SPOTLIGHT ON A SPECIES

The Clothes Eaters
By Lynn S. Kimsey

In the 1960’s edible clothing and clothes made of paper were all the rage. Thankfully, this was a short-lived fad, followed, unfortunately, by the Polyester Age. These periods of questionable taste were followed by demands for clothing made from natural fibers, such as cotton, wool and silk. This change in fabrics had many positive benefits, including supporting the agricultural industry, more comfortable clothing, and from the insect point of view, the creation of an enhanced food supply. Unfortunately, several of the natural fibers, wool and silk, are the ideal food for certain insect pests. Given these changes some misunderstandings arise, such as the question recently sent to our departmental website:

Maybe you can help, maybe not. For the last 8-10 years I & many others have been suffering with something making little holes (often accompanied with a whitish smear around them) in our mostly cotton type shirts. The holes are always around the belly button area & occasionally off to the side. There are several web pages devoted to this subject with causes ranging from rubbing against counter tops to seat belts, regular belts, tabs in jeans, washing machine, etc. I know for a fact that this is not the cause & am being driven mad by what is. I do believe it is some kind of microscopic insect, but how would it know to only eat material around the belly button area? I have been saying for several years that I would contact an Entomologist about this, so here it is. Something is going on but it is such a mystery. Any chance your department has heard of this problem & what the bug could be? I would be most grateful for your input, so would my pocket-book.

As fun as it would be to discover a cotton fiber eating insect, I’m sad to say there is no such thing. Several things have happened in the textile/fashion industry in the past decade. First, the quality of cotton fabrics and the types of weave have changed. Cotton is now often mixed with spandex and other synthetic fibers. These aren’t edible to insects either. By and large people who suffer from “belly button holes” are women.

Happy holidays Santapede! Photo courtesy of Eugene Kornienko. And no, this image has nothing to do with the article...

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Our December Open House was a great success. We had a number of local artists displaying their insect art and more than 75 visitors, most of whom stayed the whole open house.

Artwork on display was wide ranging, including sculptures by Leo Huitt, sculptures and prints by students in Diane Ullman’s Art/Science Fusion Program, photographs by Kathy Keatley-Garvey and Greg Kareofelas, prints by Fran Keller, drawings by Lynn Kimsey, Mary Foley Benson and Nicole Tam, drawing and prints by Ivana Li, and prints by students in Bryce Vinokoruv’s ART 011 class.

Remaining Open Houses

- Sunday, February 8, **Biodiversity Museum Day!** (open house with Wildlife Museum, Herbarium, Anthropology, Paleontology and the Botanical Conservatory)
- Saturday, March 14, **Pollination Nation** (native bees, honey bees, beetles and flies)
- Saturday, April 18, **Picnic Day**
- Saturday, May 16, **Name That Bug! How About Bob?** (taxonomy, species identification)
- Saturday, July 18, **Moth Night** (This is an evening event from 7-10 pm with black lighting. National Moth Week is July 19-25)

New Display Cabinets

Eight pedestal style display cabinets were donated to the Bohart Museum by a local company this fall. We plan to have them housing new exhibits in time for Biodiversity Museum Day, Feb. 8.

Insects and Art December Open House

Leo Huitt, is the artist who created several wood sculptures in the museum, including our black widow. He brought a great rhinoceros beetle made from a violin. Photo by Kathy Garvey.

Ivana Li displayed some of her drawings and prints. Photo by Kathy Garvey.

Marlen (left) and Elena Cazares of Woodland with the butterfly ornaments they made at the open house. Photo by Kathy Garvey.

Three bees print by Theresa Fukuda in ART011.
Evert Irving Schlinger (1928-2014)
A Personal Tribute by Michael E. Irwin

Evert Irving Schlinger passed away during a spectacular lunar eclipse in the early morning hours of Wednesday, October 8, 2014. He is survived by his brother Warren and sister-in-law Katie Schlinger, his four children Pete, Mathew, Jane, and Brian, and his 11 grandchildren.

Ev earned a B.S. degree from the University of California, Berkeley, in 1950 and a Ph.D. from the University of California, Davis, in 1957. Ev was a member of Calpha fraternity, a life and charter member of the Cal Aggie Alumni Association, and a recipient of the Award of Distinction by the College of Agriculture and Environmental Sciences, UC Davis. He was also an Honorary Member of the Council of the International Congresses of Dipterology; and a Fellow and Trustee of the California Academy of Sciences.

Over his career, Ev was instrumental in advancing the sciences of biology, agriculture, biodiversity, and sustainability. His research focused on two diverse yet complimentary areas of science: an innovative approach to biological control of agricultural pests, and the biology, taxonomy, and evolutionary ecology of parasitic flies belonging to the dipterous family Acroceridae, commonly referred to as spider flies, small-headed flies, or, as Ev preferred to call them, “Acros.”

His research into biological control began after receiving his Ph.D., when he accepted a position as a research entomologist with the biological control unit at the University of California Citrus Experimental Station, Riverside. In 1963 he was awarded a professorship in systematics in the newly formed Department of Entomology at UC Riverside. That proved a milestone in his career, directing his thoughts and energies into systematic research, teaching, and administration.

His study of spiders and acrocerid flies, their obligate parasites, began when he was a child and was a driving force throughout his career. His Ph.D. dissertation was on the systematics of Ogcodes, a genus of Acroceridae found throughout the world. His research on acros was aimed at understanding big-picture questions about them: their evolution, biogeography, and their fastidious and intricate relationships with spiders. Throughout his career, he maintained thousands of spiders in captivity. His passion for acros was so overpowering that he reared spiders during the seven years he pursued a career in biological control and even after he retired.

Ev’s father was one of the original founders of United Parcel Service, who, during WWII, was often paid in preferred stock rather than cash. Ev’s parents eventually placed some of the preferred stock into a family foundation. They endowed the Schlinger Chair of Systematics at Berkeley and another chair at Cal Tech, where Ev’s older brother, Warren, had studied. When Ev’s parents died, the Foundation was passed down to Ev and Warren. They ran it jointly for a while, but Ev preferred it be used to support research, while Warren wanted it to fund higher education, including scholarships. They eventually split the foundation in two, with each controlling one of the two new foundations.

As President of the newly formed Schlinger Foundation, Ev made funds available for research in dipterology, arachnology, biodiversity, biosystematics, and evolutionary biology. The foundation awarded five endowed chairs to institutions in California - at the California Academy of Sciences; University of California, Berkeley; University of California, Davis; Santa Barbara Museum of Natural History, and the Australian National Insect Collection. He also encouraged and initiated long-term insect surveys in Madagascar, Fiji, New Caledonia, Australia, India, and elsewhere.

Ev was unquestionably among the most talented, innovative, and inspiring of entomologists; his reputation is broad-based, widespread, and stellar. His family, students, and colleagues all found in Ev a life-long friend whose parting has left a deep void. He will long be remembered by all of us. To me, he will always remain a great mentor and my best friend.


Ev Schlinger. Photo courtesy of Gail Kampmeier, Illinois Natural History Survey.

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commercially, which are either plant or animal derived. Plant fibers include cotton, hemp, kapok, agave, sisal, etc. These fibers are composed of cellulose. Animal fibers are quite different. They are derived from wool or hair, silk and feathers and are made up of proteins, such as collagen, keratin and fibroin. Cellulose and complex proteins require specialized digestive enzymes that are only found in a few groups of insects. Insects such as termites and walking sticks either produce digestive enzymes themselves or have microbes that do it for them. Fiber forming proteins is similarly difficult to digest. Keratin is nearly as difficult to digest as cellulose.

However, we’re talking about insects so there are plenty of possibilities. Two types of insects stand out as eaters of animal fibers, carpet or hide beetles and clothes moths. The larvae of both of these groups specialize in feeding on debris in animal nests, dry carcasses or other kinds of dry proteinaceous animal materials. The fact that humans began using animal fibers for clothing and other needs worked out great for them.

Carpet beetles (family Dermestidae) are small oval insects, with fuzzy, caterpillar-like larvae. They are common indoor pests, and the most common species is the varied carpet beetle (genus Anthrenus). The adults disperse outside in the spring and early summer and can enter homes through open windows or doors, or are carried inside on cut flowers, furniture and even boxes. The larvae can cause serious damage to clothing, carpets, furs, feathers, stored foods, and even museum specimens. Carpet beetles will also feed on dried food residue in kitchen cupboards, beneath appliances and behind cabinets; they are pretty much a multipurpose pest.

Clothes moths (family Tineidae) have similar habits. The adults are small silvery moths that prefer dark places. They lay eggs on things that their caterpillars can feed on, like wool clothing, feathers, even silk. The adults don’t feed, having enough food reserves carried over from the larval stage. They are particularly attracted to soiled carpeting or clothing. There are several species in North America that feed indoors, the common clothes moth (Tineola bisselliella), and species of casemaking clothes moths in the genus Tinea.

Control of these pests requires a couple of approaches depending on the insect. Infested food products can be treated by freezing. Clothing can be treated by freezing or dry cleaning, depending on the item.

Carpet beetles are more difficult to control because they are more commonly found indoors. They also feed on loose pet and human hair, skin flakes, feathers, food residue in kitchens and pantries and dried dog or cat food, and they fly outdoors, particularly in the spring. So they must be controlled by keeping food residue cleaned up, frequent vacuuming and keeping susceptible products in sealed, plastic, metal or glass containers.

Clothes moths will also fly outdoors but are less common than carpet beetles and are more likely to be introduced in infested clothing, blankets etc. There are pheromone traps available for clothes moths but these are more useful to monitor their presence than to control them. The best approach to prevent problems is to clean wool clothing at the end of the season it is worn, seal it in plastic bags and store it until it will be worn again. The same applies to wool blankets.

Although you will never entirely prevent these pests from entering your home. A few simple precautions , outlined above, will prevent much of the damage they can cause.
MORE MUSEUM NEWS

Thanks to All of Our Donors in 2014!

**Wasbauer Challenge Grant**

Huge thanks to Marius and Joanne Wasbauer for their challenge grant and thanks to all of you who rose to the challenge. We successfully raised a little over $10,000, which will be added to the museum endowment! The interest from the last three years challenge grants have been issued is equivalent to a student assistant salary for an academic year! Thank you all for your generosity!

**Specimen & Book Donors**

We haven’t acknowledged all of our specimen, book and data donors in previous years, so here they are and many thanks to all!

- Larry Bezark
- Larry Bronson
- Cal Poly San Luis Obispo
- Gil Challet
- CuriOdyssey
- Glen Forster
- Henry Hespenheide
- Dave Kistner
- Barbara & Daniel Kurtak
- Frank Maglio
- Dick Meyer
- Richard Miller
- Joyce Rabaud
- Raymond Ryckman
- Charles Smith
- Jeff Smith
- Norm Smith
- Robin Thorp
- Paul Tuskes
- U.S. Fish & Wildlife Service
- Ralph Wells
- Rick Westcott

**Paul Tuskes Saturniid Moths**

Paul Tuskes received his Ph.D. in Entomology at UC Davis some years ago. He amassed a large collection of North American saturniid moths and their caterpillars. At the same time he and his wife got heavily involved in orchids and the American Orchid Society. This year Paul began donating his terrific collection to the Bohart Museum. His collection of saturniids includes 108 caterpillars and 1472 moths.

**Financial Donors**

- Larry Allen
- Fred Andrews
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- Larry Bezark
- Susan & Hank Borenstein
- Richard Brown
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- Robin Thorp
- Paul & Ann Tuskes
- Larry Vanderhoef
- Laurel Walters
- Marius & Joanne Wasbauer
- Robert Washino
- Richard Westcott
- Tom Zavortink

Maia Lundy and Tom Nguyen reassembling rhinoceros beetles from Peru that were confiscated by the U.S. Fish & Wildlife Service and donated to the museum.

Hemileuca maia. Photo by Gerald Lenhard.
Tardigrades are commonly called water bears because of their superficial resemblance to bears. They are rotund, with a tubular, pig-like snout, and eight short legs tipped by long claws. They are a poorly known phylum of aquatic and semi-aquatic invertebrates.

Water bears have unique structural and physiological adaptations, and can survive extreme environmental conditions. They can survive temperatures above the boiling point or below –200°C (-328°F), withstand the vacuum and cosmic radiation of outer space and pressures of 1,200 atmospheres, and tolerate 1,000 times more atomic radiation than other animals. Thanks to NASA water bears are also the first multicellular animal to survive exposure to outer space. Nevertheless, we know little about the conditions they find necessary for normal life on earth, how they are dispersed around the planet, or even which species exist where.

The reason they can do all this is that water bears can undergo a process called cryptobiosis. They survive hostile conditions by dehydrating. Once dehydrated their metabolism becomes nearly unmeasurable and their water content drops to 1% of normal. In this dried state they can survive for at least a decade and there is one report of a 121-year old tardigrade reactivating after being soaked out of an herbarium moss specimen.

Most tardigrades are detritivores feeding on algae, bacteria and other small particles of organic material, but a few are predatory. They live in a wide diversity of habitats, in the ocean, the top of the Himalayas, in hot springs, and many moist terrestrial environments across the globe. They can probably be found in the moss on a rock or a tree trunk near you.

Even though the Bohart is an entomology museum, our collections include more than eight phyla of terrestrial invertebrates, including tardigrades. For 30 years the Bohart Museum was the center for water bear research in North America because of studies and collecting by Collection Manager Robert O. Schuster and Prof. Albert A. Grigarick. They acquired water bears from around the world with the aid of friends and acquaintances.

The Museum water bear collection contains more than 33,000 specimens. The majority of the specimens were slide-mounted between 1950 and 1970, but unfortunately, the mounting medium of choice at that time was not of archival quality. This mounting medium is now causing degradation of the prepared slides as it dries, discolors and crystallizes. The water bear specimens are also reacting chemically to the mounting media in such a way that it is turning some of the specimens transparent.

This September Carl Johansson of Fresno City College, the Bohart Museum and William “Randy” Miller of Baker College, were awarded a 3-year grant from the U.S. National Science Foundation to remount the specimens, update the taxonomy, image the specimens, and database the collection. The resulting digital information will be made available to the larger community through the Bohart Museum website. We anticipate that this study will lead to the discovery of new species in the collection.

The project, which is a collaboration between a community college and UC Davis, presents a unique opportunity for undergraduates from different institutions to work together to document, preserve, image and restore the collection. Due to the nature of the collection, these students will have opportunities to identify and document new species, as well as gain a first hand understanding of how to do research.

Finally, we’re discovering that water bears are cute but bizarre creatures. Carl, Randy and I have decided that they must be from Mars (our thought) or Alpha Centauri (Randy’s).
ASK THE BUG DOCTOR

If you have an insect question, need advice, want an identification of something you’ve found, or would like to see an article in the newsletter on a particular topic let us know. Email us at bmuseum@ucdavis.edu.

**Mystery Clouds**

In September radar maps from St. Louis, Missouri, displayed a strange every changing, slow-moving cloud that was drifting south, as seen in a screen shot taken by the National Weather Service.

After analyzing the mysterious reflections, weather service meteorologists determined this wasn’t a radar glitch or weather phenomenon, rather it was most likely clouds of monarch butterflies, flying by the millions from Canada to Mexico in an awesome migration.

"Keen observers of our radar data probably noticed some fairly high returns moving south over southern Illinois and central Missouri," the National Weather Service said. "We think these targets are Monarch butterflies. A Monarch in flight would look oblate to the radar, and flapping wings would account for the changing shape!" The radar data also matched ground observations of monarch butterflies flying through the region.

**A Fancy New Insect Pest: The Spotted Lanternfly**

You could only wish that all insect pests were as big and lovely as this one. The spotted lanternfly, *Lycorma delicatula*, was recently found in Pennsylvania. This is the first time this species has been found in the U.S. It is native to southern Asia (China, India, Vietnam) and is invasive in Korea. The spotted lantern fly has the potential to be a pest of grapes, apples, pines, fruit trees and up to 70 additional species. We’re looking forward to seeing this one in California.

**Bird Mimics Caterpillar**

Just when you thought nature couldn’t get any weirder it does. Scientists recently described the odd behavior of the nestlings of the South American bird, the Cinereous Mournor (*Laniocera hypopyrra*). These nestlings resemble and move like the stinging caterpillar of a local megalopygid moth. [Londoño et al. 2014. Morphological and Behavioral Evidence of Batesian Mimicry in Nestlings of a Lowland Amazonian Bird. *The American Naturalist* DOI: 10.1086/679106]

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*Radar image of monarch butterfly cloud over Missouri in September. Photo courtesy of U.S. National Weather Service.*

*Juvenile Cinereous Mourner (top), photo by Santiago David Rivera. Megalopygid moth caterpillar (bottom), photo by ttnaturelink.com.*

*NOTICE*

We have closed our on-line gift shop at Yahoo.com Please visit the gift shop in the Bohart Museum.
Summer’s Coming!

We are now taking applications for our Bio Boot camp summer camps. Go to our website http://bohart.ucdavis.edu for more details.