

2021 Entomology Games

Behavior & Ecology

Q: A recent sensationalized article in the Houston Chronicle used three common names to describe a particular arthropod order. One of them is "acid-squirting land lobster from hell"; give both of the other common names used by the author. It's not nearly as dangerous as it sounds, since this arachnid order's defensive secretion is primarily composed of acetic acid.

A: whip scorpion, vinegaroon

Q: On isolated islands, large predatory arthropods can play a major functional role in ecosystem dynamics. Researchers working in the South Pacific found that an endemic chilopod species collectively kills and eats as many as 3,700 seabird chicks each year. What is the name of this voracious predator?

A: Phillip Island centipede (*Cormocephalus coynei*)

Q: What is the term for an organism that lives commensally within the nest or dwelling of another organism?

A: inquiline

Q: Kleptopharmacophagy, a newly described behavior recently observed in milkweed butterflies, is characterized by adult butterflies feeding on milkweed caterpillars. What type of alkaloids do the adult butterflies presumably gain as a result?

A: pyrrolizidine alkaloids

Q: After over a decade of terrorizing the local ground-nesting seabirds, what invasive insect species was eradicated from Johnston Atoll in 2021? This species, known for its fast and erratic behavior, would swarm the birds' nests and occasionally blind the chicks by spraying them with formic acid.

A: Yellow Crazy Ant (*Anoplolepis gracilipes*)

Q: Maydianne Andrade's work on the reproductive behaviour of Australian redback spiders has shown that male mortality is primarily influenced by two quantifiable aspects of their mating process. Name either one.

A: The number of mating events by male and the duration of copulation

Q: A female pepper weevil will lay a single egg inside a cavity on its host plant, and then deposit a marking pheromone near the oviposition site. The pheromone doesn't protect the egg from predators or parasitoids, but it is still beneficial to the pepper weevil population. What is the purpose of this marking pheromone?

A: Oviposition deterrence for better host-plant resource allocation (other pepper weevils detect the pheromone and won't oviposit in the same place, ensuring that the offspring won't have to compete with each other for resources)

Q: The predatory carabid, *Promecognathus laevis*, shows exceptionally high tolerance to cyanide in fumigation tests. This adaptation allows the beetle to overcome the defenses of its prey, which secretes a cloud of cyanide from its many spiracles. What does this beetle feed on?

A: (polydesmidan) millipedes

Q: Many aquatic insects move along the water-air interface using the surface tension of water to support them. In 2021, an undescribed Australian beetle, probably in Hydrophilidae, was observed moving through the water in a manner never before seen in any other insect. What was unique about this beetle's locomotion?

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A: Observed walking upside down on the underside of the water's surface

Q: What aquatic genus of Hemiptera was the subject of Wendy Wang's recent phylogeographic study that was published in the journal *Marine Biology*?

A: *Halobates*

Q: Halictid bees parasitized by the strepsipteran species *Halictoxenos borealis* were recently shown to exhibit unusual behavior when visiting flowers. The parasitized bees did NOT collect or eat pollen; they instead bent their abdomens downward and pressed them against the flower. According to the authors of this study, how did this behavior directly benefit the first-instar strepsipterans living in the bees?

A: Pressing the abdomen against the flower makes it easier for the mobile first-instar strepsipteran larvae to move onto the flower and wait for a new host bee to arrive

Q: What are the proteins that capture and transport semiochemicals to olfactory receptors during the first step in insect olfaction?

A: odorant-binding proteins (OBPs)

Q: Insects have evolved a detoxification system that is subdivided into three phases. After cytochrome P450s act on external toxins during phase 1, what type of enzyme acts on exogenous toxin byproducts during phase 2? GSTs and UGTs are examples of this type of detoxification enzyme.

A: transferase

Q: Wild honeybees don't have access to wax guides, so they must use clever carpentry tricks to merge hive sections that don't perfectly align. A 2021 study in PNAS identified multiple strategies that the bees used to overcome this architectural challenge. Name any one of those strategies.

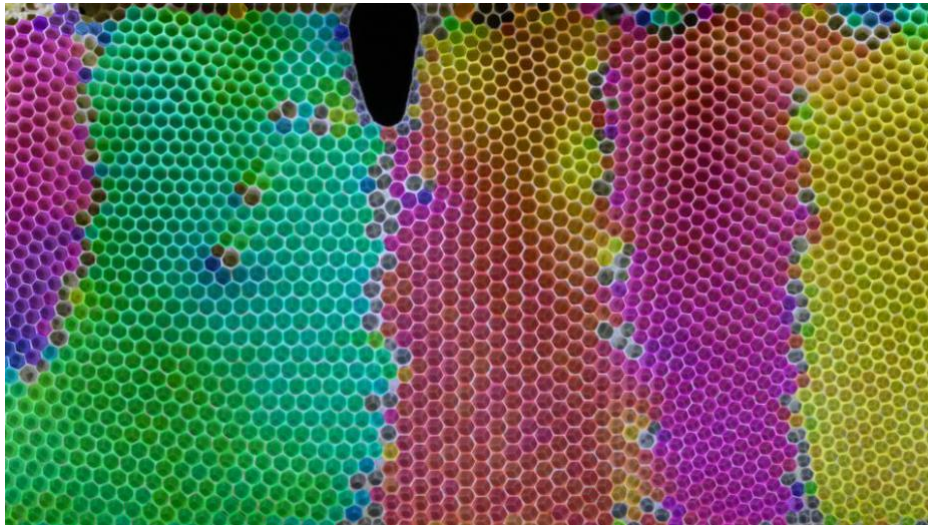


Image credit: Michael Smith, Nils Napp, Kirstin Petersen; from Smith et al. 2021, *PNAS* <https://doi.org/10.1073/pnas.2103605118>

A: change the cell tilt, changing cell size (intermediate-sized cells), using irregular cell shape (non-hexagonal)

Q: Several species of tiny moths in the family Gracillariidae are leafminers, forming blotch-type mines that are often slightly raised at the upper leaf surface. What term is used to describe these upwardly projecting mines that the moth larvae use as metaphorical encampments?

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A: tentiform

Q: Silk is produced by many insect orders, but silk production is usually restricted to a single life stage. Name ONE of the two non-holometabolus insect orders that has species that can produce silk throughout their lifetimes, during both immature and adult life stages?

A: Embioptera [all families] and Orthoptera [Gryllacrididae and Anostostomatidae]

Q: Earwigs are known for their maternal care, but the species *Anechura harmandi* goes above and beyond in its support. What describes the extreme contribution of *A. harmandi* mothers to the success of their offspring?

A: matrophagy; the survival rate of the offspring is increased when they consume their mother after parental care is complete

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Biochemistry & Toxicology

Q: Roz Laing's 2017 article in Trends In Parasitology, presciently subtitled "Old Drug, New Tricks?", reviewed the history of what insecticide, an allosteric modulator of glutamate-gated chloride channels? Thanks to Nobel-winners Satoshi Ōmura and William Campbell, this insecticide is famously marketed as an effective anti-parasitic. Thanks to the work of non-Nobel-Prize winners, this insecticide is infamously marketed as a cure for...other things.

A: Ivermectin

Q: What chemical attractant is the most heavily used synthetic compound for detection of *Ceratitis capitata*, the Mediterranean fruit fly?

A: Trimedlure

Q: What is the IRAC classification group of the compounds Mancozeb, Pyridalyl, Benzoximate, Bromopropylate, Chinomethionat, Azadirachtin, and lime sulfur?

A: UN - Compounds of unknown or uncertain MOA

Q: Baculoviruses, GROUP 31, are a recent addition to the IRAC MOA classification list. Baculoviruses are host-specific, and so far four species-specific viruses for what insect order have been identified?

A: Lepidoptera

Q: The new IRAC group 32 insecticide category includes GS-OMEGA/KAPPA-HXTX-HV1A, a bioinsecticide derived from a naturally occurring peptide. What is the source of this peptide?

A: Spider venom

Q: What is the only active ingredient that IRAC classifies as a Dipteran moulting disruptor? This active ingredient is a cyclopropyl derivative of melamine, capable of disrupting fly moulting in an incompletely defined mode of action.

A: Cryomazine

Q: Developed during World War II by USDA employee Samuel Gertler, what widely used chemical compound can be synthesized using the reagents diethylamine and meta-toluic acid?

A: DEET / diethyltoluamide / n,n-diethyl-meta-toluamide / n,n-diethyl-3-methylbenzamide

Q: In June 2013, dinotefuran (a neonicotinoid) was applied to flowering, ornamental European linden trees in a parking lot in Wilsonville, Oregon. The application resulted in the largest documented pesticide kill of bumble bees in North America, killing approximately 45,800 to 107,400 bumblebees. Name one of the two insect families the pesticide application was intended to control.

A: Aphididae or Curculionidae [root weevils]

Q: Discoveries by Feldlaufer and Chauhan have identified two new alarm pheromones in immature bed bugs. These chemical compounds were isolated from what part of the bedbug's body?

A: From cast skins that retained the chemicals from the bug's scent glands

Q: What type of cells usually take up insecticidal compounds before they are transported across the apical membrane back into the midgut lumen?

A: midgut epithelial cells

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Q: What plant family contains the Neotropical tree *Leucaena leucocephala*, a source of the insecticidal amino acid Mimosine? Other species in this plant family are hosts of the noctuid moth *Chrysodeixis includens*, the beetle *Epilachna varivestis*, and the aphid *Acyrtosiphon pisum*. Name the plant family.

A: Fabaceae / legumes

Q: What two-word term describes a petroleum- or plant-based product that is usually filtered and distilled to remove plant-harming compounds, and formulated with an emulsifier to make application easier? This product is a common component of many IPM programs and can help control insect pests by blocking spiracles, preventing eggs from hatching, and interfering with feeding or membrane function.

A: Horticultural oil or paraffinic oil

Q: Most contact insecticides are able to penetrate the insect exoskeleton because they contain a fat-soluble compound. What is the term for this type of chemical compound?

A: lipophilic compound

Q: A recent update to the IRAC Classification System lists 2 bacterial, non-BT agents and 3 fungal agents as having an unknown or uncertain mode of action. Name any one of those bacterial or fungal agents.

A: Bacterial: *Burkholderia* spp. and *Wolbachia pipientis*; Fungal: *Beauveria bassiana* strains, *Metarhizium anisopliae*, *Isaria (Paecilomyces) fumosoroseus*

Q: When a silkworm larva spins silk threads to form its cocoon, a special chemical is secreted to stick the threads together. This chemical is a protein that comprises 20%-30% of silk and surrounds the structural center of the silk thread. What is this chemical called?

A: sericin

Q: What is the mode of action of the insecticide rotenone?

A: inhibits electron transport in mitochondrial complex 1, preventing the utilization of energy by cells

Q: Kelthane, a pesticide formerly available for the control of mites, was removed from the marketplace by Dow AgroSciences in 2006. What was the common chemical name for this miticide?

A: Dicofol

Q: What type of PCR enables more rapid identification by using more than one species-specific primer in a single PCR reaction, thus amplifying several different DNA sequences simultaneously?

A: multiplex PCR

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Biological Control

Q: What subspecies of *Bacillus thuringiensis* is commonly used in biological control of fungus gnat larvae in greenhouses?

A: *Bacillus thuringiensis* subsp. *israelensis*

Q: What is the *current* scientific name of the microsporidian pathogen that has been registered in the US for control of grasshoppers?

A: *Paranosema locusta*

Q: Mary Flint's textbook *IPM in Practice* cites the management of what invasive plant, first introduced to North America from Europe, as an "excellent example of classical biological control in the Western US?" This plant was controlled by importing the European chrysomelid beetle *Chrysolina quadrigemina*.

A: Klamath weed / St. John's Wort / *Hypericum perforatum*

Q: Gabriella Tait's 2021 review of spotted-wing Drosophila IPM lists four insect families that prey on spotted-wing Drosophila and have been assessed as potential biological control agents. Name any one of those four families, which each belong to a different order: Coleoptera, Neuroptera, Hemiptera, and Dermaptera.

A: Staphylinidae, Chrysopidae, Anthocoridae, Forficulidae

Q: A 2020 review of entomopathogenic fungi stated that isolates of *Fusarium* have been reported as pathogens against Coleoptera, Diptera, Hymenoptera, Lepidoptera, and 4 non-holometabolous orders. Name any two of those orders.

A: Blattodea, Hemiptera, Orthoptera, Thysanoptera

Q: What two-word common name describes many potential biological control agents in the families Stigmaeidae, Bdellidae, and Hemisarcoptidae? This two-word term also appears in the common name of *Galendromus occidentalis*, a biological control agent in family Phytoseiidae.

A: Predatory mite

Q: If you know their common names, it should come as no surprise that *Nephus sordidus* and *Cryptolaemus montrouzieri* are effective natural enemies of pests in what insect family?

A: Pseudococcidae

Q: Native to central Europe, the cinnabar moth (*Tyria jacobaeae*) has been successfully imported to North America as a biological control agent of what noxious weed? The flea beetle *Longitarsus jacobaeae* has also been introduced to control this invasive plant, which is a biennial herb in the family Asteraceae.

A: Tansy ragwort, *Jacobaea vulgaris*

Q: Heteronomous hyperparasitism and adelphoparasitism are specific examples of what form of parasitism, usually observed in Hymenoptera, which involves females laying eggs on members of their own species?

A: Autoparasitism

Q: Joanie King received this year's Outreach and Public Engagement Award for her research on how to plan effective science communication, as well as her research on what family of

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Diptera? It is somewhat ironic that this family is best known for hindering effective communication in fire ants, by decapitating them.

A: Phoridae

Q: Dr. Osama el-Lissy is the current deputy administrator of what USDA program, which oversees the importation of natural enemies for many of the classical biological control efforts conducted in the U.S.? We will accept the full name of this program, or its three-letter initialism.

A: USDA-APHIS-PPQ (Plant Protection and Quarantine)

Q: Part of the life cycle of an obligate entomopathogenic nematode includes a free-living life stage that penetrates the host insect and initiates infection. What is the name of this life stage?

A: infective juvenile stage (IJs) / Dauer

Q: A recent article in the Journal of IPM detailed the potential for biological control of plague-vector fleas infesting prairie dogs. What general group of organisms were discussed as potential biological control agents of these fleas?

A: entomopathogenic (entomophagous) fungi

Q: Each month, Entomologists of Color, known by its hashtag #ENTOPOC, features and highlights a Scientist of the Month. In September, Jared Dyer was featured for his work tracking the population growth of what biological control agent, a natural enemy of brown marmorated stinkbug?

A: the samurai wasp, *Trissolcus japonicus*

Q: Some eulophid wasps have a relatively rare combination of life history characters, because they live on the surface of their host and allow their host to continue to grow after it has been parasitized. Name each of the words that describe these two aspects of the wasps' life history.

A: ectoparasitism, koinobiont

Q: 2021 ESA Alate Award winner Lidya Chala coordinated a program that uses stem-boring weevils to control what noxious weed that causes major crop and habitat damage in parts of Africa and Asia? Please name the genus of this plant, which has some species native to the US called feverfew.

A: *Parthenium* [*hysterophorus*]

Q: Giant salvinia is a species of water fern that is highly invasive in numerous lakes around the world, outcompeting native plants and disrupting fisheries. What family of beetles has been most successful in controlling invasive populations of giant salvinia?

A: Curculionidae

Q: Two species of tiphiid wasp, *Tiphia vernalis* and *Tiphia popilliavora*, were introduced into North America in the early 20th century, as natural enemies of what scarabaeid pest?

A: Japanese beetle, *Popillia japonica*

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Economic & Applied Entomology

Q: In fall of 2021, outbreaks of what lepidopteran pest were reported in rice, soybean, milo, corn, sweet sorghum, pasture and turfgrass across the southeastern United States?

A: fall armyworm, *Spodoptera frugiperda*

Q: This summer, the EPA announced that, as of October 29, what organophosphate active ingredient would have its food-residue tolerances revoked?

A: Chlorpyrifos

Q: A special collection published this past June in the Journal of Economic Entomology highlighted the potential of what type of aircraft to assist in pest management strategies and help reduce the use of agrochemicals? This type of aircraft is sometimes called an RPA or UAV.

A: Drones / unmanned aerial vehicle / remotely-piloted aircraft

Q: The solitary bee *Eucera pruinosa* (formerly in the genus *Peponapis*) is an efficient pollinator of what crop? There are multiple correct answers, but one of them is particularly appropriate, considering what day it is.

A: Pumpkins, cucumbers, squash, and other cucurbits

Q: Andrea Liceaga created this flowchart to demonstrate a protocol for using enzymatic hydrolysis to improve the nutritional quality of edible insect flour. What insect family was used to produce the protein hydrolysates seen here? Note that the 'C' in CPH stands for a common name of the family, not its scientific name.

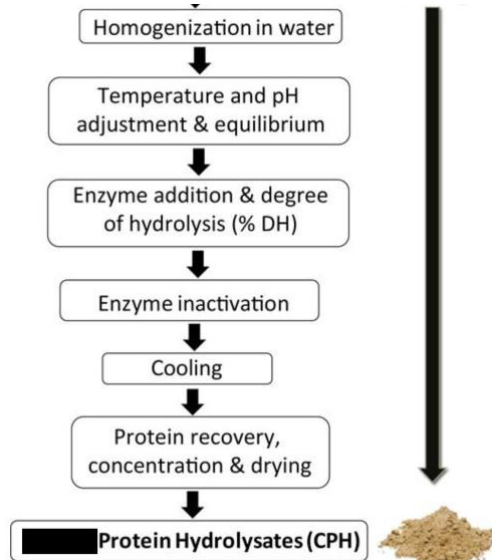


Image credit: Andrea M. Liceaga; adapted from Liceaga 2019, *Annals of the Entomological Society of America*
<https://doi.org/10.1093/aesa/saz010>

A: Gryllidae (crickets)

Q: Successful pesticide application to control a target insect can have unintended negative consequences involving other pests who weren't the original intended target. What term describes another insect species that becomes a significant problem as a result of the original attempt at control?

A: Secondary pest outbreak

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Q: *Schizaphis graminum*, the greenbug, is not divided into multiple subspecies, but it has eleven variant populations that differ in their ability to damage different plants, such as wheat and sorghum. What word is used by greenbug specialists to refer to these eleven genetically distinct populations of the same species?

A: Biotype

Q: In August 2021, a new invasive moth species, *Cydalima perspectalis*, the box tree moth, was reported in the United States. In which Eastern-Branch state was this pest first reported?

A: New York

Q: The adults of *Nudaurelia cytherea* are commonly called pine emperor moths, but the larvae have a different common name with two meanings. What is this larval common name, which references its economic importance as a pest of evergreen trees, and references the colorful, festive spots that decorate its abdomen, or 'trunk'?



Image credit: Christopher Whitehouse

A: Christmas caterpillar

Q: Animals in the livestock, poultry and aquaculture industries often consume feed that has been supplemented by insect protein. This protein frequently comes from *Hermetia illucens*, a dipteran known by what common name?

A: Black soldier fly

Q: The antihelminth moxidectan, marketed as an alternative to ivermectin, is promoted as a method to protect beneficial species in what family of Coleoptera? The beetles in this family appear to be less sensitive to the moxidectan found in the feces of treated livestock.

A: Scarabaeidae

Q: *Tyrophagus casei* is a species of mite that is both economically harmful and economically beneficial. Although it is a stored product pest, it is also used to produce Milbenkäse, which is a German variety of what type of food?

A: cheese

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Q: Emerald ash borer has wiped out large swaths of native ash across the North American continent. What native, non-ash, alternate host for this borer was identified in 2014?

A: white fringetree (*Chionanthus virginicus*)

Q: Chlordane, an organochlorine insecticide originally registered for use in agriculture, was removed from use in 1988. What was its last labeled use at the time it was removed?

A: termiticide

Q: The terrestrial isopod *Armadillidium vulgare* is generally NOT considered an agricultural pest, but in the Midwest it has been observed damaging alfalfa, canola, and what other *non-cereal* food crop?

A: soybean

Q: According to the 2020 Report on the Health of Colorado's Forests, what Scolytinae species was the most damaging forest pest in Colorado for the ninth year in a row? The official state tree of Colorado appears in the common name of this beetle.

A: *Dendroctonus rufipennis* / spruce beetle

Q: In North America alone, at least 39 exotic bee species have become naturalized. One such bee was intentionally introduced from Japan by the USDA in the 1970s, for crop pollination services. What is the genus of this significant bee pollinator?

A: *Osmia* [*cornifrons*]

Q: Trunk refugia are traps designed as an inexpensive way to sample arthropods from tree trunks. What two-word alliterative term describes the material that these traps are primarily made of? This recyclable material mimics the color of tree trunks and it contains small spaces that mimic the trunks' natural crevices. Two-word answer required.

A: corrugated cardboard

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IPM & Insect/Plant Interactions

Q: The Federal Insecticide, Fungicide and Rodenticide Act of 1947 requires that all pesticides sold via interstate commerce be registered with the Environmental Protection Agency except for certain active ingredients such as citronella and cinnamon oil. What is the name given to pesticides containing these active ingredients?

A: Minimum risk pesticide products

Q: In a 2021 review of sorghum insect pests, Okosun et al. list two orders as having species that are "key pests worldwide" on sorghum. One of those orders is Hemiptera. Name the other order, which contains the pest species *Stenodiplosis sorghicola*?

A: Diptera

Q: The egg parasitoid *Ooencyrtus kuvanae* is being considered as a potential biological control agent of spotted lanternfly, but it was originally introduced in 1908 to control another forest pest in a different order. What is the scientific name of the insect this parasitoid was originally introduced to control?

A: *Lymantria dispar*

Q: The P-IE and PBT sections of ESA host field tours to promote the importance of pest resistance management. Some of these tours have been co-hosted by what other professional society, whose members are interested in harmful plants and their impacts on ecosystems?

A: Weed Science Society of America (WSSA)

Q: According to the title of the classic 1959 Stern et al. paper, the integrated control concept involves the combination and integration of what two general types of pest control?

A: Chemical and biological control

Q: IRAC classes of insecticides are rotated based on the stage of crop development and the biology and phenology of a pest species. This minimizes development of what major agricultural problem?

A: Insecticide resistance

Q: Early warning systems provide a valuable service to members of the plant protection community who would like to stay informed of threats by invasive plants. What is the name of the USDA early warning system that sends a weekly email notification with new distributions, host reports, and other relevant information on harmful invasive species?

A: PestLens

Q: Some mealybugs and soft scales pose major economic threats to the wine industry because they can vector what viral disease, which is estimated to affect up to 50% of vineyards worldwide?

A: Grapevine leafroll disease (GLD)

Q: The spotted winged drosophila, *Drosophila suzukii*, is different from other common drosophila species because it infests healthy, intact ripening fruits. During egg laying, what is the name of the bacterium that females can introduce into the fruit?

A: Acetobacter

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Q: The path followed when collecting samples will affect how representative the samples will be of the pest population. Stratified sampling and systematic sampling are two of the three common sampling patterns that scouts can choose from. What is the third sampling pattern?

A: Random sampling

Q: Raul F. Medina recently proposed to use the pathosystem of what spiroplasmid disease as a model system for molecular studies of plant diseases? This spiroplasmid disease is vectored by the leafhopper *Dalbulus maidis* and it is considered to be an important disease that reduces growth of *Zea mays* in the Americas.

A: corn stunt disease or *Spiroplasma kunkelii*

Q: In order of increasing level of toxicity, what are the three Signal words that can be found on an insecticide label?

A: caution, warning, danger

Q: Prior to oviposition, cicada females will make small grooves in tree limbs in order to shelter the newly hatched nymphs. This can lead to what harmful phenomenon, where the grooves kill a tree's small branches, causing the twigs to die and the leaves to turn brown?

A: flagging

Q: In 2015, the EPA revised its regulations that provide occupational protections for agricultural employees and pesticide handlers in the United States. What is the collective name of these regulations?

A: [Agricultural] Worker Protection Standard (WPS)

Q: In terms of insect population ecology, there are three general types of distribution patterns for insect populations: random distribution, uniform distribution, and what third distribution pattern?

A: clumped distribution

Q: Originally published in 1989, what classic textbook formally defines IPM as "*using combined means to reduce pest status to tolerable levels, while maintaining a quality environment*"? Rayda Krell became a new co-author of this textbook for its latest 7th edition, joining Marlin Rice and original author Larry Pedigo.

A: Entomology and Pest Management

Q: In 1920, a Canadian lepidopterist became the first woman to be honored as an ESA fellow. Many decades later, a new type of survey was developed for monitoring biodiversity of ecosystems. The lepidopterist has no connection to the survey, but her four-letter first name is the same as the common four-letter abbreviation of the nucleic acid detected in the survey method. Give either of these four-letter names, which are spelled the same, but pronounced differently.

A: Edna [Mosher] or eDNA

Q: What is the name of the new certificate program rolled out this fall by the ESA Certification Corporation?

A: Certified IPM Technician

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Medical, Urban, and Veterinary Entomology

Q: *Rickettsia parkeri* causes a rickettsiosis similar to Rocky Mountain spotted fever. Its vector is endemic to the southern US, but in 2020 made news when it was collected throughout Illinois. What is the vector for *R. parkeri*?

A: The Gulf Coast tick, *Amblyomma maculatum*

Q: The Formosan subterranean termite, *Coptotermes formosanus*, is the most widely distributed and economically important termite species worldwide. In what family is *Coptotermes formosanus*?

A: Rhinotermitidae

Q: Dr. Sheba Meymandi is the director of the CECD, the only US organization fully dedicated to caring for people infected with what insect-vectored protozoan? She estimates that over 30,000 people in Los Angeles County have the disease caused by this protozoan, which is vectored by *Rhodnius prolixus*, *Triatoma infestans*, and other species of kissing bugs.

A: *Trypanosoma cruzi* (CECD - Center of Excellence for Chagas Disease)

Q: *Dirofilaria immitis*, also known as the dog heartworm, is a mosquito-transmitted nematode that causes severe disease in dogs and other canids. At the time of an infective mosquito's bloodmeal, the parasite emerges from the proboscis of the mosquito and migrates into the bite wound to infect the host. What specific stage of the parasite is transmitted from mosquitoes to dogs?

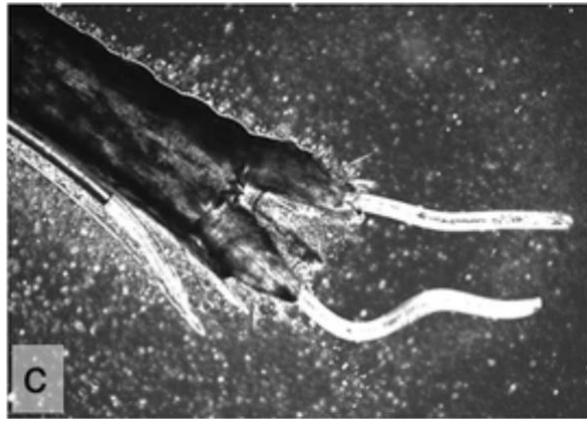


Image credit: Cornelia Silaghi, Relja Beck, Gioia Capelli, Fabrizio Montarsi, Alexander Mathis; from Silaghi et al. 2017, *Parasites & Vectors* <https://doi.org/10.1186/s13071-017-2015-x>

A: L3, third larval stage

Q: Lymphatic filariasis is a neglected tropical disease caused by mosquito-transmitted pathogens. Name 1 of the 3 filarial nematode species that cause lymphatic filariasis in humans.

A: *Wuchereria bancrofti*, *Brugia timori*, *Brugia malayi*

Q: Most female mosquitoes need a bloodmeal to produce and lay eggs. What is the term for this reproductive strategy?

A: Anautogeny

Q: This tick family contains only a single species, which is found in southern Africa with a broad host range. It has a morphological resemblance to both the Ixodidae and the Argasidae, and it is thought to be the most basal tick lineage. What is the name of this tick family?

A: Nuttalliellidae

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Q: The 2016 incidence of "zombie deer" in southern Florida led to the re-discovery of what insect species, formerly presumed to be eradicated from the United States 30 years prior?

A: Screwworm, *Cochliomyia hominivorax*

Q: These two cockroach species are peridomestic pests whose ranges overlap in the southern United States. Although they look similar and belong to the same genus, they can easily be distinguished by their pronotal markings. In order from left to right, give the scientific or common names of both species.



Image credit: Brandon Woo

A: *Periplaneta americana*/American cockroach (left), *Periplaneta australasiae*/Australian cockroach (right)

Q: After nearly 40 years in development, the World Health Organization has approved the world's first general-use vaccine for the treatment of what disease? The vaccine that treats this disease has the formal name RTS,S and the trade name Mosquirix. Name the disease.

A: malaria

Q: What is the medically-relevant genus of the insect that vectors the epizootic hemorrhagic disease virus?

A: Culicoides

Q: The Entomological Society of America has been involved in the creation of US Legislation titled the TICK Act, which focuses on aggressively fighting Lyme disease. In what US state was Lyme disease first discovered?

A: Connecticut

Q: Forensic entomologists often estimate the minimum postmortem interval by calculating a value, abbreviated ADD. This value captures the time and temperature requirements necessary for an insect to have reached the point in its life cycle at the time of collection. What does ADD stand for?

A: accumulated degree days

Q: Although 'cantharidiasis' is often used as a blanket term to describe any invasion of body tissues by beetles, Mullen and Durden use what other term to specifically describe the invasion of tissue by adult beetles?

A: scarabiasis

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Q: Give the scientific or common name of this insect, which can vector murine typhus. Counterintuitively, this insect can also vector the dog tapeworm.



Image credit: Parasite and Diseases Image Library, Australia

A: cat flea, *Ctenocephalides felis*

Q: After receiving EPA approval in May 2020, field trials of Oxitec's genetically modified male mosquitoes began in the Florida Keys this year to test their efficacy in controlling *Aedes aegypti*. What is the trademarked name of Oxitec's GM mosquito technology?

A: Friendly

Q: Where do human body lice, *Pediculus humanus humanus*, lay their eggs?

A: clothing fibers, particularly along seams

Q: Previous host of the Entomology Games Jennifer Henke was recently elected as the next Vice President-Elect of ESA. She is currently employed at what organization? This organization was originally founded in the 1920s to combat eye gnats, though its current name contains a different type of Diptera.

A: Coachella Valley Mosquito and Vector Control District

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Morphology & Physiology

Q: What is the term for the endoskeletal part of the insect head that serves as a brace and site for attachment of muscles?

A: Tentorium

Q: In 2018, Wilts and Saranathan described how the snout weevil *Pachyrrhynchus congestus pavonius* is capable of producing tunable structural colors by varying the fill fraction and cell size of its iridescent scales. These scales possess what type of 3D crystals, which produce a spectrum of colors by affecting the motion of light particles?

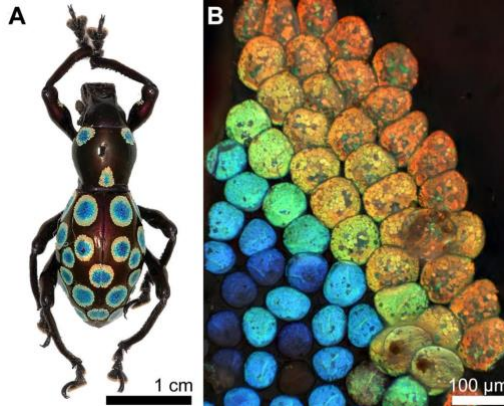


Image credit: Bodo D. Wilts, Vinodkumar Saranathan; from Wilts and Saranathan 2018, *Small*
<https://doi.org/10.1002/smll.201802328>

A: Photonic crystals

Q: Many adult Lepidoptera have hair pencils concealed inside what eversible scent glands that produce pheromones involved in mate attraction?

A: Coremata / Corema

Q: The aquatic arthropods in order Stomatopoda are crustaceans, not insects. But their common name contains the name of what insect, inspired by the prominent raptorial forelimbs that stomatopods use to catch prey?

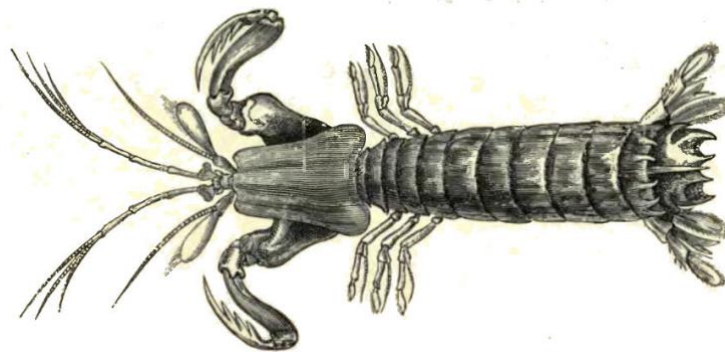


Image in the public domain; originally by R A Lydekker

A: Mantis (shrimp)

Q: Not to be confused with an EEG or EKG, an EAG is a bioassay technique used when studying the olfactory capabilities of what insect appendage?

A: Antenna

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Q: Members of the buprestid genus *Melanophila* are commonly known as fire beetles. What type of sensory organ do these beetles possess, which aids them in detecting forest fires and thus freshly-burned trees in which to lay their eggs?

A: infrared (IR) organs/receptors

Q: What specialized structures, found on the bodies of many xylophagous insects, are adapted for the transport of symbiotic fungi?

A: Mycangia

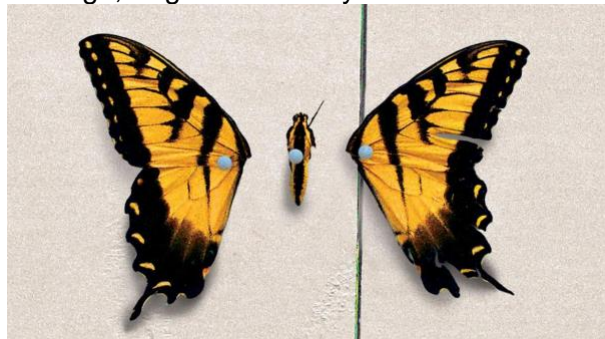
Q: Some armored scale insects are unusual in that adult females never leave the preadult cuticle, and remain encased in the shed skin of the second instar. What term was coined by G. F. Ferris to describe this trait?

A: Pupillarial

Q: The dorsal longitudinal muscles involved in flight are attached to what plate-like structures in the insect thorax?

A: Phragmata / Phragma

Q: The butterfly at the top of this image is from an album cover released by a lovely American rock band in 2009. If you change one letter in the name of the band, you get the singular name of a morphological structure, two of which are found in the male genitalia of many insects, such as Coleoptera and Hemiptera. Give either the name of the structure, redacted from the journal article at the bottom of the image, or give the nearly-identical name of the band.



Genetica (2010) 138:45–57
DOI 10.1007/s10709-009-9404-9

Genital feelers: the putative role of [REDACTED]s and aedeagal sensilla in Coleoptera Phytophaga (Insecta)

Susanne Dünkelhoef · Michael Schmitt

A: Paramore or paramere

Q: Male corixids of the species *Micronecta scholtzi* use their external genitalia (specifically, their right paramere) for what record-setting function?

A: They use the structure to stridulate, producing a song peaking at 100 decibels, comparable to the noise produced by a jackhammer. This corixid is one of the loudest known animals when adjusted for body size.

Q: What is the name of the gap that lies between the axon terminal of one neuron and the dendrite of another neuron?

A: synapse

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Q: Joan Whitten's tracheal-based classification of immature Diptera uses what term to describe the tracheal systems of Ceratopogonidae, Simuliidae, and Chironomidae? This term refers to any larva that diffuses oxygen directly through the cuticle and does NOT have any spiracles.

A: apneustic

Q: Xylem is difficult to extract from vascular plants because it is held at negative pressures inside the xylem vessels. Auchenorrhynchan Hemiptera, such as cicadas and froghoppers, can feed on xylem because they possess a filter chamber and what muscular pump that enables them to overcome the negative pressure in xylem vessels?

A: cibarial pump

Q: Rove beetles in the genus *Stenus* are capable of rapidly extending what anatomical structure, pictured here, in order to capture prey? Immature Odonata can also rapidly extend this structure in a similar manner.

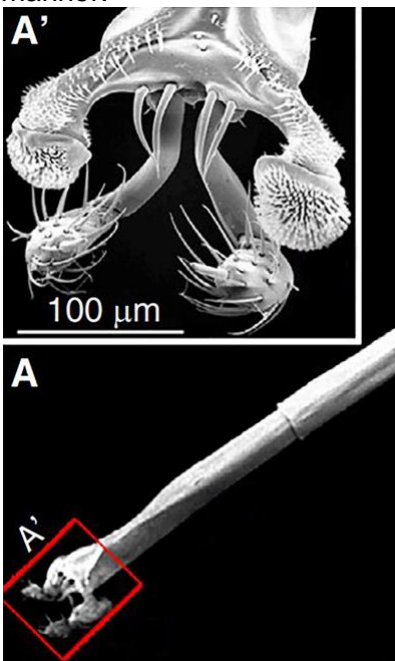


Image credit: Thomas Bauer, Martin Pfeiffer; adapted by Chenyang Cai, Dave J. Clarke, Ziewei Yin, Yanzhe Fu in Cai et al. 2019, *Current Biology* [https://www.cell.com/current-biology/pdf/S0960-9822\(19\)30002-8.pdf](https://www.cell.com/current-biology/pdf/S0960-9822(19)30002-8.pdf)

A: labium

Q: The leafcutter ant, *Atta cephalotes*, has hardened, distinctly sharpened mandibles that allow it to efficiently cut leaves. What mineral found in the mandibles provides this distinct sharpness? This mineral is also a metallic element with atomic number 30 on the periodic table.

A: zinc

Q: Mayfly subimagos are often misidentified as imagos, and vice-versa. What morphological character specifically distinguishes the imago from the subimago?

A: fully formed genitalia / reproductive maturity

Q: What specific body part contains the components of a catapult-like structure that enables the explosive jumping ability of flea beetles in the tribe Alticini? A flea beetle has two of these body parts, each of which also contains ligaments that connect them to their corresponding tibiae.

A: hind femur

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Systematics & Evolution

Q: The Natural History Museum's Coleoptera collection made headlines this year when it was confirmed that two pinned specimens died nearly 4,000 years ago, but looked freshly collected because they were perfectly preserved in an English bog. What family did these so-called 'bog beetles' belong to? Their actual common name is the oak capricorn beetle, which is apt because their antennae were reminiscent of the long, curved horns of an alpine goat.

A: Cerambycidae

Q: What bee species, only known from California and Oregon, was added to the Endangered Species List in September 2021?

A: Franklin's bumble bee (*Bombus franklini*)

Q: What order, which is sometimes treated as a suborder of Notoptera, has a name that literally means 'cricket cockroach' in Latin?

A: Grylloblattodea

Q: According to the penultimate entry in the Encyclopedia of Insects, the most noticeable diagnostic traits of what insect order are the presence of only two tarsomeres, and alate females having paddle-shaped wings with reduced venation? The encyclopedia entry lists "soil lice" and "angel insects" as common names for this order.

A: Zoraptera

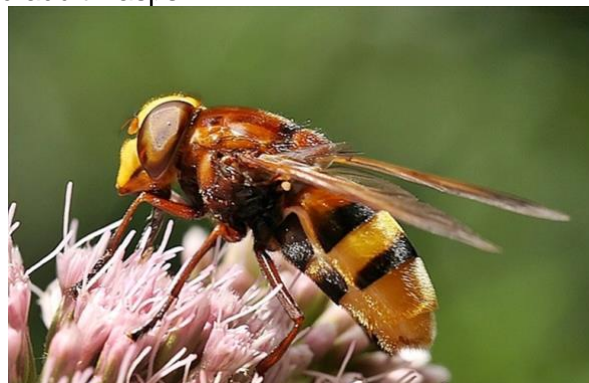
Q: Duran and Gough's 2020 adephagan phylogeny validated what group of beetles as a distinct family, instead of a subfamily of Carabidae?

A: Cicindelidae / tiger beetles

Q: The cover of the Spring 2021 issue of American Entomologist featured a picture of *Calmanesia lonchotes*, a spiny species belonging to what order of non-insect Arthropod?

A: Isopoda

Q: What genus of syrphid flies resides in the nests of social wasps, and scavenges on detritus as well as dead larval and adult wasps?



A: *Volucella*; the larvae often drop from nests in the fall and are considered somewhat of a nuisance

Q: The order Phasmatodea is typified by insects disguised as twigs or bark. However, in contrast to these stick insects, the Phasmatodea contain a clade of dorso-ventrally flattened

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insects that resemble leaves. Name the family that contains these extant leaf insects, also known as walking leaves.

A: Phylliidae

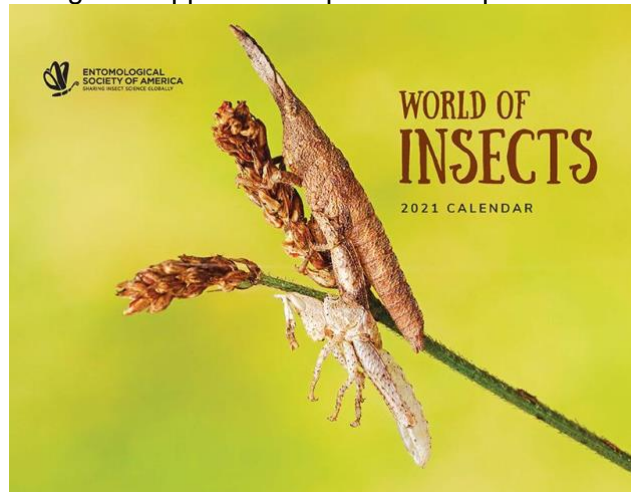
Q: What order contains the families Elenchidae, Corioxenidae, Myrmecolacidae, Halictophagidae, and Stylopidae?

A: Strepsiptera

Q: Barbara Mantovani's research on a form of reproduction called androgenesis involved what genus of Phasmatodea? This genus name is appropriate for a stick insect, since it's the Latin word for 'stick', but it's much more widely known as the genus name of a rod-shaped bacterium used for biological control.

A: *Bacillus*

Q: This just-molted insect on the cover of the 2021 World of Insects Calendar belongs to what family, which contains bush grasshoppers and aposematic species called gaudy grasshoppers?



A: Pyrgomorphidae

Q: According to Wipfler et al.'s molecular phylogeny of extant Poly-neoptera, what insect order is most closely related to Phasmatodea? The phylogeny included five genera from this order, including *Aposthonia*, *Antipaluria*, and *Haploembia*.

A: Embioptera / Embiidina

Q: In 2019, Cecilia Waichert described a new species of what hymenopteran family from a fossilized specimen whose forewing had ten closed cells? The new discovery confirms that this family of wasps is at least 50 million years old, which is still 250 million years younger than the oldest fossil of their potential arachnid prey. Name the wasp family.

A: Pompilidae

Q: Most entomologists are familiar with the sand pits of Myrmeleontidae, but the same behavior has convergently evolved in the larvae of a family of Diptera. Historically placed in the Rhagionidae, these predaceous flies are known by what common name, derived from the Latin name of their current family, Vermileonidae?

A: wormlions

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Q: A Triassic-era beetle species described in 2021 was the first ever insect to be discovered in a certain type of fossil. This information helped the authors determine that a species of *Silesaurus* must have fed on the tiny beetles. What type of fossil were the beetles found in?

A: coprolites, fossilized feces

Q: With over 2600 species in over 400 genera, what is the scientific name of the most species-rich family of scale insects, commonly known as the armored scales?

A: Diaspididae

Q: Although Rhinotermitidae were the subject of her doctoral dissertation, what other family of Isoptera did Margaret Collins primarily study during her entomological career? One such example was her study of *Nasutitermes acajutlae* nest architecture, and another species in this family, *Parvitermes collinsae*, was named in her honor.

A: Termitidae

Q: In 1851, John Cassin and James Fisher published their findings on a new species of insect in the US. Although the species is named after Cassin, it is now widely accepted that the species was actually discovered earlier by Margaretta Hare Morris, and that Cassin and Fisher only began investigating this species after reading her reports of its existence. Name the family or genus of this species, which has the specific epithet '*cassinii*'?

A: Cicadidae, *Magicicada*

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Bonus: Culture & Current Events

Q: In the classic late 80's film "Honey, I Shrunk the Kids", the miniaturized children befriend one arthropod in their backyard and fight another. Name the taxonomic order of one of the two arthropods involved.

A: Hymenoptera, Scorpiones

Q: According to the book *The Insect People of the Maori*, what is the Maori word for 'mosquito'? Some of you have probably heard this word outside of New Zealand, because through sheer coincidence it is also the name of a popular hip-hop dance featured in a 2015 single by rapper Silentó.

A: NaeNae

Q: The man on the left is an entomologist who was credited with documenting the malaria vector *Anopheles gambiae* in the New World. The man on the right is his grandson, an actor with roles in *Knives Out*, *The Shape of Water* and coincidentally, the 2006 film *Bug*. What surname do these men share?

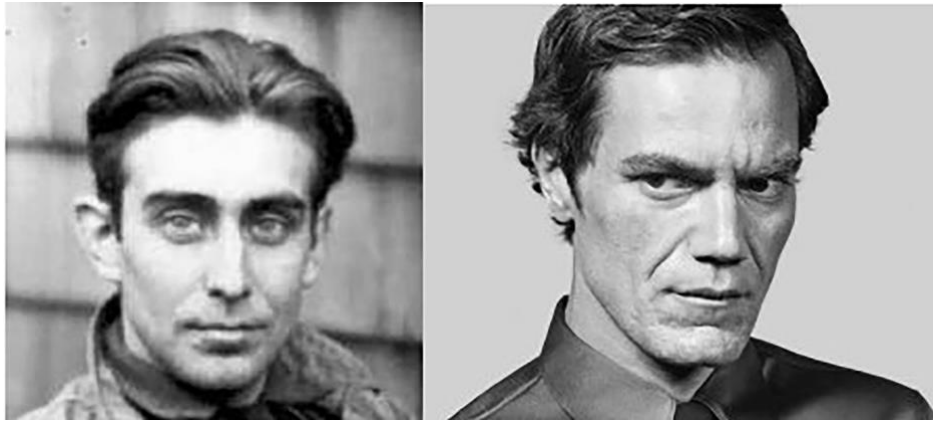


Image credit: Prada (right)

A: Shannon (Raymond C. Shannon and Michael Shannon)

Q: Competing in the American Midwest Conference, the Harris-Stowe State University Hornets are based in what North Central Branch state? One notable alumna of Harris-Stowe is congresswoman Cori Bush, who currently represents this state's 1st congressional district.

A: Missouri

Q: What entomological acronym was used to refer to a group of American women who worked as auxiliary service pilots for the US during World War II?

A: WASP (Women Auxiliary Service Pilots)

Q: Charley Patton, the "father of the Delta blues," recorded an influential song about the boll weevil in the 1920s. Unlike most other insect blues songs, where the insect is a metaphor, Patton's song was actually about a boll weevil damaging cotton. The full title of this "Boweavil Blues" song includes the name of what US State, where Patton was born and spent most of his life?

A: Mississippi Boweavil Blues

Q: The Scorpions, led by Craterface, are a rival gang of the T-Birds, led by Danny Zuko, in what movie musical?

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A: Grease

Q: Two weeks ago, Saturday Night Live aired a sketch called Bug Assembly. What Oscar-winning actor hosted that episode and is seen here wearing a stinkbug costume in the sketch?



A: Rami Malek

Q: A French version of tiddlywinks, pictured here, involves catapulting discs high into the air to get them into the central target. The movement of these jumping discs inspired the name of the game, "Jeu de puces," which in English means "Game of" what?



Image licensed under CC BY-SA 3.0

A: fleas

Q: Founded in 1922, this unique club is an informal organization of people who have needed to use a parachute to jump out of a disabled aircraft. The club's name refers to the silk threads that made the original parachutes, acknowledging the debt owed to a certain insect. What is the alliterative name of this club?

A: Caterpillar Club

Q: The world's first and only carousel featuring an insect-exclusive lineup was installed at which American zoo in 2005? This zoo is also the home of the Wildlife Conservation Society's headquarters.

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A: The Bronx Zoo

Q: According to Brooke Borel's review of bedbugs' impact on American history and culture, what painter pranked a colleague by painting realistic-looking bedbugs on their pillow? The artwork seen here, titled 'Nightbugs', is a parody of this painter's best-known work.

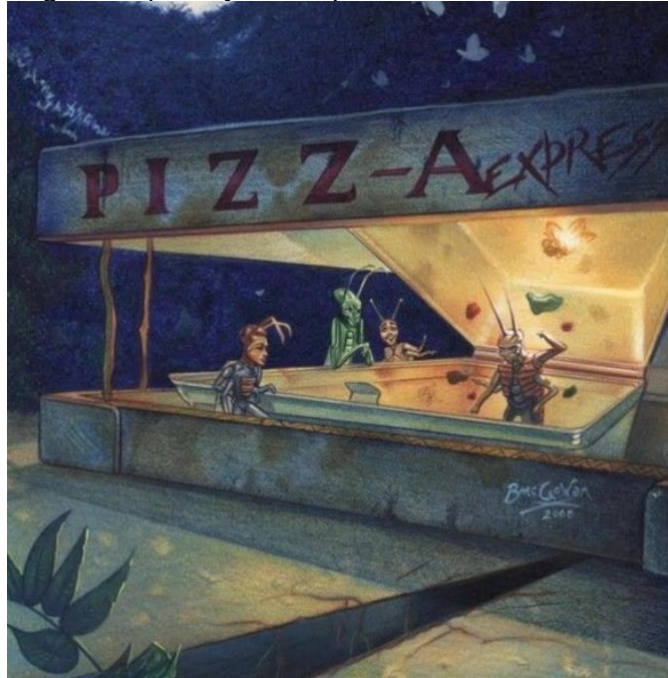


Image credit: Barry McGowan Art

A: Edward Hopper

Q: Castillo de Chapultepec, which literally means "castle of the hill of the grasshopper," used to be the official residence of the president of what country? This changed in 1939, when then-president Lázaro Cárdenas turned it into a museum.

A: Mexico

Q: Christine McPherson is the title character of what 2017 Oscar-nominated film? According to director Greta Gerwig, the character's better-known nickname was inspired by a classic nursery rhyme about an insect that is told to "fly away home."

A: Lady Bird

Q: Who became the owner of the Charlotte Bobcats NBA team in 2010, and proudly announced that he would "bring the buzz back" and change its name back to the Charlotte Hornets in 2014? The name change was not surprising, since it's not the first time this man was seen interacting with Bugs on a basketball court.

A: Michael Jordan

Q: The video game *Animal Crossing: New Horizons* features dozens of collectible bugs based on real insects. Two of the rarest and most expensive insects in the game are *Allotopus rosenbergi* and *Prosopocoilus giraffa*, which both belong to the same family of Coleoptera. Name that family, OR give the common name used in the video game for either species.

A: Lucanidae, Golden Stag, Giraffe Stag

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Q: The largest online gallery of US postage stamps has records of many butterfly stamps, but only two moth stamps. Both of these stamps, one of which is pictured here, contain illustrations of moths in what family?



A: Saturniidae (the buck moth, *Hemileuca maia*, and the luna moth, *Actias luna*)

Q: The Dow Jones Industrial average is a composite of thirty companies listed on US stock exchanges. Currently, the list contains two companies that reference insects or insect products in their names. Name one of these companies.

A: Caterpillar (CAT) and Honeywell (HON)

Q: "Hebo" is a niche Japanese cuisine that refers to prepared larvae of what order of insects, which must be very carefully hunted and raised before consumption?

A: Hymenoptera

Q: What Tony-winning actor played opera singer Song Liling in the original Broadway cast of *M. Butterfly*? This actor also played Dr. Henry Wu, the chief geneticist who extracted dino DNA from fossilized mosquitos in *Jurassic Park*.

A: BD Wong

Q: An incompetent martial arts instructor named *Dragonfly Jones* was one of the many recurring characters played by what comedian on his self-titled sitcom, which ran for 5 seasons on Fox in the 1990s. Based on domestic box office numbers, this comedian also had a lead role in the highest-grossing film of 2020.

A: Martin Lawrence [the sitcom is *Martin*, the 2020 film is *Bad Boys For Life*]

Q: A new book by biologist Jonathan Balcombe, subtitled "The Unexpected Lives of the World's Most Successful Insects," shares its name with what 1972 blaxploitation film, which features an iconic soundtrack by soul singer Curtis Mayfield?

A: Super Fly

Q: Ma Yi Shang Shu is a classic dish in Sichuan Chinese cuisine whose name translates to "Ants climbing a tree". Allegedly, the person who named it imagined the chopped scallions as tree leaves, the [BLANK] as tree branches, and the little bits of [BLANK] as the ants. Name either ingredient that fills in the blank in this description of the dish.

A: glass noodles, ground pork

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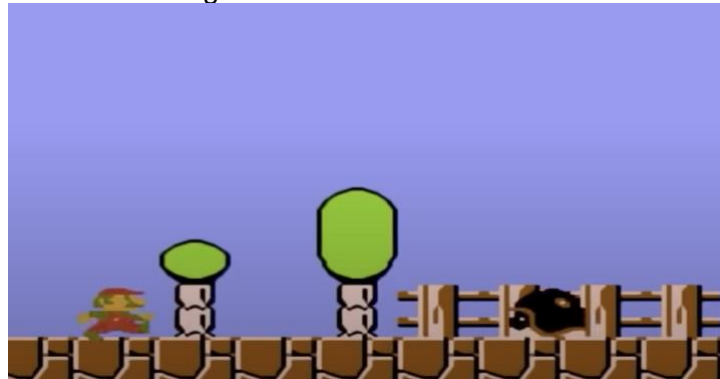
Q: What off-broadway show was advertised as a "girl-meets-bug musical-comedy", about an exterminator named Carly whose custom-made insecticide accidentally turns ordinary insects into human-sized mutants? Carly then falls in love with a charismatic insect named Cimex, who she sings about in the show-stopping number "*He Pierced Me*."



Image credit: Rex Bonomelli

A: Bedbugs!!

Q: What black-shelled enemy with an alliterative name is the only insect that appears in the original NES Super Mario Brothers game?



A: Buzzy beetle

Q: Elizabeth Hargrave, the award-winning game designer who created the board game Wingspan, recently released what entomological board game, where the goal is help your monarch butterflies complete their migration to and from their overwintering site in Mexico?

A: Mariposas

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Q: This unflattering portrayal of entomologists is from what popular webcomic? You may answer with either the comic's full name or its four-letter initialism.



Biologists are weird.

A: Saturday Morning Breakfast Cereal (SMBC)

Q: This Brazilian soccer player has represented her country at the Olympics a record 7 times. Her unselfish and cooperative style of play is reminiscent of eusocial insects, which is why she is best known by what nickname, the Portuguese word for ant? An exact answer is required; this name sounds similar to, but is not the same as, a common ant genus.



Image licensed under CC BY-SA 2.0

A: Formiga

Q: Jacqueline Charlotte Dufresnoy was a nightclub singer and actress who was the first French person to have gender confirmation surgery, and the first transgender person in France to legally marry. Early in her showbiz career, she adopted a stage name that is the French word for an insect in what family of Coleoptera?

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A: Coccinellidae [Coccinelle]

Q: In what decade was the term "ant farm" first used to describe a formicarium? Other ant-related events in this decade include the publication of E.O. Wilson's doctoral dissertation on taxonomy of the ant genus *Lasius*, and the release of a popular sci-fi film about giant irradiated ants.

A: 1950s

Q: The prime minister of what country has their office in a parliament building nicknamed 'the beehive', which appears on this country's 20-dollar note? The newly described species seen here, *Hemiandrus jacinda*, is endemic to this country, and was named after the current prime minister of this country.



Image licensed under CC BY-SA 4.0

A: New Zealand (Jacinda Ardern is the prime minister)

Q: What insectoid supervillain has been a part of the DC comics universe since the 1960s? His main supervillain name is also the name of a certain insect larva, and one of his aliases is, fittingly, an entomologist named Robert Dobson.



A: Hellgrammite

Q: Last summer, ESA Vice President Dr. Jessica Ware was featured on the podcast "Getting Curious." In her episode, entitled "Are Cicadas The Only Ones Having a Hawt Gurl Summer?",

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she discussed periodical cicadas, cockroaches, dragonflies, and more with the podcast's host, who is also a star of Netflix's *Queer Eye*. Name the host of this podcast.

A: Jonathan Van Ness

Q: In 2018, Rachel Brosnahan won an Emmy for Outstanding Lead Actress in a Comedy Series, for playing a character with what dipteran nickname?



Image credit: AP

A: Midge [Miriam 'Midge' Maisel from *The Marvelous Mrs. Maisel*]

Q: *Dragonfly*, the debut solo album of Bob Marley's son Ziggy Marley, featured guest appearances from two members of the Rock and Roll Hall of Fame: John Frusciante and what other rock musician?

A: Flea

Q: The Italian liqueur alchermes has a unique flavor profile derived from cinnamon, cloves, nutmeg and other plants. However, its signature color is derived NOT from these plants, but from insects in the genus *Kermes*. What is the color of alchermes liqueur?

A: red

Q: The original sanskrit names of these yoga poses are Vrischikasana, Titibhasana, and Ashtanga Namaskara. Give the common English translation of any ONE of these poses, each of which contains the name of an arthropod.



Image credit: Getty images (left), licensed under CC BY-SA 3.0 (right)

A: scorpion, firefly, caterpillar

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Q: The 2018 film *Spider-Man: Into the Spider-Verse* introduced audiences to many other web-slinging heroes that fought crime alongside Peter Parker. What is the secret identity of either the Spider-Man on the left, or the Spider-Woman on the right?



Image credit: Sony Pictures Animation

A: Miles Morales, Gwen Stacy

Q: *Butterfly/Cocoon* was an episode of what critically acclaimed drama series? MJ Rodriguez and Billy Porter both received acting Emmy nominations for this show's final season, which aired this past summer on FX.

A: Pose

Q: What British guitarist, who died in 2001, was memorialized by a pine tree planted in Los Angeles' Griffith Park? In an unfortunate, and somewhat ironic, development, the pine tree was later killed by an infestation of beetles.

A: George Harrison [of The Beatles]

Q: In 2016, Sydney Brannoch and Gavin Svenson named a new species of mantis after what US Supreme Court Justice? The mantis' neck plate was said to resemble the decorative jabots frequently worn by this Supreme Court Justice.

A: Ruth Bader Ginsburg

Q: The Butterfly Cluster is an open cluster of stars roughly 1,500 lightyears away. From our perspective on Earth, it appears to be located in between Sagittarius and what other constellation?

A: Scorpius

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Bonus: History & People

Q: Dr. Sunday Ekesi is an entomologist, R&D scientist, and leader with extensive knowledge and experience in sustainable agriculture and biodiversity. He is currently the director of research and partnerships and a member of the Senior Management Committee at the Internationale Centre of Insect Physiology and Ecology in Nairobi, Kenya. What award is Dr. Ekesi being honored with this year at ESA?

A: 2021 Fellow of the Entomological Society of America

Q: After getting his PhD in 2018, this hymenopterist began working at the USDA Bee Research Lab in Maryland. But he is better known for his extensive outreach, making appearances on the Today Show and many local news outlets. His two interviews on WIRED magazine's YouTube channel were posted earlier this fall and already have a combined 400,000 views. Who is this entomologist and science communicator, known by the nickname "Dr. Sammy" on social media?

A: Samuel Ramsey

Q: The ESA Early Career Professionals committee was initially established as the Student and Young Professionals Committee in what year? This was also the final year ESA used the old 'Sections A-F' before switching to the current sections P-IE, SysEB, PBT, and MUVE. Answers within two years will be accepted.

A: 2007

Q: Wheel bugs, developing queen honeybees, and different life stages of termites have been the subjects of what regular feature in issues of American Entomologist? This single-page feature is subtitled *A Photographer's View of Entomology*.

A: Through the Loupe

Q: This Google Doodle was released in 2013 to celebrate the 180th birthday of what famous figure in medical entomology?



A: Carlos Finlay

Q: Dr. Clare R. Baltazar received the prestigious Rizal Pro Patria Award for her contributions to entomology and biological control in the Philippines. One of her greatest achievements was the first authoritative catalogue on the Filipino species of what insect order? This catalogue listed

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over 2000 species found in the Philippines, greatly expanding on the previous work of 19th-century entomologists Frederick Smith and William Ashmead.

A: Hymenoptera

Q: Margaret Fountaine was one of the first women to become a fellow of the Royal Entomological Society. She was a lepidopterist literally until the day she died, suffering a fatal heart attack in the field at age 77. Her dead body was found, butterfly net still in hand, on what island in the Lesser Antilles? This island is also the birthplace of SEB President-Elect Michelle Samuel-Foo.



Image licensed under CC BY-SA 4.0

A: Trinidad

Q: David Cross, Debra Messing, and Cameron Esposito starred in the 2020 film *The Dark Divide*, based on the true story of lepidopterist Robert Pyle's wilderness excursion in search of butterflies and bigfoot. Much of the film was shot on location in Gifford Pinchot National Forest, which is located in what Pacific Branch state?

A: Washington

Q: What ant systematist and evolutionary biologist is the current director of the Cornell University Insect Collection, and was recently named an ESA Fellow in 2020? Her 2011 study of ant evolution on a South Pacific island is far from her most-cited paper, though fans of H. G. Wells may be amused by the coincidence.

A: Dr. (Corrie) Moreau

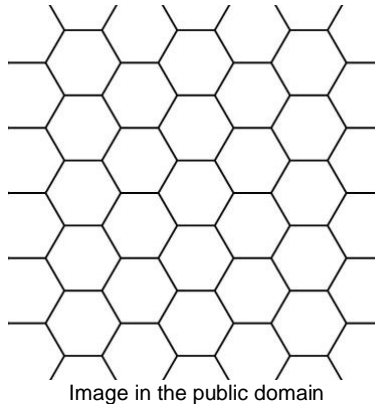
Q: Keteoko is a traditional 'honey feast' celebrated by the Enawene-Nawe people indigenous to the Brazilian Amazon. In order to collect large amounts of wild honey for the feast, the Enawene-Nawe have developed their own classification system, based on morphology, behavior, nest structure, and honey flavor, for identifying native species of what type of bee? Please answer with the common or scientific name of a *tribe* of Apidae.

A: Meliponini, stingless bees

Q: A hexagonal grid is the most efficient way to divide a surface into regions of equal area with the smallest possible perimeter. Bees have instinctively known this for millennia, but human

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mathematicians did not prove it until 1999. As an homage to beehive architecture, this mathematical statement is called the [BLANK] conjecture. What nine-letter word fills in the blank?



A: honeycomb

Q: These talks were given earlier today at a member symposium organized by what professional society, which is usually abbreviated ASA?

- | | |
|--------------------------|--|
| ★ 9:50 AM – 10:05 AM MT | Seasonal population dynamics of bermudagrass mite and associated mites in turf
Presenting Author: Matthew Steven Brown – Clemson University
Co-author: Juang-Horng Chong – Clemson University |
| ★ 10:05 AM – 10:20 AM MT | Evaluating newly registered miticides for management of plant-feeding mites in highbush blueberries
Presenting Author: Lorena Lopez – Virginia Polytechnic Institute and State University
Co-author: Oscar E. Liburd – University of Florida |
| ★ 10:20 AM – 10:35 AM MT | Optimizing biological control of <i>Tetranychus urticae</i> with the predatory mite <i>Phytoseiulus persimilis</i> in staked tomato systems
Presenting Author: Tom Bilbo – North Carolina State University
Co-author: Jim Walgenbach – North Carolina State University |
| ★ 10:35 AM – 10:50 AM MT | The effect of rearing host plant on dispersal behavior of predatory mites
Presenting Author: Samantha A. Willden – Cornell University
Co-author: Gregory Loeb – Cornell University |

A: Acarological Society of America

Q: Born in 1869, this botanist and entomologist moved to Colorado to teach biology. She frequently published papers in entomology journals as the sole author, a rarity for female entomologists at the time. Her husband Theodore, who was also an entomologist, named multiple insects after her, including the bees *Hesperapis wilmattae* and *Bombus lateralis wilmattae*. Who was this accomplished entomologist (either maiden name or married name acceptable)?

A: Wilmatte Porter Cockerell

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Q: Even though the 26th International Congress of Entomology has been delayed due to COVID, the 27th ICE meeting has already been scheduled to take place in 2024 in what city? This city is located approximately 250 miles from a much larger city that held the recent COVID-delayed Summer Olympics.



A: Kyoto, Japan

Q: The ESA website maintains a list of HBCUs that offer agricultural programs. Two of these HBCUs are in the southwestern branch: Prairie View A&M, and what Oklahoma university? This university's name is the same as the *first name* of a famous Harlem Renaissance poet who wrote "In time of silver rain / The butterflies lift silken wings/ To catch a rainbow cry."

A: Langston University [the poet is Langston Hughes]

Q: *Hypoderma tarandi* is a botfly that was part of the traditional diet of the Nunamiut people of Alaska. The botfly occasionally feeds on humans, but its primary host is a land mammal that is also part of the diet of some indigenous Alaskans and Canadians. Name this mammal.

A: caribou or reindeer (*Rangifer tarandus*)

Q: The ESA website states that the North Central branch encompasses 14 states and 3 Canadian provinces. This is technically not correct. Since Nunavut is a territory, not a province, and since a large part of Ontario is in the Eastern branch, there is only one Canadian province that is entirely contained within the NCB region. Name this province.

A: Manitoba

Q: What evolutionary biologist contributed a chapter to the 2004 book *Methuselah Flies* about the correlation between desiccation resistance and postponed aging in *Drosophila melanogaster*? It is one of the most frequently cited works of this biologist, though it only has one-third the citations of his book *The Emperor's New Clothes: Biological Theories of Race at the Millennium*.

A: Joseph Graves, Jr.

Q: What island nation's parliament building is perhaps the only such building in the world to maintain a pinned insect collection? The collection is comprised of several glass displays showcasing this nation's diverse insect life, including the endemic Queen Alexandra's Birdwing.

A: Papua New Guinea

Q: The Fall 2021 issue of American Entomologist had an article about an outreach program where scientists at the Florida Museum would travel to local public schools and teach students

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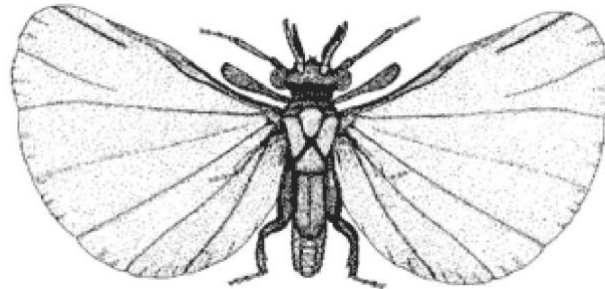
how to rear Lepidoptera, in order to foster interest in the natural world. This outreach project was known by what rhyming name, a reference to the excrement of the reared caterpillars?



Image credit: Jeff Gage, from Markee et al. 2021, *American Entomologist* <https://doi.org/10.1093/ae/tmab042>

A: Frass in the Class

Q: What is the only major organization that uses a picture of a strepsipteran as its official logo? The logo was meant to honor William Kirby, who described the order Strepsiptera a couple decades before this organization was founded.



A: Royal Entomological Society

Q: This year, ESA introduced the Rising Stars of Entomology Award Symposium. This new award symposium celebrates the hard work and success of exiting Master's and Ph.D. students from each ESA section. Name any two of the five 2021 award recipients.

A: Benoit Bechade, Kara Fikrig, Sajjan Grover, Daniela Pezzini, Yan Yan

Q: What ESA journal was recently given its first impact factor (4.771) and is currently ranked #6 out of 102 entomology journals? This journal is currently edited by Sydney Cameron and James Whitfield.

A: Insect Systematics and Diversity

Q: What new national ESA award was established to honor 4 students at Historically Black Colleges and Universities, as well as other minority-serving institutions?

A: Alate Award

Q: The use of genetically modified mosquitoes in the United States is regulated by what organization, which is currently run by administrator Michael S. Regan?

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A: The Environmental Protection Agency (EPA)

Q: Which naturalist, entomologist, and illustrator's 366th birthday was celebrated with this Google Doodle on April 2, 2013?



A: Maria Sibylla Merian

Q: Two of next year's branch meetings are scheduled to be held on islands. Name both of those islands.

A: Puerto Rico (SEB), Hawai'i (PB)

Q: The article on the final page of an issue of American Entomologist used to be called Terminal Segment, but it is now known by what other name, which it shares with a genus of Coleoptera?

A: Zyzyva

Q: Veterans of the Entomology Games know that Abraham Lincoln signed the Morrill Act into law in 1862, establishing land grant universities in the US. But in what year did president Benjamin Harrison sign the second Morrill Act, which expanded the system to include historically black land-grant institutions?

A: 1890

Q: Arachnologist Paula Cushing is the senior curator of invertebrate zoology at what museum? This museum also has an invertebrate paleontology collection, managed by Kristen MacKenzie, that includes cricket fossils from the Green River Formation and longhorn beetles from the Florissant Formation. Name the museum.

A: Denver Museum of Nature and Science

Q: What is the name of the USDA ARS administrator who gave an opening plenary address at the 2020 virtual ESA meeting? Earlier this year, President Biden nominated her for the position of USDA Undersecretary for Research, Education, and Economics.

A: Chavondra Jacobs-Young

Q: Not counting current ESA president Michelle Smith, who is the most recent president from the North Central Branch? This past president is the director of the University of Nebraska State Museum, and was elected as an ESA Fellow in 2020.

A: Susan Weller

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Q: Dr. Bryan Lessard's 2011 paper on the horse fly genus *Scaptia* went viral because he named a new species after Beyonce. Nine years later, he received similar accolades for describing the elegant, extravagant soldier fly seen here, and naming it after what celebrity, who just won the 2021 Emmy for Outstanding Host of a Reality or Competition Program?

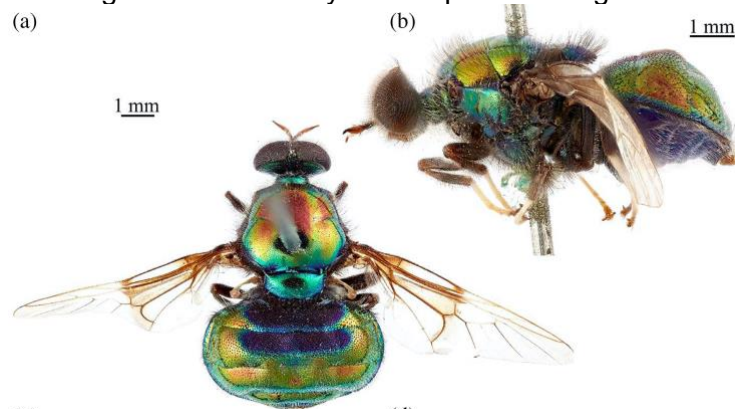


Image credit: Bryan D. Lessard, David K Yeates, Norman E Woodley; from Lessard et al. 2020, *Austral Entomology*
<https://doi.org/10.1111/aen.12485>

A: RuPaul [*Opaluma rupauli*]

Q: This entomologist spent much of his career at the Walter Reed Army Institute of Research. His notable accomplishments include discovery of drug-tolerant scrub typhus and elimination of *Aedes albopictus* from San Jose, California. Earlier today, Mustapha Debboun, Dina Fonseca, and Ary Faraji all gave talks at a member symposium organized in his honor. Name this medical entomologist and ESA fellow, who passed away in 2020.

A: Daniel Strickman

Q: Lepidopterist Marianne Horak, the first-ever winner of the J.O. Westwood Medal for excellence in insect taxonomy, did her graduate studies in what European city near her home canton of Glarus? This city is also known for its soccer team GCZ, nicknamed 'Grasshoppers', that has won 27 national championships.



A: Zürich, Switzerland [the 'Z' in GCZ]

Q: The ability to edit insect genomes with CRISPR has revolutionized many fields of entomology. Name either winner of the 2020 Nobel Prize in Chemistry that co-developed the CRISPR/Cas9 method of genome editing.

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A: Emmanuelle Charpentier, Jennifer A. Doudna

Q: The painting seen here, with the caption "They left because the boll weevil had ravaged the cotton crop," is one of 60 panels in the Migration Series, depicting the mass movement of African-Americans from the rural South to the urban North. The Migration Series is arguably the best-known work of what 20th-century American artist?



A: Jacob Lawrence

Q: What prize, named after a 20th-century entomologist-turned-geneticist, is awarded annually by the Society for the Study of Evolution? It *makes sense that biologist* Katja Kasimatis is the newest winner of this prize, *in light of* her research on genome evolution.

A: Dobzhansky Prize

Q: Early 20th-century geneticist Nettie Stevens bred many insects for her experiments. She even started a colony of *Drosophila melanogaster*, years before her advisor Thomas Morgan popularized them as model organisms for heredity research. But she is best known for discovering the function of what important structures, found in the cells of both insects and humans?

A: sex chromosomes

Q: In early 2021, Godwin and Bond described 33 new species of the trapdoor spider genus *Ummidia*, including a species named in honor of what alt-country singer-songwriter, who was the most-nominated woman at the 2019 Grammy Awards? She has had success both as a solo artist and as a member of the all-female supergroup The Highwomen, and her annual music festival "Girls Just Wanna Weekend" is held in Mexico near the type locality of her namesake trapdoor spider. Name this singer.

A: Brandi Carlile

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Q: A 2018 paper describing a new species of *Scolopendra* became controversial in 2021 after the government of what Asian country claimed that the authors acquired the type specimens illegally? Although the specimens were caught legally by local collectors in the town of Kabayan, and on Mindoro island, the first author did not obtain the correct permits to have them shipped from this country to his home university in Spain.



Image credit: Carles Doménech, Víctor M. Barbera, Eduardo Larriba; from Doménech et al. 2018, *Zootaxa*
<https://doi.org/10.11646/zootaxa.4483.3.1>

A: The Philippines

Q: John A. Mulrennan Jr. won the 2021 Ig Nobel Prize in Entomology for his Cold-War-era study on a new method of cockroach control in what type of vehicle? Mulrennan called his study "a unique and challenging opportunity for military entomologists", because residual vapors from fumigants are much more dangerous in this type of vehicle.

A: US Navy submarines

Q: What insect family is essential for the production of iron gall ink? The ink is made using tannins extracted from oak galls, which are induced by larvae of this family.

A: Cynipidae

Q: The ability for Corixidae to stridulate was first discovered by 19th-century Irish entomologist Mary Ball. She is also known for her studies of Odonata and her extensive collection of animals in what phylum? This phylum is NOT Arthropoda, though it does contain species commonly known as sea butterflies.

A: Mollusca

Q: Michael Osae is the current president of the Entomological Society of what African country? In 2018, this society held a Fall Armyworm Symposium in collaboration with the CABI West Africa Centre and the Kwame Nkrumah University of Science & Technology.

A: Ghana

Q: The ESA governing board is comprised of 6 branch representatives, 4 section representatives, the president, the VP, the VP-elect, and five other positions. Name any two of those remaining five positions.

A: Past president, treasurer, student representative, early career professional representative, executive director