

# 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 Dick Dearborn

### From The President

Cold nights and bare trees signal decreasing insect activity as the smell of wood smoke fills the air. If you're like me that woodpile is just not big enough yet, but we'll see! Although I saw or heard of many interesting insect finds in 2008, this was probably the leanest year that I have experienced for many insects in both numbers and diversity, especially Lepidoptera! This was also evident in the case of my pets, the woolly bears. I was only able to find 3 of my fuzzy friends, the lowest number since I started counting red segments for my forecast back in 1997! In spite of this I continued with my count, finding an average of 4.33 red bands per caterpillar indicating an average winter coming up, whatever that means. I'm still putting in firewood!

As you all know, this will be my last report as President of MES, and I must have started this report at least four times only to have my attempts lost in a computer glitch or lost in frustration. So here I go again before our editor comes looking for me. I have really enjoyed holding office since 1997 and have met most of you at one point either personally or through the process of dunning you for dues. I really appreciate your support and enjoy the wonderful articles many of you have worked so hard to compose. Although I now hope to back off into the regular member category, I still plan to participate in MES activities.

Our Annual meeting was very enjoyable and our gracious hosts, Bob and Nettie Nelson made everyone feel at home. However, change seemed to be the theme for MES, as it has been for our national election process. While Bob Nelson remains our intrepid webmaster and editor, the only officer "hanging in there" is our Treasurer, Dana Michaud. Charlene Donahue now becomes your newly elected President, and I am sure that she will do well with existing activities while implementing the new, many of which came up at our meeting.

Karen Hopkins was elected Vice President. Our former V.P., Chuck Peters, asked to be relieved so that he too could give more time to other commitments. Chuck has been a staunch supporter of MES and especially a reliable source of articles such as his "Tech(nical) Tips" feature and great insect photos. I'm sure that Chuck, too, will participate in group activities as much as he can. Thanks so much Chuck for being there for us!

Our two new Board Members at Large are Dave Bourque and Brandon Woo.

Other Annual Meeting items involved votes to: keep our dues at a flat \$10/yr for now; keep *The Maine Entomologist* at 8 pages, if possible, to save on postage; support our new scholarship fund [see p. 2] using \$1/member/yr of dues, \$1 per calendar or shirt sale, plus additional moneys raised through 50/50 raffles and donations. Our scholarship committee will determine disbursement of funds as dictated in the mandate.

We can now order new shirts, which will be ordered on demand at a price based on order size. Both the "Maine Insect" and circular MES "Logo" are available. Other items may soon be offered as well. And don't forget, we are also in the process of completing our 2009 MES calendar. Contact me in regard to the shirts and calendar.

Our MES program for 2009 is basically ready to go, so check it out in this newsletter and set those dates aside, or better yet, buy one of our calendars with the dates and places already in place. I've had fun but now I can step back and watch MES grow as a member!

This should wrap things up for me. Over the next couple of months I will be turning things over to Charlene. It would streamline things if you would funnel future MES business to Charlene at Insect & Disease Lab, 50 Hospital St. Augusta, ME 04330, Ph. (207) 287-3244 or charlene.donahue@maine.gov. Contact Dana on dues.

Don't forget your dues for 2009. Thanks and "Happy Buggin!"

Our member count stands at 132!

- Dick Dearborn

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## Maine Entomological Society Scholarship Fund

by Charlene Donahue

At the 2008 annual meeting in Clinton, the Maine Entomological Society voting body agreed to set up a Scholarship Fund for MES members. This idea was brought forward by Gail Everett in 2006. It was then researched and a plan drafted by a committee comprised of Gail Everett, Domenica Woo, Charlene Donahue (chair) and Chuck Peters. Below is the plan for the scholarship fund.

The purpose of the Scholarship Fund is to support and advance the study of Entomology. The Maine Entomological Society has been in existence for over ten years and during that time it has accomplished much on multiple fronts. Some MES activities that have furthered the understanding of insects over the past decade include: quarterly newsletters on topics pertinent to Maine's insect population, numerous field trips each year, co-sponsoring the Maine State Museum's Bug Maine-ia, co-sponsoring six Bioblitzes at Acadia National Park's Schoodic Point, joint meetings with the Acadian Entomological Society and Vermont Entomological Society, supporting saving the Patch House from becoming a parking lot and more.

People are eligible for funding if they 1) have an interest in furthering their knowledge of insects and 2) are a Maine Entomological Society member in good standing.

Scholarship funds may be used for:

- 1) Support for courses, workshops, meetings etc. in Entomology that will further the understanding of insects in Maine.
- 2) Support for pursuing a degree in entomology at either the undergraduate or graduate level.
- 3) Support student attendance at Entomological meetings.
- 4) Support Continuing Education Credits in entomology for teachers or others as deemed appropriate by the selection committee.

A scholarship selection committee consisting of three members elected every three years will determine recipients.

Funds will be raised for the Scholarship Fund in various ways including: allocating \$1 for the fund from each membership, t-shirt and calendar sold; donations; auction, raffle or sale of insect-related items including books; 50/50 raffles at MES events; corporate sponsors such as forest industry, green industry, pest control industry; socials, dinners, music entertainment and anything else someone comes up with for an idea.

A 50/50 raffle was held after the vote and all proceeds were donated to the new fund. An additional gift has already been made bringing the total in the new Scholarship Fund to ~ \$75.

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### **Seasonal Gem**

As I mentioned in my President's report, numbers of Lepidoptera were generally down this year. A notable exception was the migrating Mourning Cloak butterfly, *Nymphalis antiopa*, which posted modest increases in numbers in surveys in late summer across much of southern Maine. Populations of other migrating butterflies were more spotty and variable but generally down.

- Dick Dearborn

## **A Mating Assembly of Mutillids**

by Monica Russo

I was standing staring at the bare ground (a hallmark of hymenopterists), hoping to discover the owner-builders of several tumuli. A tumulus is the mound of excavated dirt at the entrance to an underground nursery, created when a predatory or solitary wasp digs. The tumuli look like tiny volcanoes, with an entrance hole often big enough to poke a pencil into. Many different genera of fossorial (digging) wasps create tumuli: *Ectemnius*, *Crabro*, *Sphex*, *Philanthus*, or most hopefully, *Cerceris fumipennis*, a hunter of buprestid beetles, which I was specifically looking for.

Standing and waiting, I looked around, but didn't want to lose my field of view because it was important to see who might return to the tumuli, perhaps even carrying prey, or who might emerge and start working and digging again. Nothing much happened of course: a watched tumulus never moils. My gaze wandered, and I saw a female velvet ant. This was a big shock, since the last velvet ant I saw was during an MES field trip to the Kennebec Plains around 1993. I could hardly believe it. A minute later, I saw another. Then another, and another. It was amazing. Then I saw a black wasp running around which I thought at first was a Pompilid, a spider-hunting wasp. I ignored it. But then I saw another, and then another. Finally I realized the black wasps were frantically following the velvet ants. They were the male velvet ants! They flew and ran, trying to catch up to the females, and a few were able to make a sort of confusing, jumbly tumbling contact, which I presumed to be successful mating.

Velvet ants are not ants, but wasps, belonging to the Family Mutillidae. There is considerable sexual dimorphism, as the females and males are different colors, and only the males have wings. I'm sure I will never have the chance to see a mating assembly of velvet ants again. It is a reminder that when you are looking intently for one species, you should remain alert for something else happening. I took specimens which are at the Augusta lab.

(The tumuli were not those of *Cerceris* after all. I netted an owner-builder, which appeared to be a *Philanthus* wasp; she was not what I was hoping for, but it's always fun to see the bright yellow face of that genus, with a sort of surprised look on it.)

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### **Acadia National Park Spider Blitz: an overview**

by Rich Bradley

The Acadia Spider Blitz was held on 21-22 July, 2007. A large group of volunteers, many from the Maine Entomological Society, collected spiders from 84 sites on the Schoodic Peninsula. Most of these sites were within Acadia National Park. Many of these volunteers also assisted in the important task of organizing, labeling, and sorting spider specimens to family. Don Chandler, Charlene Donahue, Jim McKenna, and Dan Jennings placed a large number of pitfall traps at a variety of sites earlier in the week. A total of 197 lots (a lot is a unique collection technique at one site) were collected. Daniel Jennings (USDA, Forest Service, retired), and to a lesser extent Richard Bradley (Ohio State University) performed species determinations on all of the spider specimens.

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### 2007 Spider Blitz Overview (cont.)

The effort yielded 1,040 adult specimens representing 18 families, 101 genera, and 151 species. Of these, 89 species had not been recorded previously on the Schoodic peninsula. According to Dan Jennings, one species, *Porrhomma pallidum* Jackson, 1913, is a Palearctic species that until recently had not been collected in North America. Dr. Jennings has recently collected this species (both males and females) elsewhere in Maine. There is one other species, *Sciastes* sp. (near *extremus* Holm 1967) that may be an introduction or an extreme range extension. This, along with 4 other specimens (all erigonine Linyphiidae), remain to be confirmed. Six species that were collected during the blitz are new state records for Maine. One of these, the wolf spider *Pardosa palustris* (Linnaeus, 1758), may represent the first record for the conterminous United States.

As expected, the various collecting methods captured different assemblages of spider species. The most productive method (in terms of number of spiders collected) was sweeping (314 specimens representing 53 species). The various pit fall traps yielded 264 specimens of 65 species. Hand collecting provided 274 specimens of 74 species. Beating yielded 103 specimens and 37 species. Litter extraction produced 64 specimens, and 38 species. Thus, if we assume that number of spiders is a reasonable measure of effort, litter sampling yielded the maximum number of species per unit collecting effort. This is likely a result of the fact that tiny erigonid linyphiids, the most speciose group of spiders in our area, are chiefly collected by litter extraction.

The composition of the collection of spiders from the blitz held some surprises for me. There were fewer species of ground spiders (Gnaphosidae), ground sac spiders (Corinnidae), and jumping spiders (Salticidae) than I would have anticipated based on my Ohio collecting experience. The dominant families (in terms of number of specimens and species) were not as surprising. The most specimens and species were sheet weavers (Linyphiidae) with 54 species represented among 292 individuals. The second most abundant spiders were the cobweb weavers (Theridiidae) with 269 individuals of 20 species represented. An astounding 48% (128) of these were specimens of one introduced species, *Enoplognatha ovata*. At least it is an attractive species, well known for its distinctive color polymorphism. The generally large and obvious orbweavers (Araneidae) were not particularly abundant, 101 specimens of 8 species, but this can probably be ascribed to the fact that they mature in late summer/autumn and many individuals were probably immature at the time of the blitz and were thus discarded as unidentifiable.

There is still work to do in the form of additional verification of determinations, as well as analysis of the habitat associations of the spider species. Nevertheless, it is clear that last year's spider blitz was a great success. Thanks to the efforts of dedicated volunteers, we now know much more about the diversity of spiders in Acadia National park, and on the Schoodic peninsula in particular.

I would like to thank everyone involved in the planning and execution of the blitz, in particular the staff of the National Parks Service; Charlene Donahue, David Manski, and Jim McKenna. Daniel Jennings is the real spider expert in Maine. As I'm sure everyone realizes, this effort could not have been

successful without his expert help, local knowledge, and sage guidance. I would also like to thank the National Park Service for permission to study on lands under their care (Permit #ACAD-2007-SCI-0033).

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### 2008 Hemiptera Blitz Bugs All

by David Manski

Over the August 8-11, 2008 weekend, 60 people volunteered 1,850 hours in conducting the sixth annual BioBlitz at Acadia National Park. This summer's event at the park's Schoodic Education and Research Center was focused on True Bugs (Hemiptera). Drs. Andy Hamilton from Agriculture and Agri-Food Canada, Don Chandler from the University of New Hampshire, and Laura Miller from the West Virginia Department of Agriculture were the lead taxonomists for the event.



**Bug Blitz 2008 participants gather for a group photo.**

A total of 173 confirmed species were identified representing 26 different families. Many of these were new species to Maine and to the park, including some highly unusual specimens. The planthopper *Tumidigena terminalis* and the leafhopper *Destria bisignata* were both far out of their known ranges. The former was previously known as far north as Martha's Vineyard (off Cape Cod, MA) but after the BioBlitz it was also found at Portsmouth, NH. The latter is known only as far north as southern New Jersey. Since they both came from a recently filled-in channel and from the same grass, it seems extremely probable that both arrived at the same time, as eggs in floating salt hay (*Spartina patens*) washed ashore during a hurricane.

The leafhoppers *Xestocephalus fulvocapitatus* and *X. provancheri* were formerly regarded as separate species, the former from Canada and the northern USA, and the latter from the Gulf Coast states. The specimen taken in the BioBlitz is intermediate between these taxa, having the yellow dorsum of the former and the brown, sparsely spotted wings of the latter. Similar intermediates are also known from Wisconsin and southern Ontario, so this record completes the E-W zone of contact between the two taxa, and establishes that they are indeed subspecies.

On Sunday of the BioBlitz weekend, Dr. Cassie Gibbs and Marcia Siebenmann taught a public workshop titled "Introduction to insects and the true bugs" that was attended by over 30 people, including many children and families. Through

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2008 Hemiptera Blitz Overview (cont.)

classroom and "hands-on" field activities, the participants learned about insect natural history, identification, and methods of collection.

Short videos on the Blitz have been prepared and uploaded at the Acadia National Park web site. You can see them at <http://www.nps.gov/acad/naturescience/truebugblitz.htm>

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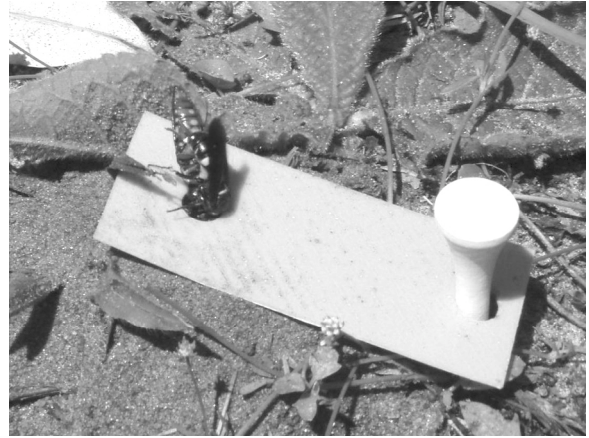
**CERCERIS BIOSURVEILLANCE UPDATE**

by Colleen Teerling

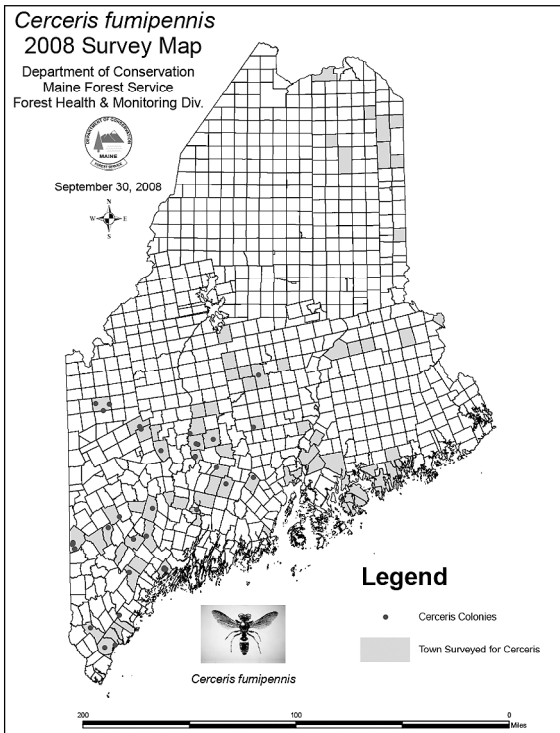
So what has been happening this summer with *Cerceris fumipennis*, the wasp that hunts emerald ash borer? At the beginning of the summer, all we knew about *Cerceris* in Maine was that two MES members had collected it in the past.



*Cerceris fumipennis* with buprestid prey (*Dicerca* sp.) rests on finger.



Wasp with prey tries to enter nest through 'Careless collar.'



By the beginning of September we had searched multiple sites in over 80 towns and found 30 colonies of this wasp, with

another seven possible colonies which we need to confirm next year (see map).

The *Cerceris* colonies we found were in central and southwestern Maine, west of Bangor and south of Rangeley (or the line formed by the Vermont-Quebec border). We now are fairly sure that Maine is at the northern limit of this wasp's range. We do not expect to find it in northern Maine, although we hope to find it farther east.

We found our first colony on a school baseball field in Farmingdale (near Augusta) on July 15, just as the adults were starting to emerge. It was a cool, wet spring this year, and everything was delayed, so we expect to typically see the first colonies a week or two earlier than this in Maine. By late August/early September the wasps were disappearing for the season.

We found most of our colonies in baseball and softball fields. This may be partly due to our bias: we often used the computer to find baseball field in areas where we had other field work and checked these sites on our way home. Other colonies were found in unused sand pits, small airfields, campgrounds, dirt parking lots, and other areas of sunny, bare, packed, sandy soil.

**Thank You**

I'd like to say 'thank-you!' to the MES members who helped us look for colonies this summer. You were a huge help, and we wouldn't have gotten as much done without you. We appreciate the help from those who found colonies as well as those who looked and didn't find any. Both types of information were very useful to us.

**What's Next?**

Between 13 and 24 of the colonies we found this summer are large enough and close enough to ash trees to be suitable for biosurveillance. Because the Maine Forest Service (MFS) does not have the personnel to monitor all these colonies, we are hoping to find individuals or groups near each site to "adopt-a-colony". This would involve spending 2-3 sunny warm afternoons at a colony during the month of July. The MFS will provide all materials needed.

The observer would place 'Careless collars' (named after Philip Careless, the grad student who has been doing this research) over the nests. The holes in these collars allow wasps to leave the nests, but are too small for them to enter while

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**Cerceris Biosurveillance update (cont.)**

carrying prey. The observer(s) then either net the heavily laden wasps as they fly back to the nests or intercept them as they try unsuccessfully to enter the nest hole, and steal their buprestid prey (remember, the wasps don't sting). If EAB is not seen within the first 40 prey items collected, we can be reasonably certain it is not in that area. I expect this process to take 4-8 hours for each colony, depending on the warmth of the day and the number of wasps in the colony. At one site this summer, in about 5 hours (over the course of a month), we collected 45 buprestid specimens in 6 genera and 11 species.

The following is a list of towns where we have colonies needing biosurveillance. **Bold print** indicates a colony that we know is suitable for biosurveillance. Regular print indicates that we do not yet know the size of this colony (it was found late in the season after many of the nests had caved in), and so are not certain that this colony will be useful for biosurveillance. If any MES members live near one of these colonies and are interested in adopting it, please contact me (contact information below). One colony (Farmingdale) has already been adopted by a Girl Scout group.

<u><i>Suitable for monitoring</i></u>	<u><i>MAY be a suitable colony</i></u>
<b>China</b>	Dover-Foxcroft
<b>Farmingdale (adopted)</b>	Newport
<b>Freeport</b>	Norridgewock
<b>Fryeburg</b>	Norway
<b>Harrison</b>	Phillips
<b>Montville</b>	Poland
<b>Saco</b>	Rangeley
<b>Sanford</b>	Skowhegan
<b>Smithfield</b>	Wells
<b>Turner Center</b>	
<b>Winslow</b>	

For further information about the biosurveillance project, visit our website, [www.maineforestservice.org/idmhome.htm](http://www.maineforestservice.org/idmhome.htm) and click on "emerald ash borer hunter" in the left sidebar. Or contact me:

Colleen Teerling  
Ph: [207] 287-3096  
Email: [colleen.teerling@maine.gov](mailto:colleen.teerling@maine.gov)  
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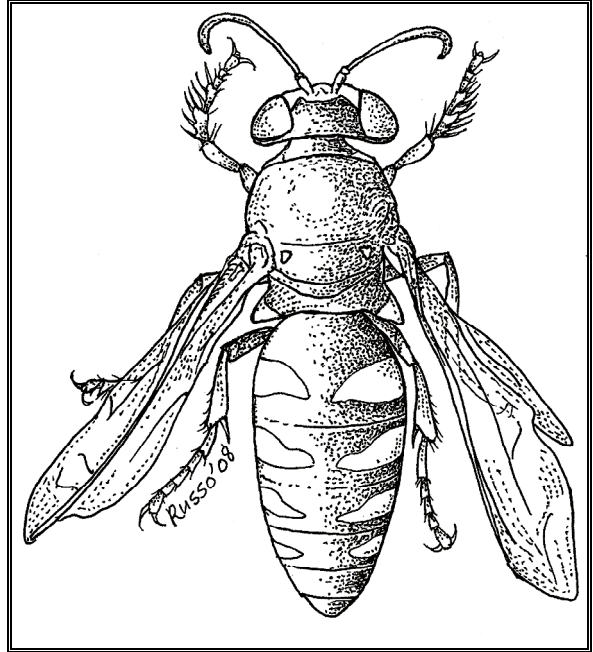
**FINDING BICYRTEs QUADRIFASCIATUS  
IN MAINE  
by Monica Russo**

Like many other MES members (I hope), I hunted for *Cerceris fumipennis* wasps this past summer. These wasps hunt the Emerald Ash Borer beetle, which could become a significant forest pest. These predatory wasps are fossorial (digging nests in the ground), so if you don't see any foraging at flowers, you need to look for a tumulus, which is the excavated mound of dirt at the entrance to the underground nursery.

Unfortunately, many other species of hunting wasps create similar tumuli and many also nest in loose colonies, from 3 or 4, to scores or more. Each tumulus looks like a tiny volcano, a conical mound with an entrance hole just about big enough to stick a pencil into. The tumulus may belong to a *Bembix*, a *Philanthus*, *Crabro*, *Sphex*, *Ectemnius* or other digger wasps. So you have to stand and watch the owner/builder return, and

then capture her and make an identification. Specimens are not taken: this was a catch-and-release program, since the wasps are beneficial.

One of my survey sites was an area where I caught *Cerceris fumipennis* in July of 1998. Yes, ten years ago, so there was much change in land-use. However, I did see several promising tumuli in an open sandy area. As I stood and watched the wasps come and go, they appeared much too big for *Cerceris*, but not quite right for *Bembix*. I collected two on August 16, and when I discerned their identity, returned on August 18, and collected 2 more. They are *Bicyrtes quadrifasciatus*, a hunting wasp which preys upon stinkbugs. The sandy habitat was directly adjacent to a garden center with an extensive outdoor selection of herbs, flowering plants and shrubs.



*Bicyrtes quadrifasciatus* (Say) [Drawing by Monica Russo.]

The stinkbug-hunter may be a first-record for Maine. You might look to see if you have this, unidentified, in your own collection. There is a photo on the internet of *Bicyrtes ventralis*, shot in Kennebunk. This is a very similar species, but the surface of the thorax has a sort of smiley-face on it – two dots and a curve – while *Bicyrtes quadrifasciatus* has a plain black thorax. The hallmark of the genus is a conical projection at the rear of the thorax, on each side.

It is always an exciting surprise to find something new and different. Finding a colony of *Bicyrtes quadrifasciatus* was the direct result of looking intently for something else entirely!

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**The Deadliest Bugs**

The honeybee kills more people world-wide than all the poisonous snakes combined, but the animal responsible for the most human deaths world-wide is the mosquito. The disease-carrying mosquito, delivering encephalitis, West Nile virus, malaria, and Dengue fever, is by far the deadliest beast in the animal world. The World Health Organization says mosquitos cause more than 2 million deaths a year worldwide.

# Oak Galls, Ink, and *We the People* - An Introduction to Oak Gall Ink and Some of Its Uses

by Andrea Ostrofsky

## PART I. INTRODUCTION AND INGREDIENTS

Many people know the story of the Declaration of Independence. What most people don't know is that oak trees and cynipid wasps had a part to play in the story. Both the Declaration of Independence and the U. S. Constitution were written on parchment with oak gall ink [Charters of Freedom]. Ink made from oak galls was an important tool from the Middle Ages well into the 20<sup>th</sup> century.

In this paper I present an introduction to oak gall ink, some examples of its uses and some problems with its use.

The two black inks commonly used during the past two millennia are carbon black ink and oak gall ink, also known as iron gall ink. The pigment in carbon black ink is carbon from soot or charcoal. This carbon is chemically inert, but the ink can be smudged and rubbed or washed off the substrate. The rich black color of oak gall ink results from the chemical reaction that occurs from mixing its ingredients. It has been valued as a permanent ink that could not be easily erased and therefore has been the ink of choice for documents. Unfortunately, it is not chemically inert.

### INGREDIENTS.

Although recipes vary, there are four basic ingredients in oak gall ink: oak galls, ferrous sulfate, gum Arabic and water.

**Oak Galls.** Plant galls are atypical growths on plants caused in response to the activities of another organism. Plant galls can be caused by insects (notably Cynipidae and Cecidomyiidae), mites, nematodes, fungi, bacteria and viruses. There is even a branch of science, cecidology, that is the study of plant galls.



An oak gall (from <http://tinyurl.com/6oyubb>)

The galls of interest to the gall ink story are oak galls caused by cynipid wasps. There are many species of oak (*Quercus*) throughout the world, and more than 600 different cynipid wasps that cause characteristic galls on oak leaves, twigs or buds. Commonly a wasp lays an egg in the plant tissue, causing the oak to form a gall, which provides both protection and a food source for the developing insect. The life cycle of the insect, the physiology of gall formation, and the ecology of the gall are fascinating topics, but not the subject of this paper. Oak galls have been called by many common names, some general and some specific, including gall nuts, nut galls, and oak apples.

Historically, oak galls have been used in making medicines and ink and in the processes of tanning and dyeing .

What is desirable about oak galls? Oaks trees are naturally high in tannins. Oak galls have a high concentration of tannins, which are important to the gall ink making process.

Tannin concentration in oak gall tissue often depends on the specific tree species and the gall forming agent. Some galls such as the Aleppo gall (also known as the Turkey gall or the gall of commerce -*Quercus* spp., *Cynips gallae-tinctoriae*), the acorn gall, and the Bessorah Gall are particularly rich in tannins, 65%, 45%, 26% respectively. Galls from western Asia and Europe and have been used to make ink for centuries.

**Ferrous Sulfate.** The second critical ingredient of oak gall ink is Iron II sulfate ( $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ ). This component is responsible for the ink's other common name, iron gall ink. These names can be used interchangeably. Iron II sulfate has been known by a variety of other names including ferrous sulfate, vitriol, green vitriol, copperas, green copperas, and Roman vitriol [Note: blue vitriol or blue copperas is copper sulfate]. Historically, ferrous sulfate was obtained by evaporating water that had come in contact with ferrous earths. Other salts, including copper sulfate could be present. A mine in Goslar, Germany was a major European supplier of vitriol.

**The reaction.** When crushed galls are mixed with water the ester linkages in the gallotannic acid are broken, releasing gallic acid. (In addition the mixture may be heated or fermented by molds). Gallic acid +  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$  yields ferrogallotannate, a black pigment when exposed to oxygen. The resulting solution is acidic.

**Gum Arabic.** Another component of iron gall ink is gum Arabic, a water soluble gum from the Acacia tree native to Egypt and Asia Minor. Gum Arabic improves the flow of the ink. It keeps the pigment in suspension, depositing it at the surface of the substrate. It also acts as a binder.

**Water.** Although most ink gall recipes extract ground up galls in water, some recipes called for the addition of wine, vinegar, or beer. This influenced the acidity of the solution and perhaps the mood of the ink maker.

**Additional Ingredients.** Oak gall ink is usually pale when freshly made. With exposure to oxygen in the air, the ink soon darkens to black. Sometimes an additional coloring agent such as logwood or indigo was added to oak gall ink to compensate for the initial pale color. Unfortunately, chemical reactions in some formulations have, over time, led to corrosion of the underlying paper.

## PART II: EXAMPLES OF USE

Although use of oak gall ink became common in the Middle Ages, there are two early examples involving the oak gall-ferrous sulfate reaction that are of interest.

**Philo of Byzantium - 3<sup>rd</sup> century BC.** Philo of Byzantium described a type of invisible ink in the third century B.C. The ink was made from an extract of nutgalls. The invisible writing became black and clearly visible when exposed to an extract containing iron salts.

**Pliny - 23-79 AD.** During the first century AD, Gaius Plinius Secundus, known as Pliny the Elder, wrote in his Natural Histories that galls were used in medicine, dying and tanning. He also reported using the reaction between oak gall extract and

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Oak Gall Ink (continued from previous page)

iron salts as a chemical indicator. Desirable and expensive verdigris [ $\text{Cu}(\text{CH}_3\text{COO})_2 \cdot 2\text{Cu}(\text{OH})_2$ ] was sometimes cut with the cheaper ferrous sulfate. This adulteration could be revealed by applying the verdigris in question to papyrus that had been dipped in an infusion of oak gall. The papyrus turned black if the verdigris was contaminated with ferrous sulfate. Although the chemistry was not understood, the use of the reaction fits the description of an analytical test, a test that has been used for almost 2000 years. Pliny was interested in many things, including the 79 AD eruption of Mount Vesuvius which caused his death. Notably, 3.8 kg of galls dating from the time of the eruption have been found in Herculaneum.

**Martianus Minneus Felix Capella - 420 AD.** In the fifth century AD, Capella described an ink named "gallarum gummeosque commixtio." The ingredients are an infusion of galls, green vitriol, and gum Arabic.

**Middle Ages - Monks.** During the middle ages, monks prepared ink from traditional recipes that were often kept secret. Iron gall ink was one type of ink they used in their manuscripts.

**Book of Hours - 1324.** Iron gall ink was used to form the letters in a small illuminated book of prayers, the Hours made for Jeanne d'Eyreaux, Queen of France. The book was commissioned by her husband, King Charles IV. This book is part of the collection of the Metropolitan Museum, New York.

**Leonardo da Vinci - 1452-1519.** One of the inks Leonardo da Vinci used in his notebooks was oak gall ink. In one of his notebook entries from 1493, Leonardo described my favorite recipe for gall ink, perhaps one he used when he was traveling. Here is an English translation appearing in Richter's 1883 compilation of Leonardo's notebooks: "Take powdered gall nuts and vitriol, powder them and spread them on paper like a varnish, then write on it with a pen wetted in spittle and it will turn black as ink." Recent non-destructive analytical imaging studies of Leonardo's famous 1481 painting, *The Adoration of the Magi* revealed that Leonardo used iron gall ink to add detail to the preparatory drawing.

**Books of Secrets - 16th century.** In the sixteenth century, "books of secrets" were printed. They contained recipes and techniques that had once been secrets of various crafts, and some included gall ink recipes.

**Shakespeare - 1602.** Shakespeare made reference to oak gall ink in his play, *Twelfth Night*. In act III scene 2, Sir Toby Belch gives letter-writing advice: "Let there be gall enough in thy ink, though thou write with a goose pen, no matter." The reader should consult the play's script to enjoy Shakespeare's inevitable double meanings.

**French Government - 1626.** The French government developed a standard recipe for gall ink without any added colorant. This type of ink was adopted for use by many governments, used in Europe and eventually the U.S. and Canada.

**Charter from King Charles II - 1681.** The original charter from King Charles II to William Penn was written with iron gall ink, as were many maps, letters, legal documents, and architectural drawings.

**Johann Sebastian Bach - 1685-1750.** Bach wrote many of his musical scores in iron gall ink, including the original score of *Mass in B Minor*.

**Rembrandt drawings of 17<sup>th</sup> century.** Many drawings such as *Landscape with a Bridge* by Rembrandt were made with iron gall ink. Many of his drawings and those of other seventeenth century Dutch artists are susceptible to iron gall ink corrosion.

**Dutch United East India Trading Company.** Administrative records of former Dutch colonies and records of the 17<sup>th</sup> century trading companies were written with iron gall ink. These records, including records of the Dutch United East India Trading Company, have been particularly damaged by iron gall ink corrosion.

**Benjamin Thompson's Secret-Ink Letter.** In 1775, Massachusetts-born Ben Thompson wrote a letter in invisible ink revealing American troop activity to the British. Brown and Stein examined the letter and concluded that it had been written with gall extract, with the secret message revealed by application of ferrous sulfate. After the Revolution, Thompson lived in Europe, was awarded the title of Count Rumford, and made significant contributions to science.

**Declaration of Independence 1776, Constitution of the United States, Bill of Rights.** These charters of our freedom were inscribed with iron gall ink on parchment. They are stored in special climate-controlled cases at the National Archives, where curators monitor their condition.

**Charles Dickens - 1837.** Dickens' manuscript for *Oliver Twist* was written with gall ink (1837-39). He used iron gall ink for his early works, but not for later works.

Iron gall ink was used into the 20<sup>th</sup> century. Newer, non-gall tannin sources, such as the quebracho tree (which is a member of the sumac family) have been used to provide tannins for ferrotannate inks. Synthetic inks developed in the 19<sup>th</sup> and 20<sup>th</sup> centuries are also much used.

Such a wonderful array of artwork, documents, maps, and manuscripts have been produced using oak gall ink. Over time some gall inks have faded to brown, and some have resulted in degradation of the substrate. It is ironic that an ink used for its rich black color and its permanence, has over centuries and in some situations resulted in problems due to its instability.

The causes of these problems are varied and not totally understood, but include the following: high acidity due to the vitriol, worsened by additives such as wine or vinegar, leading to acid hydrolysis of substrate; excess ferrous ions oxidizing to ferric ions leading to free radical formation and substrate degradation; ink additives such as colorants, or ink contaminants such as copper posing additional problems.

Research to identify problems, conserve and stabilize documents, and remediate problems is important and ongoing. You can learn more about how scientists and conservators continue to work on ways to conserve deteriorating materials at the Ink Corrosion Website:

<http://www.knaw.nl/ecpa/ink/intro.html>.

Oak gall ink has been called the most important ink in Western history. This rich black ink made of unusual ingredients was used in the documents of everyday life as well as in documents and artwork of genius that changed our world. Even today we can enjoy the rich variety of works created with oak gall ink and appreciate the activity of the cynipids that made it all possible.

(continued on next page)

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**Both Winter Workshop and 2009 Acadia Blitz  
to Focus on Minor Orders  
by Charlene Donahue**

Once again MES will be offering a Winter Workshop at the Maine Forest Service Entomology Laboratory in Augusta on Saturday, January 17, 2009 from 9:30 a.m. to 2:30 p.m. The topic of the 2009 workshop will be Minor Insect Orders, to prepare us for the coming BioBlitz at Acadia National Park's Schoodic Point in August. Of course, this information is invaluable for anyone interested in insects in Maine, and the workshop is a chance to learn and share with other like-minded folks. So SAVE THAT DATE! These workshops have proved very popular and are always filled to capacity. There is a \$15 fee to cover expenses and pre-registration is required; there is a limit of 24 people. Please bring a bag lunch as there is no nearby feeding station.

To register: send your name, address, phone number and email address to: Charlene Donahue, Insect & Disease Laboratory, 50 Hospital St., Augusta, ME 04330 or (207) 287-3244 or [charlene.donahue@maine.gov](mailto:charlene.donahue@maine.gov). If weather is threatening on the day of the workshop, contact Charlene at 549-7241. Also if you can not make it for some reason, please call so that if there is a waiting list others could attend.

Directions: From I-95 take exit 113, go straight at first light, turn right at second light onto Riverside Dr. Take the third exit off the rotary following Rte. 9 up the hill. Go straight at light, past the State Police and fire station on right. The next green building on right is the Lab.

\* \* \*

The **2009 Acadia Blitz** will be on Minor Orders and will be held on August 7-10, 2009. More specific details will follow as plans firm up.

Just what ARE the minor orders of insects? Of the 30 Insect orders represented in the US, only 26 could occur in Maine, and of these there are 15 that could be considered minor orders. Dick Dearborn put together a list of the minor insect orders that could be found at Schoodic. They are as follows:

<u>Order</u>	<u>Common Name</u>	<u>Potential no. of species</u>
Collembola	springtails	< 50
Diplura	diplurans	1
Microcoryphia	bristletails	1, marine
Thysanura	silverfish	2 possible
Orthoptera	grasshoppers & crickets	< 75
*Phasmatodea	walkingsticks	only 1, if that
Dermaptera	earwigs	< 5
*Isoptera	termites	only 1, if that
Mantodea	mantids	only 1, if that
Blattodea	cockroaches	< 10
Thysanoptera	thrips	< 30
Psocoptera	psocids or barklice	< 50
Neuroptera	lacewings, fishflies, etc.	< 75
Mecoptera	scorpionflies	< 15
<u>Strepsiptera</u>	<u>twisted wing insects</u>	<u>&lt; 5</u>
<b>Total</b>		<b>≤ 322</b>

\* These two orders are highly unlikely to be found at Schoodic, but have both been reported from Maine.

*(continued on next page)*



**2009 Acadia Blitz (cont.)**

As you can see from this list, the number of species expected at Schoodic would be small and many can be identified by generalists. When you delve into the aquatic or parasitic groups, collecting and identifying becomes more specialized and requires input and assistance from experts in the group.

\* \* \* \* \*

**Wandering Woolly Bears**  
by Dick Dearborn

A year ago Richard Hildreth wrote a fascinating account of the amphibious wanderings of a woolly bear in this newsletter. I thought this might be the last of our accounts of wandering's until I was faced with a question this September. A friend in upstate New York asked why woolly bears always seemed to wander directly across a road? Could they see the other side? I sent them some information and suggested that they follow Hildreth's suggestion to observe such movement. Fortunately they had more woolly bears in upstate New York than we did. I just received their response.

"Hi, guys! I got your letter & article about the woolly bear caterpillars, thanks! I've been watching them carefully - - - and have noticed them heading in different directions with regard to the points of the compass, but only once was one NOT headed directly across the road I was traveling on: and that once, the woolly bear in question was going the same direction as I was- -but it was about to cross a street which intersected with the road which we were on, and it was about to cross THAT street perpendicularly. I still find this uncanny."

*Any Comments?*

\* \* \* \* \*

**U.S.P.S. Features Two Maine Insects in New Issue**



The new U. S. postal issue sheet featuring ten stamps of wildlife of the Great Lakes dunes includes two insects, both of which are part of the Maine fauna. Shown above, these are the tiger beetle *Cicindela formosa* and the Red Admiral butterfly, *Vanessa atalanta*. Sheets are \$4.20 at your local post office.

**PHEW! That's hard work!**

*The first week as an adult worker, honeybees clean the hive. By the second week, they feed the young. The third week, they make and repair wax cells in the hive. By the fourth week, they have begun guarding the hive, and finally, they will visit flowers for pollen (bees have built-in saddle bags) and nectar from the fifth week till they die. Workers might live for 6 to 8 weeks, while queens live up to 5 years. The total distance of the many trips honey bees will typically travel to produce a pound of honey is about equal to twice the distance around the world.*

**A Bug Maine-ia Thank-You\* !**

Thank you all very much for making Bug Maine-ia 2008 such a huge success, and for giving so generously of your time and energy! We had just under 1000 students pre-registered and had a total of 1964 visitors come throughout the day. Luckily, all of those visitors were nicely spaced out so we had a full day but not an overwhelming day. Everyone I talked to had rave reviews for the day! ....

.... I would love to know your thoughts about the day, suggestions are always welcome and the only way we can keep improving the event."

Thank you again,  
Joanna Torow, Chief Educator  
Maine State Museum

\* Adapted from an email Thank-you that was sent to Bug Maine-ia 2008 participants.

***Minor Order Word Search!***

R F O R F I C U L A B A L T T I C M P E R D A  
A O S P H A L M E C O P T E R A S T I R C L E  
L S P H A S M A T O D E A E A D I L L Y R G A  
M H I O L S S N C A M E L C R I C K E T I T O  
K T S H R A M T E T R I G I D A E S P K C O R  
A L O C U S T I L T I N S G S P A P O R K A T  
T H P A A S H D P I T D P O D U R I D A E R H  
Y L T O P T H Y S A N U R A A R P R U Z T E O  
D M E R E S O B O O K L I C E S W H R Y S T P  
I D R K S O M E C O O K N U T C A T I S E P T  
D I A C E A R W I G S L G L A C R I D I D A E  
S C H O O D I C D B L A T T O D E A A N I M R  
S I O C O L L E M B O L A E T I M R E T E R A  
S A S K S M I N T H U R I D A E A T C H W E A  
A N T L I O N I U B E I L A C E W I N G T D N  
L E A D I R U H T N I M S N A K E F L Y S O D

**FIND THE WORDS!** In the diagram above, find each of the following entomological terms, related specifically to this summer's Blitz for minor orders at Schoodic Point in Acadia National Park. Words can be forwards, backwards, vertically up or down in the matrix. Some letters are in more than one word.

- |                  |               |               |
|------------------|---------------|---------------|
| Collembola       | crickets      | psocid        |
| springtails      | lacewing      | booklice      |
| Sminthuridae (2) | Phasmatodea   | cockroach     |
| Thysanura        | mantid        | Poduridae (2) |
| Gryllidae        | Schoodic      | Tetrigidae    |
| Blattodea        | locust        | Acrididae     |
| thrips           | katydid       | Orthoptera    |
| Mecoptera        | camel cricket | earwigs       |
| Dermaptera       | Isoptera      | ant lion      |
| Forficula        | snake fly     | termite       |

*Comparative studies show that humans have 792 distinct muscles, whereas grasshoppers have 900, and caterpillars may have as many as 4,000 separate muscles.*

## DON'T FORGET YOUR CALENDARS!

If you've been putting off planning your Christmas shopping until you saw the announcement, wait no more! The 2009 M.E.S. calendars are soon to be on their way home from the printers! We had scores of great photos to choose from!



The 2009 M.E.S. calendars will be every bit as gorgeous as the 2008 edition, updated for the new year and featuring photos by YOU, the M.E.S. members. They make great gifts for your entomological friends, and great at-home reminders of all the M.E.S. events as well - the events are already entered on the appropriate dates!

The calendars remain at \$10 each if you pick them up, or \$12 if you want it mailed to you. Contact Dick Dearborn at 115 Spring Hill Rd., Mt. Vernon, ME 04352, or by e-mail at [modear@prexar.com](mailto:modear@prexar.com), OR by telephone at (207) 293-2288.

### Looking for Another Gift Idea ?

Take a look at the relatively new (2007) *Kaufman Field Guide to Insects of North America*, by Eric R. Eaton and Kenn Kaufman. Houghton Mifflin Co. 392 pp. It's well done and at less than \$20 it's a good buy for our area. (- Dick Dearborn)

## Cold Weather Moths!

by Dick Dearborn

Spotting a small geometrid moth on my kitchen wall the other day was a reminder that moth activity may slow down with the colder weather, but it doesn't stop. November is a time of activity for the so-called "Hunter's Moths." While a number of species do occur, two of the more common are the frail tan males (the females are wingless - yes wingless !) of *Operophtera bruceata* and *Alsophila pometaria* (Geometridae). These moths may fly into December on milder days as males seek a mate! If you want to find the fascinating wingless females, look carefully at the bark on trees with highest male activity. From now through spring you may also see the huskier, hardier pinions and sallows (Noctuidae: Cuculliinae) which can even fly on milder nights in January.

### COMING M.E.S. EVENTS in 2009:

(See <http://www.colby.edu/MES/> for more detailed information; stories on the Winter Workshop and Blitz elsewhere in this Newsletter.)

- |                    |  |
|--------------------|--|
| 17 January, 2009   | Winter Workshop on Minor Orders:<br>MFS Entomology Lab, Augusta        |
| 23 May, 2009       | MES Field Day, York County   |
| 20 June, 2009      | MES Field Day, Rangeley Area   |
| 18 July, 2009      | MES Field Day, Augusta Area  |
| 7-10 August, 2009  | Minor Order BioBlitz, Schoodic Point,<br>Acadia N.P.                   |
| 12 September, 2009 | Annual Meeting, Rock Ridge, Clinton                                    |
| 16 September, 2009 | Bug Maine-ia at Maine State Museum<br>Wednesday, from 9 a.m. to 3 p.m. |



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Please visit our website at <http://www.colby.edu/MES/>

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