



The Gloworm

Catching fish with artificial bait that resembles insects dates to Roman times (2nd century) and independently in the mountains of Japan.



Volume XXIII No. 4

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

July-September 2016

After 24 years, the Paper Edition of the Gloworm is being Dropped into a Kill Jar but not by Dr. John!

This is the last paper edition, due to budget cuts, and will sever our ties with over 800 campers, parents of or friends of the Gloworm. Please consider switching to our email version by sending your email address to j.guyton@msstate.edu, with *Gloworm* in the subject line. We look forward to staying on contact with you.

However, before we go there are some things we would like to know...

Your camp story?

The Gloworm articles that you remember?

If you were a camper, did you do a science fair project concerning arthropods or insects?

Have you written any stories about insects or arthropods?

Are you working as an entomologist, or preparing to?

Did you take or are you taking any entomology courses in college?

What is your career? Career plans?

What influence, if any, did camp have on you?

What year(s) did you camp with us? Do you have any pictures to share?

Would you enjoy a Camp reunion?

Please email your responses to j.guyton@msstate.edu with *Camp Story* in the subject line.

The International Congress of Entomology was Great with Four Bug & Plant Campers Speaking!

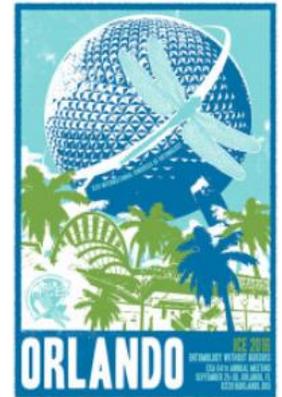


The International Congress of Entomology (ICE) is 106 years old and meets every 4 years. Only five Congresses have been held in North America (Cornell, USA 1928; Montreal, Canada 1958; Washington, D.C. USA 1976; Vancouver, Canada 1988 and Orlando, USA 2016). The next ICE will assemble in Penang, Malaysia December 3 - 4, 2020.

I enjoyed working the preconference Teacher Workshop and the Insect Expo with my counterparts from all over the country. It was especially enjoyable to have campers Wes Campana, Breanna Lyle and Matthew Thorn assisting as well! All three also presented papers and their presentations were very well received! Breanna placed

second in the world in the Linnaean Games!

A fourth camper, Nicholas Homziak who is working on a Masters in Lepidoptera at the University of Florida, was on the agenda. However conflicts prevented my attending his sessions.



What's New at the Zoo?

The Ambassador molted on September 15 and has returned to service as the Extension Arthropod Zoo's "Ambassador!" We have given her over a month to adjust to her new size and allow her skin to harden. Her first time out of her habitat she was a little slow to respond and after a couple minutes was ready to work and walked over 3 or 4 people's hands! The bald spot on her abdomen is gone, she is notably larger and still has her gregarious people loving attitude!



Mexican Jumping Beans

We brought a few jumping beans home from ICE. Be sure to ask to see them if you stop by the zoo over the next couple months.

The seeds of deciduous desert shrubs (*Sebastiania pavoniana*) host the moth's larvae (*Laspeyresia saltitans*). And jumping "beans" is a little misnomer, they are actually seeds. It is like: "all bugs are insects but not all insects are bugs (true bugs or Hemiptera)." Beans are a kind of seed or legumes: peas, legumes, lentils, hyacinth, soybeans or coral beans). Oh, and like coffee beans are a fruit!

Jumping Beans life cycle starts in the spring when the female moth lays an egg on a flower's ovaries. When the egg hatches the larva burrows into the capsule and begins feeding on the seeds developing inside. Only seeds without larvae will mature.

The tan to brown "beans" jump in response to heat, probably in an effort to reach shade and possibly to hide from predators. During the winter they pupate and remain motionless. By spring the adult moth is ready to emerge and begin the cycle again.

The moth larvae can hop for relatively long distances because of the convex shape of their capsules (see photo).

An ancient game involves placing competitors' beans in the center of a circle on a piece of paper and watching to see which wins the race across the circle.



Photo by J. Guyton

Brady is Rearing Stag Beetles

Brady Dunaway, a MSU Extension Arthropod Zoo Keeper, collected and has been rearing several stag beetle larvae in the zoo, and they are beginning to emerge.

Female beetles lay fertilized eggs in rotting trees or stumps where the grubs hatch and mature. Check rotting logs along streams or rivers. The larvae may take as long as 4 years before pupating after which they will emerge as adults at the beginning of the next flight season. At this point most of their life is behind them and they will only live for several months as adults.



Photos by J. Guyton

Note: I have not seen many stag beetles in campers collections in recent years and we have been collecting in suitable habitats. It seems unlikely but it has been mentioned that their grubs' lengthy development time, that can span several years, may be interrupted by the removal of dead timber.

We Have Ticks (seed ticks – the larval stage of a tick)!

Thanks to Santos Portugal and Dr. Daniel Fleming we have a pint jar full of Lone Star Seed Ticks (*Amblyomma americanum*) in the Extension Arthropod Zoo. The white dot or "star" in the center of the female's back (not pictured) easily distinguishes her from other ticks.

The star is part of her shield. These are aggressive ticks and known to travel great distances in search of a host. The Center for Disease Control and Prevention list the following diseases associated with this tick: Monocytic Ehrlichiosis, Tularemia and possibly **Lyme Disease** and **Rocky Mountain Spotted Fever**.

The photo shows at least a couple thousand seed ticks on a piece of paper towel. The Extension Zoo demonstration is to clasp a hand on the jar over the location of a large group of ticks for a minute or so warming the ticks (through the glass jar) to show their resulting fast and extensive movement! At this point the audience often wants to know if it is safe go outside and are ready to learn prevention measures! This many seed ticks alarms many entomologists who have stopped by and made suggestions for their disposal or accidental release! If we have a similar collection of seed ticks next season we will add the means to safely inject carbon dioxide into the jar to demonstrate its function in activating ticks.

The trouble with ticks is too complex for a newsletter article, so we just touched on the complexity and suggest you make a more complete internet search.

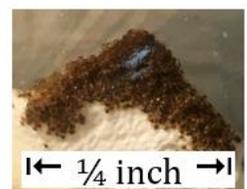


Photo by J. Guyton

Prevention – This may be the most difficult task. Ticks are small, not easy to see and found almost everywhere! They predominantly live in grass, wooded or bushy areas laying hundreds of eggs and that is a good place to start. Pets love to romp through high grass and some seem to be tick magnets! Long pants tucked into tall boots and duct taped is a good start. The final tape wrap should be made sticky side out to collect ticks climbing the outside of the boots and your pants. Treat your boots and pants with a Permethrin tick repellent. You can do this treatment ahead of time and allow to dry and add a last spraying before entering the field or woods. Fipronil, Permethrin and Pyrethrins (5%) are common active ingredients for tick control on dogs or cats. Walk in the center of trails avoiding contact with shrubs or grass. I prefer DEET and 20-30% will work on skin or clothing. Follow label directions!

Tick Removal – Most ticks do not carry disease and their bites do not cause serious harm. However, their immediate removal is very important. After a collecting trip through the grass inspect your net and do a body search. Seed ticks are very hard to see. If you are itching, head for the shower. You may as well shower your clothes (not on your body) and net as well. Hot water will kill them. It is best to shower before they bite. Inspect yourself carefully including your back, underarms, in and around your ears, inside belly button, between legs, behind your knees, around your waist, and in your hair. Carefully inspect your dogs, daypacks and collecting equipment. Alcohol wipes work on crawling ticks. Ten minutes tumbling dry clothes in a hot dryer will kill ticks.

People working where they know ticks are a problem often take tape and apply it over areas where they find ticks and remove them with the tape. Alternately you can wipe them off with alcohol wipes.

If they are already biting their removal is important. If you live in tick infested areas you should invest in a tick remover or key. I keep one with me during tick season. Different models are available and they cost less than \$5. The Center for Disease Control Tick Removal Guidelines follow:

1. Use fine-tipped tweezers to grasp the tick as close to the skin's surface as possible.
2. Pull upward with steady, even pressure. Don't twist or jerk the tick; this can cause the mouth-parts to break off and remain in the skin. If this happens, remove the mouth-parts with tweezers. Wipe the area with alcohol and resist handling the ticks with bare hands.
3. After removing the tick, thoroughly wash the bite area and your hands with warm soapy water, or rubbing alcohol.
4. Dispose of a live tick by submersing it in alcohol, placing it in a sealed bag/container, wrapping it tightly in tape, or flushing it down the toilet. Never crush a tick with your fingers.

Itch Relief – A cold compress is a good place to start and this often relieves the itching and prevents or reduces swelling. Analgesics help with pain, fever and the itchiness. Cortisone cream is also useful in reducing the inflammation and even the redness. The next level of treatment is the use of antihistamines (non-sedating) and these should be continued until the itchiness and swelling are gone. For broken skin or blisters use an antibacterial ointment.

Bug Club Activities, A Special Urgent Note to Extension Agents

I hope to provide 4-H Volunteers with training on mosquito abatement as a 4-H Club initiative this coming February. These would be year round clubs working to make our communities safer. This has great potential to popularize 4-H and provide youth with the opportunity to make significant contributions to the health of people in their communities.

Mosquito abatement will be an important spring through fall activity, however I will continue developing and providing enough activities to last throughout the year.

Mosquitoes, the Most Incidious Disease Vector in Humans' History

A Call to Revisit and Reinvent Mississippi's Corn Clubs to Address a Health Need – Bug Clubs

Mosquitoes are the most deadly animals on earth. The vector-borne diseases transmitted by mosquitoes cause more deaths each year than humans do in crimes and wars combined.

With the emergence of the Zika virus and the declaration of a new *global health emergency* by the World Health Organization there needs to be a concerted response where mosquitoes breed and live. As an Extension entomologist it is important that every Extension agent understand that carriers of zika virus *Aedes albopictus* are in Mississippi. *Aedes aegypti* have been here, are all around Mississippi, and they are in all probability coming back, if not already here and not yet trapped!

In the spirit of Corn Club Smith, founder of corn clubs - the forerunner of 4-H Clubs, it is time to revisit the usefulness of the progressive education movement's most famous offspring, 4-H Clubs. Smith, superintendent of

schools in Holmes County Mississippi during the late 1800s, saw a need to diversify the crops being planted by Mississippi's farmers and realized the potential of training youth in improved agricultural practices. As Corn Club members began experimenting and later became farmers they were more scientific in their practices. Our schools are in trouble and seem to have lost their compass. The criticality of mosquito vectored viruses has the potential to provide youth with an important mission that will give them and 4-H high visibility. Opportunities are plentiful and range from science fair projects and interdisciplinary instruction opportunities to reinventing a progressive, proactive 4-H Bug Club.

The Zika Virus has Arrived

Thus far most 3,951 travel related, 139 locally acquired, 33 sexually transmitted zika cases and 1 lab related have been reported in the US. Travel-related cases of Zika virus infection have been confirmed in Mississippi but no locally-transmitted cases have been reported. It is not a matter of **if** zika arrives in our communities, it is **when**. A CBS Newswire Zika expert was credited with saying "DEET should be Miami's new perfume." This is serious and and it is an opportunity for 4-H Clubs to become involved in an important service project that will earn them much credit and contribute to a more healthy community.

The Mississippi State Health Department reported 38 cases and one death in 2015. As of October 2016, 23 cases have been reported in Mississippi.

The the yellow fever mosquito *Aedes aegypti* and the Asian tiger mosquito *Aedes albopictus* are carriers of Zika virus. The Asian tiger mosquito is common in Mississippi and the yellow fever mosquito is in Florida and Louisiana. What do you want to bet the yellow fever mosquito is hiding among the 60 species of mosquitoes found in Mississippi and has not been found, yet? Thankfully not all mosquitoes carry diseases.

Yellow fever found its way to Mississippi before. I remember my grandparents' stories of the 1878 yellow fever epidemic in Noxubee County, MS. The mortality rate for the state was 25.7%. Reconstruction following the war between the states was nearing an end, political turmoil at an all time high, refugees clogged the roads and trains fleeing contaminated areas, commerce came to a halt, quarantine lines were established around towns, entire families died, towns died, everyone suffered. Mississippi was not alone and adjacent states experienced similar conditions. Yellow fever was transmitted from person to person by the *Aedes aegypti* mosquito.

Aedes aegypti has not been detected in Mississippi since the early 1990s and MS State Health Department officials are currently conducting surveillance for *Aedes* mosquito populations in every county in the state.

Source: Goddard, Journal MSMA Vol 57, No 6, 2016.

Mosquito ID

Both the yellow fever and tiger mosquitoes have (1) white bands on their tarsi, banded abdomen and short palps with white tips.

The differences include:

The yellow fever mosquito is a small dark brown to black mosquito with silver-white markings including silver white lyre shaded lines on the sides of their thorax.

The Asian tiger mosquito is very similar in appearance to the yellow fever mosquito. It is dark brown to black with silver-white markings that include a silver stripe down the center of their thorax.

(Picture and descriptions from The Mosquito Book Exploring the World of Mosquitoes by Ed Boles; Edited and Updated by P. Guyton, J. Guyton, & W. Varnado)



The Mosquito-borne West Nile Virus is More Deadly Than was Thought

A new study by Randy Dotinga suggests that West Nile virus might often kill people months or years after infection. Until a vaccine is funded and developed prevention is the rule. The only way to prevent infection is to prevent mosquito bites. The only way to reduce bites is to reduce the mosquito breeding sites. 4-H Bug Clubs can be a major player in this arena!

Effective Mosquito Management Starts with an IPM Approach

This is the title of the Entomology Society of America's Policy Document for mosquito management. Integrated Pest Management is where Bug Clubs can attract a huge amount of local attention and make their communities healthier. "All public health agencies must adopt IPM principles for pest and disease control, including the important step of informing and engaging all stakeholders."

"IPM for mosquitoes involves identification of mosquito species and surveillance of their populations at all life stages. When populations of mosquitoes (immatures, adults, and especially pathogen-infected females which feed on blood) reach action levels, public health officials take steps to lower those populations using a variety of tactics that may include draining standing water to reduce populations of immature mosquitoes, releasing fish that eat immature mosquitoes, and treating immature and adult mosquitoes with pesticides. When mosquito populations need to be managed, professionals should use science-based IPM tactics that are effective, minimize harm to the public and the environment (including insect pollinators), and are sustainable. These tactics also extend to minimizing harm to honey bees and other pollinators. Although insect pollinators may be sensitive to some of the products used for mosquito control, their risk can be effectively managed by applying them in ways that maximize exposures to mosquitoes and minimize exposures to pollinators."

Bug Club members can learn to identify mosquitoes and their breeding sites. Many neighborhood breeding sites can easily be eliminated by 4-H Club members and you can likely get city and county maintenance to eliminate others. **4-H Can Make a Difference!**

Reference: http://www.entsoc.org/sites/default/files/files/EntSocAmerica_Mosquito-Management-Recommendations.pdf

A Surprise in Guyton's Insect-Pitcher Plant Interaction Tie

ICE seemed the perfect occasion to wear one of my insect-plant interaction ties. The MSU Crosby Arboretum provided the pitcher plant (*Sarracenia*) and I collected local carpenter ants. It was immediately apparent the tie was quickly making a large meal of the ants. Thankfully, Dr. Rebecca Baldwin's, (Bug and Plant Camp, 2015 and faculty member at the University of Florida) student, who has a carpenter ant farm, came to my rescue. I put some of his ants on display at ICE and fed the seemingly ravenous plants in my tie the others.

And then came a pleasing surprise, a pitcher plant caterpillar (*Exyra*) made an unexpected appearance chewing its way through the side of a pitcher! So, twice the excitement for ICE: a carnivorous plant at work dining on ants and a moth that easily negotiate the slippery interior walls of the pitcher plant dining on its leaves and calling it home! These moths mate in the pitcher plants with the male and female positioned heads-up. Caterpillars that emerge from tiny white eggs laid inside and just below the top will sometimes girdle the leaf, or pitcher, causing the top to collapse thus protecting them during development. Before pupating they often chew a drainage hole to prevent flooding. An auspicious tie for an auspicious occasion, ICE!



Registration is open for Bug and Plant Camp - June 11-15, 2017

Camp typically fills fast so please don't hesitate to register. Forms will soon be on our website or you can email Dr. Guyton at j.guyton@msstate.edu or Peggy at bugcampmama@gmail.com and they will forward the requisite forms.

Following registration we will send you a PDF of the Mississippi 4-H Entomology Manual and the Mosquito Book. We will be having a Linnaean Games competition during camp and questions will come from these books and programs during camp.

We are already working on the agenda! If you are a repeat camper and hope we will not eliminate your favorite activity or have a suggestion for something we haven't done, email us and let us know.

Camper Sophia Relates her Camp Experiences on BioQuip's Website

Every year at the Entomological Society of America's annual meeting I enjoy a conversation with one of BioQuip's owners, Louise Fall. This year she saw me coming before I saw her and she rushed to greet me asking if I had seen their website. On BioQuip's front page is a picture of Sophia DiPiazza, a camper from last summer that, when clicked, will take you to an article, by Sophia, about her entomology camp experiences last summer. Louise

has been a supporter of our camp for years, but providing a scholarship for Sophia was unique. BioQuip was so impressed with the 5 county 4-H Entomology Field Day Sophia designed and conducted they gave her a scholarship. Sophia earned the Emerald Star award in 4-H for the event. BioQuip supplies nets, aspirators, and other equipment to the entomology community, including us, so Sophia's article on their site is wonderful exposure. We found Sophia as exciting as Louise did and we enjoyed sharing stories about our young entomologist during ICE. Check it out her story at: <https://www.bioquip.com/>.

Ode to Tom Turpin & John Guyton

Colorful Characters in Hats

John with his tie and Tom with his hat,
Had just discussed the crickets Tom spat;
The carnivorous tie and ants at John's neck,
And flying crickets, what the heck?
Tom's signature bowtie and John's IPM hat,
Can only mean its bug time, and that is that!



That Leaf is Not Just Blowing in the Wind, and Neither were the Pebbles!

Dr. Daniel Flemming provided the evening entertainment at BugFest on Thursday night. When he reported a pebble suspended from a piece of silk above a trail we grabbed our flashlights and headed out to have a look. And sure enough there was a white pebble about eye height suspended from a single silk thread disappearing into the tree above.

Before the excitement of BugFest each morning Peggy and I grab cups of coffee and enjoy a relaxing walk around the arboretum. But the morning's walk this year had a theme, Peggy and I wanted to see that pebble in the light. Unfortunately it was gone, but now our senses were primed and we were delighted to find a set of pine needles suspended from a silk thread beside the trail. We followed it aloft and saw an orb weaver and its web! On closer inspection we noticed it was anchored on two sides in the branches of a tree with the third pulled taut by the dangling pine needles! Along the trail we also saw the suspended leaf in the image and a couple more and a couple more suspended pebbles! We realized we had seen leaves "caught" and suspended before but never paused long enough to understand what we were seeing!



Leaf from movie by J. Guyton

What engineers. Obviously the spider needing a third anchor point, descended to the ground paying out silk as it descended, attached it to a pebble, re climbed the silk thread and then pulled the pebble off the ground and attached the silk to the web suspending the counter weight. The weight of the pebble pulled on the bottom of the orb keeping it fully expanded!

During visitor orientation we suggested they watch for leaves blowing in the wind describing what they would be witnessing. And many stopped by before leaving and excitedly reported seeing this marvel of nature during MSU's BugFest at the MSU Crosby Arboretum.

Malaria, the Most Insidious Vector Borne Infectious Disease since the Dawn of History

Part 1 by Dr. John Guyton (A two part article, see the conclusion in the next Gloworm)

The history of malaria and the search for the fever-bark tree in Margaret Kreig's book *Green Medicine* bears retelling. Much of what follows paraphrases her description with updates from a National Geographic article *Bedlam in the Blood, Malaria* (July 2007), A History of Entomology in Mississippi and my notes and anecdotes. I deeply appreciated Dr. Jerome Goddard's review and comments. And, now malaria....

Sir Ronald Ross, who determined malaria was carried by mosquitoes in 1897, wrote "Malarial fever is important not only because of the misery it inflicts upon mankind, but also because of the serious opposition it has always given to the march of civilization... .. no wild deserts, no savage races, no geographical difficulties have proved so inimical to civilization as this disease." Malaria remains one of the major causes of morbidity and mortality primarily affecting third-world countries. We will get to Ross again as we explore the interesting history of malaria.

During the "eradication era", fifty some odd years ago, malaria was eliminated or suppressed in many parts of the world by oiling standing water, draining swamps and the use of DDT, including spraying the inside walls of houses and nets that were hung over beds. However, malaria is rebounding in many areas in-part because of antimalarial drug resistance. Many state health departments and the Center for Disease Control are worried that as

global warming progresses malaria will follow tropical climates to higher latitudes. Best estimates suggest there are 300-500 million cases and 1-3 million deaths per year. Over 90% of the cases are in sub-Saharan Africa where almost all deaths are among African children under 5 years of age. Increasing worldwide travel makes its spread a potential global epidemic for over 2 billion people, or 40% of the world's population, in about 100 countries. Compounding this threat is mosquitoes increasing resistance to insecticides and antimalarial drugs.

Malaria comes in the night when a female mosquito in need of a protein rich hemoglobin, or blood, meal to nourish her eggs tracks down her victims by following their carbon dioxide trail. Her antenna is capable of detecting minuscule amounts and guiding her toward greater concentrations. To prevent the blood from clotting and clogging her, harder than calcite sclerotin proboscis, that is intricately molded in soft protein, she spits an oily saliva to lubricate the bite area. And this is where and when the infection takes place. In her saliva are the minute single-cell, worm-like parasites, or plasmodia. There can be 50,000 of them in a drop the size of the period (.). Within minutes they exit the circulatory system and bury into the liver where they can remain undetected for a week or two...

The first stage of malaria consists of muscle soreness, backache followed by chills and uncontrollable shaking, the next stage involves high fever, severe agonizing headaches, vomiting and in the final stage the infected person's temperature drops and they sweat profusely experiencing a burning delirium. Infected people may also experience anemia, weakness and a swelling of the spleen. Even after the fever breaks seizures relentlessly return repeatedly, on the infecting parasite's schedule.

Correct identification and understanding of the disease was not possible until after 1880 when a young French doctor, Dr. Alphonse Laveran, found *Plasmodium malariae* in the blood of dying Algerian troops. Finally the disease had a name and a cause, but the prevention and cure remained elusive.

Some evolutionary biologists believe the single-cell malaria was an early organism in the scale of evolution and easily adapted to reptiles, birds and monkeys, that still experience forms of malaria similar to the human variety. In our early history it must have been a dreaded curse striking down the strongest and youngest without any apparent wound or cause, often wiping out entire settlements near stagnant ponds while sparing those on hill tops.

Cave paintings and fossil skulls show skulls were opened in trephining operations, the first surgical practice, as early as the Neolithic period, possibly to let the headache demons escape. The standard medical treatment became bloodletting and it persisted well into the 19th century. Malaria must have baffled early medicine men, who would have to wait centuries for the discovery of the fever tree. All that was available for the pain wracked sufferers was to lie on the cool ground or in cold streams praying for relief from what the Bible calls "the burning ague that shall consume the eyes" (Leviticus 26:16). Chinese Emperor Shên Nung, around 2700 BC, prescribed a hydrangea, Ch'ang Shan, in his *Book of Herbs*, that when tested by western scientists in the 1940's was found to have antimalarial properties. Other herbal remedies included: the febrifuge feverfew we now call bachelors button (*Chrysanthemum parthenium*), ague grass (*Aletris farinosa*) and arguweed or common boneset (*Eupatorium perfoliatum*). And there were more exotic treatments such as "Three drops of blood from the ear of a cat in wine. Must be administered by a lady of high birth." In hindsight, these herbal remedies do not sound so bad when you consider that since the medical treatment for the malaria parasites that destroy the iron containing hemoglobin in red blood cells causing anemia and prostration, was bleeding and purging that contributed to the patients' demise.

Blind faith in Galen, a Greek physician who practiced in Rome around 164 AD and produced about 500 books incorporating Hippocrates' and earlier ideas concerning the need to balance the four humors: blood, phlegm, black bile and yellow bile, successfully stifled the scientific investigation of the real cause of diseases for about 1,500 years! During this time the poor country folk were better served by wives using herbal remedies! This blind faith is made more unfortunate because about 50 years after Galen the Roman scholar Marcus Terrentius Varro wrote, "Marshes produce small creatures invisible to the eye which fill the air, enter the nose and mouth and cause loathsome diseases." Then during the time of Nero, "the agriculturalist Collumella warned that marshes 'breed animalcules armed with stings which fly upon us in exceedingly thick swarms and from which are contacted diseases, the causes of which even physicians are unable to understand.'" Blind faith prevailed and observation science was ignored, putting progress on the mosquito born disease into limbo.

The early Romans instituted a system of swamp drainage in a belief that poisonous vapors arose from stagnant water, known as the miasma theory. The Encyclopedia Britannica of the day stated, "Attempts have been made without success, to separate malarious poison from the gases generated by swamps..." A dictionary dating to 1890 described malaria as derived from *mala aria*, meaning bad air; specifically, the disease produced by air impregnated with poisons causing intermittent fever," A Kentucky physician suggested it was caused by decomposing vegetation under and around dwellings. Night air was thought to be hazardous so families were

encouraged to keep doors and windows closed at night. This likely helped but for a different reason - the Anopheles mosquito, that is the carrier of malaria, is most active at night and in the early morning.

A Baltimore physician, John Crawford, was the first to doubt the miasma theory and in 1807 and published a paper on the origin of fevers stating, "Malaria must be occasioned by eggs insinuated without one's knowledge into our bodies." So unorthodox was this notion that he lost most of his patients! An Alabama surgeon and a French naturalist concluded mosquitoes were the culprits in the 1840s and 50's but lacked proof. Dr. Albert Freeman Africanus King, a Washington D.C. obstetrician, generated a list of 19 reasons malaria was transmitted by mosquitoes breeding in the slimy marshes of Potomac flats and suggested a screen fence the height of the Washington Monument around the city would protect them from malaria.

The discovery of quinine from the bark of the cinchona or fever-bark tree spelled the end of Galenism, became mired in the exploits of explorer-naturalists and antagonistic religious sects, spawned rivalries between nations, generated commercial greed and international monopolies! Cinchona bark was the first specific treatment for a given disease as opposed to the common witches, brews of the day that contained numerous inactive ingredients. Its discovery is coded and obscured in legends. Father Calancha reported in the Chronicle of St. Augustine in 1633 in South America, "A tree grows which they call the fever tree in the country of Loxa, whose bark is the color of cinnamon. When made into a powder amounting to the weight of two small silver coins and given as a beverage it cures the fevers and terians. It had produced a miraculous cure in Lima." A treatment had finally been found and announced for the world's most devastating disease. One legend reported a tree fell in a pool during a violent storm and made the water so bitter the local villagers refused to drink it but a stranger with a burning disease who was passing by did and was cured. Another legend has it that the Jesuits, who chewed bark to differentiate trees were curious about the bitter bark and discovered its medicinal properties during their experimentation. Then there is the one of a marooned pirate ship's surgeon who watched ailing lions chewing the tree's bark. The most common and famous legend is now known to be inaccurate but it describes the Countess of Chinchon, the young wife of the Viceroy of Peru, who became ill. When word of her illness reached the Governor of Loja he sent a packet of quinaquina, the "bark of barks" and she promptly recovered and shared the cure with all who needed it in Spain when she returned. It became known as Contessa's Powder. We now know the first Countess died before her husband was appointed Viceroy and the second Countess was healthy until her death in Columbia, never returning to Spain. Linnaeus gave the Countess a nod in 1742 when he named the fever-bark tree Cinchona.

Medical historians cannot agree if malaria existed in the new world before the Europeans arrived or was brought to the new world from hot spots such as Rome and Seville by early settlers, by African slaves who had developed an immunity and were carriers or the first Asians to cross the Bearing Straits. In *The Conquest of Malaria* Dr. James Jaramillo-Arango, Rector of the National Facility of Medicine in Bogotá was convinced the Indians knew of the bark's curative powers before the Spaniards arrived and pretended ignorance hoping the disease would kill off the conquerors. Pizarro's soldiers were said to have preferred the indigenous herb doctors to their own lance happy doctors.

Catholic missionaries living in remote areas observed that ague could be successfully treated using fever-tree bark. Soon Spanish galleons were transporting balsams of Peru, Tolú, sarsaparilla and coca leaves to the old world. The absence of fever tree bark in manifest is interesting. Father Bartolome Tafur is thought to have brought the first fever bark to Rome, a malarial hot spot, in 1645. Soon the Jesuits were shipping fever-bark or "Jesuit's bark" to the Holy City. After a surge in the popularity of the powders the Archduke Leopold of Austria used them and then suffered a relapse and died, but not before denouncing the treatment bringing Galenical medicine back into vogue. For the first time in the history of the papacy the Roman conclave of 1655 concluded with no deaths from ague! Banners appeared accusing the Jesuits of trying to poison the Protestants with their powders and the cure became virtually unavailable in protestant countries.

To be continued...

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



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