downtown Bangor. This will be part of his ongoing 20-year project to paint 50,000 honeybees in murals, worldwide, to represent the average number of bees in a healthy hive.

The goal of his project is to "Ignite radical curiosity and active engagement around planetary health issues through art, bees and storytelling..... The global hive Matt is painting is a metaphor for the connectedness of all things. The bees are a symbol for humans, trees, animals, pollinators, water, soil and everything in between."

Artist Matthew Willey stands with the mural he painted at the entrance to the Great Ape House at the U.S. National Zoo in Washington, D.C. (photo from the artist's web site)

According to his web site (**https://www.thegoodofthehive.com/**), he's got a ways to go to reach his 50,000-bee goal. Thus far, he's painted 8734 of them in 35 works - from Louisiana to New Hampshire, North Carolina, Washington, D.C., and even the U.K. and China. The Bangor mural will be his second in New England - he painted one on the Peterborough Community Center in New Hampshire in 2018. You can see all his previous murals at:

https://www.thegoodofthehive.com/murals

Google Earth street view of the exterior wall of Pepino's Mexican Restaurant at 2 Park Street in Bangor, which in July will start becoming a giant bee mural.

Camden Snow Bowl & Hosmer Pond Field Trip - Camden

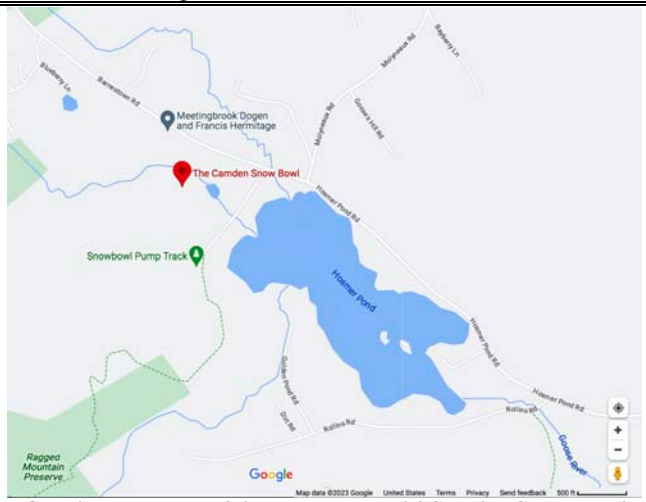
Saturday, July 8, 2023 (rain date Sunday, July 9)

10:00 a.m. - 1:00 p.m.

Join us July 8th at 10 a.m. for a foray at the Camden Snow Bowl at the peak of butterfly diversity in Mid-Coast Maine. This property offers a mixture of open mountainside fields, mixed forests, a stream, wet meadows and a lake. During a NABA butterfly count at this location ~10 years ago, 22 species were recorded, including the spectacular Bronze Copper and several species of hairstreaks. For those interested, there are trails to the top of Ragged Mountain, at over 1200 feet elevation. Participation by novices is encouraged for this educational event.

We will gather at 10:00 a.m. in the parking lot of the Snow Bowl. Be aware that disease-carrying ticks are prevalent in this area. You are advised to wear protective clothing (long pants tucked into socks, long sleeves, hat and repellent). Be sure to pack insect repellent, water, and a lunch or snacks. Bring collecting gear and/or a camera if you plan to collect specimens or photos.

Contact Roger Rittmaster (roger.rittmaster@gmail.com) to confirm your participation and for notification of any last-minute changes.



Google Maps map of the Hosmer Pond / Camden Snow Bowl area. GPS coordinates for the turnoff into the parking lot are 44.217756, -69.131336 . Note that the road towards Camden is known as the Hosmer Pond Road, whereas the same road to the NW is the Barnstown Road.

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Lubec Field Day - August 5, 2023 (Washington County)

Saturday August 5th, is going to be a great field day in Lubec, at the far easternmost tip of Washington County. We'll meet at 10:00 a.m. at the summer home of Lisa Dellwo and Bill Schlesinger, who have graciously invited us to help with their biological survey of the 80 or so acres they own on Comstock Point, off North Lubec Road; GPS coordinates for the driveway turnoff from the road are 44.882274, -67.024469.

Bob Nelson collected here two days in the summer of 2021 and was able to find 50 species of Carabids, as well as numerous other beetles that Dana Michaud has identified. To guide you, M.E.S. signs will be set up at the key turnoff from County Road (State Route 189) to North Lubec Road, and at the end of the *long* driveway.

Good faunal lists exist for the site for Lepidoptera and Odonata, based largely on sharp photos submitted to and identified via iNaturalist. However, other groups undoubtedly have many species yet to be identified. As we know from the experiences we had in thirteen years of BioBlitzes at Acadia, there's *always* something new to be found.

Local habitats include dry and wet meadows, two very different ponds (one deep and old, the other shallow and new), coastal spruce forest, mixed conifer-hardwood forest, and rocky shorelines with a high tide range. As much as possible, the lands are being maintained in a natural state.

Several people have already let Bob Nelson know of their interest and plans to attend. This is the height of tourist season in Lubec, so if you'd like to go and haven't already made plans for an overnight stay, you might want to do so ASAP. Accommodations are limited in and around town; there is camping available at Cobscook Bay State Park nearby, but not in Lubec itself.

Bob Nelson (BeetleBob2003@gmail.com) is hosting the event, and will be staying overnight on Friday ***and*** Saturday nights at a local motel. Please do let me know if you're planning to come if you haven't already informed me. At last count, we had seven or eight confirmed attendees - a solid core group!

Plan to bring lunch, collecting gear (or cameras, if you prefer), insect repellant, and lunch with drinks - all the standards. If you prefer, this last can be purchased at the gas station and convenience store at the corner of North Lubec Road and County Road (= State Route 189, the main road into "downtown" Lubec itself). There IS a bathroom we can use on-site.

Anyone wishing a copy of the latest edition of the faunal and floral update of the property can e-mail me, and I'll send a copy. They've got quite the inventory!

Quick trivia tidbit: What U.S. community is, in straight-line distance, the closest to Africa?

The answer: Lubec, Maine! It's just 3,164 miles from Lubec to Tarfaya, Morocco; by comparison, it's 2,785 miles from Lubec to San Diego, California, only 379 miles closer! Lubec is also just a short bridge away from Campobello Island (N.B.) and the summer home of F.D.R. - so bring your passport if you'd like to play tourist on Sunday and tour a Presidential summer home before heading home, eh!

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Finally, The Writing Workshop!

by Kathy Claerr

The pandemic long delayed MES's Writing Workshop, but the session on April 15th proved well worth the wait.

Seri Lowell, a former Bates College Science Writing Specialist, guided 6 participants toward improving our writing technique. Participants included a self-employed forester, a would-be nature writer, professional and self-

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Writing Workshop (cont.)

taught entomologists, a Master Naturalist, and newsletter contributor.

We first analyzed published writing samples. We then applied these insights to our own drafts. Fellow participants provided feedback about what they liked about our pieces, as well as what else they would have wanted to know. Having these critical, but kindly eyes focused on our work demonstrated that it's a pretty good idea to share a draft before "going to press."

In the end, all agreed to share email addresses so that we receive that important feedback on our future writings.

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CODE RED! at Maine Historical Society, Portland

A new exhibit, entitled ***CODE RED: Climate, Justice & Natural History Collections***, has opened at the Maine Historical Society in downtown Portland and will run through the end of this calendar year. It covers a wealth of materials dealing with Maine's history relative to its indiginous peoples and the natural environment, including three areas of particular entomological interest.

Charlene Donahue prepared the part of the exhibit describing the important work that M.E.S. members have performed over the past quarter-century documenting the insect fauna of the state, while noted naturalist and author Berndt Heinrich prepared a section on the importance of pollinators in the natural environment. A third entomology-related part of the exhibit discusses Christopher Livesay's lifelong commitment to collecting butterfly specimens.

Much more can be found about the exhibit at the MHS web site at

https://www.mainememory.net/sitebuilder/site/3261/page/5181/display

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The following Insect Collectors Code* was developed at Penn State after discussions with entomology students and is based on codes of ethics from other disciplines. This seems like it could be a good standard for MES members.

Insect Collectors' Code

I strive to fulfill, to the best of my ability, the following ideals:

- I will respect the hard-won scientific gains of those entomologists in whose steps I walk and gladly share my scientific gains and knowledge with those who are to follow.
- I will aid in the dissemination of scientific knowledge, both to those who study insects and those who do not.
- I will not discriminate against others, and I will strive to create a safe working environment, whether in the field, the classroom, or the lab.
- I will treat insects humanely. As a collector, it is within my power to take insect life; I will not take insects that will not be deposited in a natural history collection or otherwise made available for research and education. While bycatch is often unavoidable, I will, to the best of my ability, attempt to reduce the unnecessary loss of insect life, and will find use for these specimens.
- I will consider the ecological impact of removing insects and their products (galls, nests, etc.) from the environment when collecting, whether the species are protected by law, known to be declining, or are considered to be of least concern. I will strive to avoid or minimize disturbance to the environment.
- I will secure appropriate permits and permission prior to collecting insects, and I will honor and uphold the provisions stated by each permit. I will keep copies of all permits on my person while collecting and furnish them to authorized agents upon request. I will save all permits associated with specimens as proof that they were collected legally.
- I will keep detailed field notes of my collecting activities and will make these available to the greater scientific community.
- I will prepare and label specimens according to standards established by professional entomologists who work with collections.
- I will properly store all specimens under my care, and I will not allow specimens to become damaged or degraded through neglect.
- I will properly use and dispose of preservatives, killing agents, and other chemicals associated with specimen collection and preparation. I will never use these chemicals to harm myself or others.
- I will make arrangements for any personal specimens or collections in my possession to be deposited in a museum in the event of my untimely death.
- I will not create false data.

May I always act so as to preserve the finest traditions of natural history, and so long as I uphold these traditions and the stated ideals, may I long experience the joy of my contributions to the furthering of scientific knowledge.

* **Trietsch, C., & Deans, A. R. (2018). The Insect Collectors' Code. *American Entomologist*, v. 64, no. 3, pp. 156–158. URL: https://doi.org/10.1093/ae/tmy035**

COMING M.E.S. EVENTS in 2023

(See the MES web site at https://www.maineentosociety.org/events for additional information on any event, especially upcoming webinars - which will be posted as soon as information is available.)

May 13: Ringed Boghaunter Field Day, southern Maine (Pete Darling)(See p. 8 in February issue)

June 3: Field Day, Florida Lake, Freeport (Roger Rittmaster; see p. 9)

June 24: Field Day, Oak Hill Conservation Area, Fayette (Dana Michaud; see p. 7)

July 8: Field Day, Camden Snow Bowl, Camden (Roger Rittmaster & Kathy Murray; see p. 11)

August 5: Field Day, Lubec (Bob Nelson; see p. 11)

September 9: Field Day, Good Will - Hinckley trails, Fairfield

September 30: Annual Meeting, Clinton (Bob Nelson)

The Maine Entomologist **is the quarterly newsletter of the Maine Entomological Society. Dues are $15 per year, or $18 if paid via PayPal through our web site (https://www.maineentosociety.org/join). Checks should be made payable to the M.E.S. and sent to Mr. Dana Michaud, M.E.S. Treasurer, at 3 Halde Street, Waterville, ME 04901-6317 (e-mail: djmichaud1@gmail.com). If you're unsure about your dues status, please contact the Treasurer.** ***Individual articles reflect the opinions of the authors and mention of any specific commercial products or businesses should not be construed as formal endorsement by the M.E.S. of any such product or business.***