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CIRCULAR OF THE ENTOMOLOGICAL SOCIETY OF NEW SOUTH WALES Inc

This month's member spotlight is our president and long-standing member Robert Ryan. Bob has had a long career in pest control and particularly in the area of fumigation. Bob has also contributed a short article on a pending invasive species, the brown marmorated stink bug. Thanks also to Dinah Hales who has contributed two short articles on the perils of taxonomy and type localities for her favourite insects – aphids, and on a layman's method of slide-mounting aphids.

We continue providing hyperlinks to entomological stories and research that may be of interest to members and some interesting photos of insects.

Kind Regards

Garry Webb

Circular editor

The brown marmorated stink bug: a quarantine concern

Robert Ryan (MSc, ASTC; FRACI, C.Chem; FAIFST; FAMI CPM).

While the child-friendly metallic sheen Hibiscus Harlequin Bug (*Tectocoris diophthalmus*) is always popular with young visitors to the NSW Entomology stand at the annual Ku-ring-gai Council Wildflower Art and Garden Festival, the brown marmorated stink bug, BMSB (*Halyomorpha halys*), on the other hand is an invasive quarantine pest.

Hibiscus Harlequin Bug

Brown Marmorated Stink Bug

The BMSB "risk season" which requires compulsory treatment of incoming goods and vessels arriving in Australian between 1 September and 31 May (inclusive) each year. The list of countries of origin of export goods that potentially require treatment is now in excess of fifty. There is a very extensive target of high risk goods which even includes metals, vehicles, textiles, wood and commercial equipment.

The currently approved treatments carried out by Australian Government approved/registered providers include: Heat Treatment (>56°C); Methyl Bromide (>24 g/m^3) and Sulfuryl Fluoride (CT of 200 g-h/m^3).

The BMSB is native to eastern Asia, including China, Taiwan, Korea, and Japan (Lee et al. 2013). Following its discovery in North America (2001) BMSB spread rapidly and has emerged as a major pest of tree fruits and vegetables, causing millions of dollars' worth of crop damage and control costs each year (Leskey et al. 2012a).

BMSB has also become a nuisance to homeowners due to its use of structures as overwintering sites (Inkley 2012). Invasions in Italy and the United States have caused massive biosecurity responses. A press report described hellish scenes involving thousands of stink bugs invading suburban homes. One researcher killed 26,205 bugs in their home in just six months. Biosecurity New Zealand is also very concerned. A stink bug incursion into New Zealand would devastate the horticultural industry. Any incursion would require a massive pesticide response that could make it impossible for New Zealand fruit growers to export their produce to some of our most lucrative trading partners.

Following its invasion of North America, BMSB expanded its global range into Europe, Eurasia, and South America (Chile), making it an invasive species with a global impact (Wermelinger et al. 2008, Faúndez and Rider 2017, Valentin et al. 2017). The bug's association with human-made structures has made it an adept hitchhiker; parked vehicles, including recreational vehicles and cargo containers, can serve as desirable overwintering sites. Subsequent movement of these vehicles and cargo across state lines or between countries has been implicated in its rapid spread. Although widespread in the United States, BMSB has not established sustained reproducing populations in every state where detection has occurred. The invasive potential of BMSB has led to increased vigilance on the part of nations which have not been invaded. Precautions to limit its global spread include inspections of potential host plants and the fumigation or heat treatment of cargo that may contain hitchhiking BMSB (Duthie et al. 2012).

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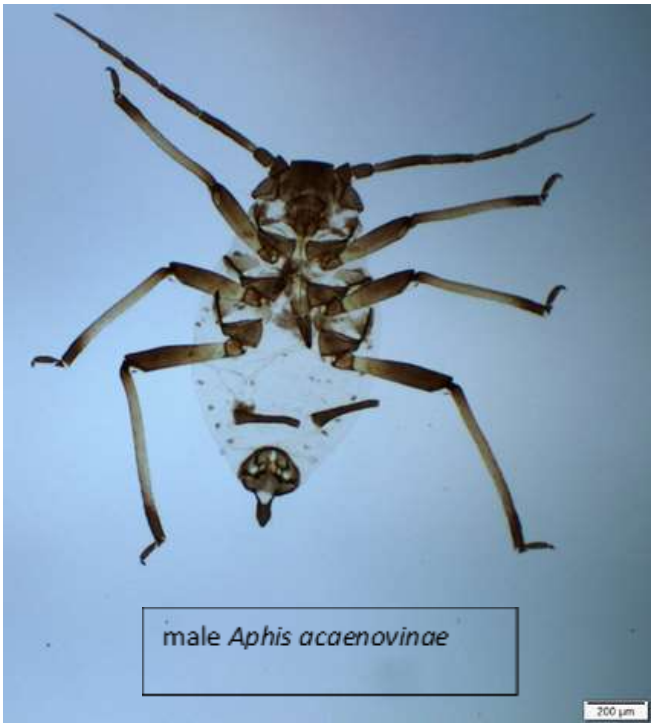
Modified Mounting Method for Aphids

Dinah Hales PhD



During the Covid lock-down, I've been running a yellow trap to catch aphids. It didn't take long to realise that, in order to have any chance of identifying the catch, I would have to clear the specimens and mount them on slides. While I was at Macquarie University, I did this quite often, but how to achieve it at home? For one thing, it is almost impossible as a private person to buy ethyl alcohol. Would methylated spirit do? And potassium hydroxide? etc etc. I raised the problem with former mentor Roger Blackman, of the Natural History Museum, London, and he thought metho would probably work. More importantly, he pointed out that his website, *Aphids on the World's Plants*, provides a more accessible mounting method that can be used at home. It involves alcohol, potassium hydroxide, water and Pritts Clear Glue mixed with borax and glycerol. There seems to be no supplier in Australia of Pritts Clear Glue, except for an eBay site that twice sent us the wrong thing (white glue rather than clear). Pritts is a PVA glue - for my first lot of slides I used ordinary hardware PVA glue which dries clear. It has two disadvantages, firstly that it doesn't dry clear under a coverslip, and secondly that it is difficult to arrange the appendages of an aphid immersed in an opaque liquid! Despite this, the slides were usable. Looking for clear PVA glues available here, I came upon Elmers School Glue, which can be bought in the supermarket. It doesn't actually say it is a PVA glue, but it seems to work well when used as in Roger's method. A lot of my specimens ended up with distorted wings, which I think may

have been caused be over-cooking and / or over-handling. So, my modifications of the website instructions are:

1. Use metho instead of alcohol.
2. Use sodium hydroxide rather than potassium hydroxide, being more readily available in the local hardware. Tend towards the shorter period of heating.
3. Specimens were arranged on the slide in a drop of diluted glue, which was then carefully removed with a tissue.
4. A small drop of Elmers-borax-glycerol was added and the coverslip was put in place.

Using this method, the hairs are clear enough to count and measure, sometimes an important feature in aphid keys. The longevity of the slides is unknown, but there seems no reason why they would deteriorate in the medium term.

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Ephemeral Study Sites and Type Localities

Dinah Hales PhD

The disadvantage of collecting anywhere but in sites that you can control, such as your own garden, is that they may disappear without a word of warning. During the autumn I was studying three aphid species. One was on a tree in my garden - no problems. One was on a neighbour's tree with branches extending over our fence, and the third was on a group of street trees. They are all non-native species and therefore at risk. Towards the end of winter, we drove past the street trees. Shock, horror - the council had chopped them right back to the basic branch structure. My hypothesis was that a small population would survive through the winter and increase on the spring flush. An alternative was that the aphids might have laid eggs that would hatch in the spring. Both hypotheses wiped out! The only remaining possibility was that the sprouting trees would be re-invaded after winter, but so far, the trees have leaves but the aphids aren't back. One morning we woke to the sound of machinery (not unusual). I looked out and wouldn't you know it, the neighbours' tree was being cut down! Not a big deal in this case as there are other trees of the same species not too far away - until either the council or the land care group gets rid of them. Cross my fingers.

I'm not a taxonomist but have always had an eye open for aphids that are either new species or species new to Australia. Take for example *Aphis platylobii* Carver and Hales. The type locality was the bush behind Macquarie University. Another example is *Neophyllaphis lanata* Hales and Lardner. It has been found in various places, but the type locality was the bush at the bottom of Mahers Rd, West Pennant Hills. The type localities of both these species were eradicated by the construction of the M2 motorway. Incidentally, so was our house.

Has anyone else had the same experience with study sites or type localities?

Ulmus street tree – before and after

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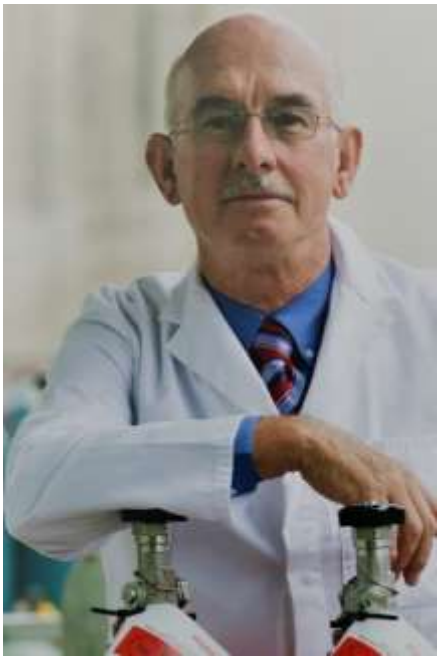
Member Spotlight

Robert Ryan



Leaving school I moved to Sydney from rural NSW and I was employed by a number of companies while studying chemistry part-time at UNSW. The industries included Flavours & Fragrances, Pharmaceuticals, Soaps and Detergents, NSW University and CIG Industrial Gases. An insect related project led me to be a certified PCO and fumigator, a part-time TAFE Pest Control Teacher, participant in a World Bank project [Dalian, China] and in UNIDO projects [Ho Chi Ming City, Vietnam; Bangkok, Thailand; Jakarta, Indonesia].

I am an unlikely NSW Entomology Society President as I am an industrial chemist however my "mission" is to eliminate insect pests that interfere with human health, comfort and development. My involvement with public health pests started in 1974 following an outbreak of Murray Valley Encephalitis, a virus transmitted by mosquitoes. Although the number of cases was comparatively small, the high mortality and morbidity provoked community fear, media hype and public health concern. An earlier outbreak led to the loss of 17 lives (mostly children). Subsequently the Commonwealth Industrial Gases Ltd R&D program resulted in the development of high pressure (50 bar) industrial gas cylinder patented products (Ryan et al, 1978) based on the solvent/propellant properties of liquid carbon dioxide for the control of mosquitoes. The active ingredients are dissolved in the compressed liquid carbon dioxide which produces aerosol particles of less than 10 microns when dispensed to atmosphere. One of the active ingredients used was natural pyrethrum which is extracted from the perennial pyrethrum "daisy" flower. CIG Pyrethrum was formed to produce natural pyrethrum in Tasmania. This resulted in the first experimental growing of Pyrethrum in Tasmania (1981). CIG Pyrethrum evolved into Botanical Resources Australia Pty Ltd (recently purchased by Sumitomo Chemical). Tasmania now produces over 60% of the global natural pyrethrum and has the most high-tech pyrethrum industry in the world. The innovative CIG Envirosol products were launched by CIG Ltd in 1976 to the commercial pest control market with applications of "fogging" large spaces for mosquitoes and other pests.

There was also a strong need to control insects in grain and foodstuffs to prevent food losses and to satisfy export marketing requirements. The traditional preferred fumigants were methyl bromide (CH_3Br) and phosphine (PH_3) with the latter the fumigant of choice because of cost considerations, superior efficacy and environmental acceptance - methyl bromide is listed on the Montreal Protocol as an ozone depletor. Phosphine is a naturally occurring gas, albeit short lived because it reacts with atmospheric air forming phosphoric acid (it gives soft drinks a tangy flavor and prevents the growth of mould and bacteria, which can multiply easily in a sugary solutions). The phosphine releasing metallic phosphide ("solid phosphine") formulations have been commercially available for almost eighty years and have made significant contributions to grain protection. My contribution to fumigation

was the introduction of high pressure gaseous liquid phosphine mixtures. Innovations included the non-flammable PHOSFUME/ECO$_2$FUME (Ryan and Latif, 1989) and the pure VAPORPH$_3$OS/ UltraPhos (Ryan and Shore, 2005) which is mixed on-site "very quickly" with air to ensure non-flammability. The benefits of gaseous phosphine products include elimination of the flammability hazard; auto-control of phosphine concentration, quick distribution within the grain mass; effective flow-through fumigation of unsealed storage, piped gas system to minimise WH&S concerns, elimination of handling & disposal of the "spent" metallic phosphide tablets and avoidance of fires associated with the tablets.

I continue to be involved in the global technology transfer of innovative fumigation techniques developed in Australia. After a rather remiss start for a large grain exporter, Australia has a very high standard for the requirement of delivering insect and pesticide free grain to the world (export grain needs to be insect-free and preferably pesticide-free).

My extracurricular activity as a TAFE Pest control teacher, Ultimo NSW was to take over from Phil Hadlington (ex-Forestry NSW) and I subsequently handed over to John Gerozisis. I employed John when he was a student with Erik Shipp, UNSW. The "bible" for pest control students, "Urban Pest Control in Australia" was initially published by Phil while later editions have jointly authoed by Phil and John.

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New Entomological Research

(**Right Click** on the titles (or **CTRL Right Click**) to see the full articles)

Key to butterfly climate survival may be colour coded

A butterfly's ability to absorb or reflect heat from the sun with its wings could be a matter of life and death in a warming world, according to British research published Thursday calling for gardens, parks and farms to host shady, cooling-off spots. While all butterflies are ectotherms -- they cannot generate their own body heat -- the ability to regulate temperature varies significantly, researchers said. The study found that species that struggle to moderate their body temperatures often rely on being able to escape the full heat of the sun in shaded "microclimates" to survive. These butterflies are "likely to suffer the most from climate change and habitat loss," said lead author Andrew Bladon, of the University of Cambridge's Department of Zoology. Researchers said the cooler niches they rely on have dwindled as habitat is lost and fragmented, driving population decline in two-thirds of butterfly species in Britain.

One step closer to bomb-sniffing cyborg locusts

If you want to enhance a locust to be used as a bomb-sniffing bug, there are a few technical challenges that need solving before sending it into the field. Is there some way to direct the locust -- to tell it where to go to do its sniffing? And because the locusts can't speak (yet), is there a way to read the brain of these cyborg bugs to know what they're smelling? For that matter, can locusts even smell explosives? Yes and yes to the first two questions. Previous research from Washington University in St. Louis has demonstrated both the ability to control the locusts and the ability to read their brains, so to speak, to discern what it is they are smelling. And now, thanks to new research from the McKelvey School of Engineering, the third question has been settled. The answer, again: 'yes.'

Design of insect-inspired fans offers wide-ranging applications

A highly sophisticated folding mechanism employed by a group of insects for at least 280 million years is set to become available for a wide range of applications, thanks to a design method developed and tested through multidisciplinary research by engineers and palaeobiologists. According to an article published in the *Proceedings of the National*

Academy of Sciences today, researchers have recreated the complex, highly compact folding mechanisms found in the wings of earwigs with an origami-inspired geometrical method, which has potential applications across different fields of engineering.

The grasshopper that was lost, then found, is now endangered

The Key's Matchstick Grasshopper, or the Keyacris scurra, was once widespread and abundant in New South Wales, the Australian Capital Territory and north-central Victoria, but over the past century its numbers have seriously declined. So much so that in NSW, it has now been declared endangered. The distribution of Key's Matchstick Grasshopper has contracted to such an extent that its habitat is now severely fragmented and shrinking. The species was once found in an area covering 15,906 km², – but it now occupies only 68 km² which represents a loss of 96 percent of its range. As agriculture expanded, vast tracts of land where the grasshopper once occurred were cleared. The native daisies and grasses that the grasshopper relied on were replaced by 'improved' pasture that was considered more suitable for livestock grazing.

Some Indian jumping ant workers can transition to a queen-like state

A team of researchers at the University of Pennsylvania has found that some Indian jumping ant workers can transition to a queen-like state if their queen dies. In their paper published in the journal *Science Advances*, the group describes their study of *Harpegnathos saltator* ants, and what they learned about them. Most ants live in colonies in which individuals have clearly delineated roles. Worker ants, for example, build nests and keep them clean. Each colony has a queen that lays eggs to keep the population thriving. New colonies are formed when new queens are born and fly off with a group of worker ants. In this new effort, the researchers have found that one species of ant, H. saltator, does things a little differently.

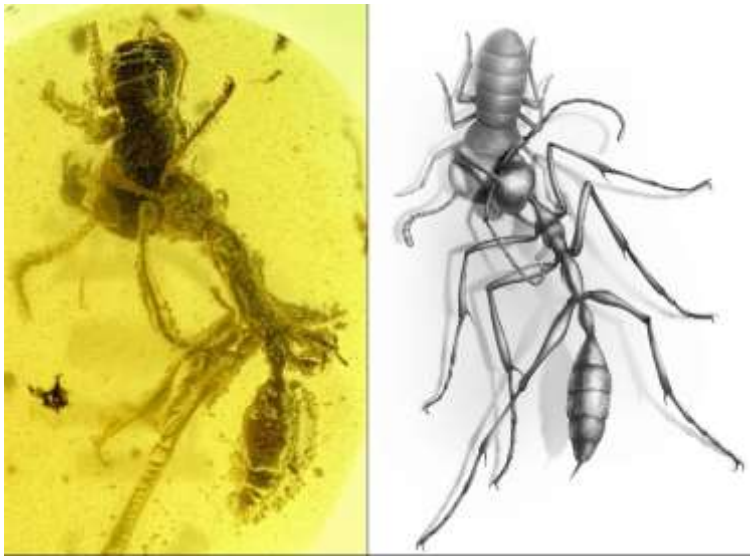
Honoring World Mosquito Day

August 20th, 2020 is World Mosquito Day. Why celebrate an animal dubbed as one of the “world’s deadliest”? Organizations commemorate this day in various ways, but they all aim to spread awareness of the importance of mosquito control to prevent the spread of infectious diseases. According to the American Mosquito Control Association (AMCA), this day originated in 1897 to commemorate the work of Dr. Ronald Ross of the Liverpool School of Tropical Medicine. Through his work, Ross documented the lifecycle of the malarial parasite and the role played by mosquitoes. He is credited with discovering that mosquitoes transmit malaria to humans and was awarded a Nobel Prize in 1902.

Digging Deep: The Secrets Within Termite Nests

Not only are some species of animals social, but they are also able to collaboratively build often elaborate structures, such as the nests of paper wasps, honeybees, and termites. There are no building plans or construction foremen, so how do they do it? It turns out that individuals have very simple tasks to do, and they perform those tasks over and over again without knowing anything about how the structure will ultimately look, and without any central direction. They do those tasks in response to some stimulus, which might be a change in odor or light. The stimulus may trigger them to work in a certain location, whether expanding a current nest, adding tunnels to food sources, or building an entirely new nest. This nest-building activity fascinates Nobuaki Mizumoto, Ph.D., who just spent two years in Arizona observing and investigating the behavior of subterranean termites and discovering some interesting details about their tunneling activities.

Stunning 99-Million-Year-Old Fossil Reveals "Hell Ants" in Detail: Hunted With Bizarre, Deadly Mandibles



In a 99-million-year-old preserved amber fossil, researchers get a detailed glimpse into how 'Hell Ants' hunted with scythe-like mandibles and horn appendages. In findings published on August 6, 2020, in the journal Current Biology, researchers from New Jersey Institute of Technology (NJIT), Chinese Academy of Sciences and University of Rennes in France have unveiled a stunning 99-million-year-old fossil pristinely preserving an enigmatic insect predator from the Cretaceous Period — a 'hell ant' (haidomyrmecine) — as it embraced its unsuspecting final victim, an extinct relative of the cockroach known as *Caputoraptor elegans*. The ancient encounter, locked in amber recovered from Myanmar, offers a detailed glimpse at a newly identified prehistoric ant species *Ceratomyrmex ellenbergeri*, and presents some of the first direct evidence showing how it and other hell ants once used their killer features — snapping their bizarre, but deadly, scythe-like mandibles in a vertical motion to pin prey against their horn-like appendages.

About 94 per cent of wild bee and native plant species networks lost

Climate change and an increase in disturbed bee habitats from expanding agriculture and development in northeastern North America over the last 30 years are likely responsible for a 94 per cent loss of plant-pollinator networks, York University researchers found. The researchers, corresponding author Professor Sandra Rehan of the Faculty of Science and grad student Minna Mathiasson of the University of New Hampshire, looked at plant-pollinator networks from 125 years ago through present day. The networks are comprised of wild bees and the native plants they historically rely on, although most of those have now been disrupted. About 30 per cent of plant-pollinator networks were completely lost, which translates to a disappearance of either the bees, the plants or both. In another 64 per cent of the network loss, the wild bees, such as sweat or miner bees, or native plants, such as sumac and willow, are still present in the eco-system, but the bees no longer visit those plants. The association is gone.

Scientists Alarmed by Long-Term Effects of Insecticides on Ant Colonies

This week, scientists of the Institute of Bee Health of the University of Bern have published an article in the peer-reviewed journal Communications Biology, which shows how even low doses of neonicotinoid insecticides, as they may realistically occur in contaminated soils, adversely affect the development of black garden ants (Lasius niger). This study highlights the need to overthink current deployment and management of chemical pest control for more sustainable agriculture. "Ants are one of the most important animal groups on our planet. However, they are also affected by the recently observed global declines in abundance and diversity of insects," says Daniel Schläppi of the Institute of Bee Health of the University of Bern, main author of the study. Evidence suggests that pesticides are among the factors responsible for the observed declines. "One problem of these substances is their persistence and the potential to contaminate soils and water, even in areas in which they are not applied," says co-author Gaétan Glauser from the University of Neuchâtel.

What Can We Learn From Ants About Epidemics?

They clean themselves before entering their home. They use special chemicals to disinfect. They restrict access to high-traffic areas. And no, they're not human — they're ants. Long before social distancing became a household term for us, ants were practicing a version of it to ward off diseases in the nest. And they're good at it. Ants are effective at preventing epidemics within their colonies, despite their close living quarters and massive communities. In fact, epidemics and sick colonies are rarely, if ever, found in the wild. Thanks in part to this, ants are one of the most successful species on Earth. According to some estimates, they make up

almost a quarter of all terrestrial animal biomass. And because of the social measures they've evolved to use, ant behavior often seems distinctly intelligent — but it's really not.

Road verges could be havens for pollinators

Better-managed road verges can help boost pollinating insects, new research shows. Pollinators such as bees, butterflies and hoverflies benefit from the plants and flowers in road verges, which form a network of "corridors" that provide food and shelter. While there are downsides of living by the road, including exposure to pollution and the risk of being hit by vehicles, the researchers found that the benefits for insects far outweigh the costs. The team of scientists, led by the University of Exeter, reviewed more than 140 studies. They found that verges can be dramatically improved for pollinators by measures such as creating flower-rich verges, reducing mowing and limiting the impacts of street lighting.

Bumblebee habitats and diets change over their lifecycle

Bumblebees change their home ranges and dietary preferences after establishing nests, suggesting that diversified landscapes help support bee populations as their needs change during different phases of their lifecycle, according to a study published July 8 in the open-access journal *PLOS ONE* by Pablo Cavigliasso of the Instituto Nacional de Tecnología Agropecuaria in Argentina, and colleagues. As noted by the authors, the study contributes to the growing understanding of how bumblebees use the environment and provides valuable information for conservation planning and sustainable management of the land at a crucial moment in the bumblebee life cycle. Bumblebees are important pollinators for many wild and cultivated plants and have experienced steep population declines worldwide. Understanding how bumblebees use the resources in agricultural landscapes is essential to develop meaningful farm-based land-use management plans that sustain bee populations and maximize the potential pollination service they provide to farmers and ecosystems.

How Long to Play Dead in Order to Stay Alive? The Answer Is "Highly Strategic"

Many animals remain motionless or play dead after being attacked by a predator in the hope that it will give up and move onto some other unfortunate prey. A team of scientists from the University of Bristol has been studying this phenomenon in antlions considered to one of the fiercest predators in the insect kingdom. Their findings, which appear today in the journal *Proceedings of the Royal Society B*, suggest that studying the duration of such immobility may provide a new understanding of predator-prey

relationships. Professor Nigel Franks, from the School of Biological Sciences, led the research. He said: “Lots of animals play dead in extreme danger. Examples include possums, certain birds, and woodlice. “Even humans may play dead *in extremis*. However, to the best of our knowledge, no one before us has asked the question how long should a potential victim ‘play possum’?”

Gall fly outmanoeuvres host plant in game of "Spy vs. Spy"

Over time goldenrod plants and the gall flies that feed on them have been one-upping each other in an ongoing competition for survival. Now, a team of researchers has discovered that by detecting the plants' chemical defenses, the insects may have taken the lead. According to John Tooker, professor of entomology, this complex scenario begins when a female gall fly (*Eurosta solidaginis*) lays its eggs in the leaf bud of a goldenrod plant (*Solidago altissima*). This action forces the plant to produce a tumor-like growth, called a gall. This gall, he said, provides the fly larvae with a source of nutrition and safety from predators and the environment but decreases the plants' ability to reproduce. "Our previous research showed that goldenrod plants have evolved to 'eavesdrop' on the sexual communications of their gall fly herbivores—specifically, the sex pheromones used by males to attract females," he said. "Our new research, suggests that the plants respond to this 'intelligence' by strengthening, also known as 'priming,' chemical defenses to prevent females from laying eggs and inducing gall formation."

The next trend in food: Edible insects?

You might not have known, but a lot of people think you should be eating insects. Their arguments are legion: Edible bugs are better for the environment and can help slow climate change, they can alleviate malnutrition and ease food insecurity. Also, they're delicious. "June beetles are fantastic," said MacKenzie Wade, a doctoral candidate in anthropology at UC Santa Barbara. "They truly taste like bacon." Wade, who farmed mealworms in her dorm room as an undergraduate at Kansas State University, is an unapologetic advocate for edible insects. Her interest in them, however, is far more than gustatory. Her research specializes in insects as food, and the cultural aversions to eating them. That led her and Jeffrey Hoelle, an associate professor of anthropology and her graduate advisor, to do the first systematic review of research literature on edible insect production. "A review of edible insect industrialization: Scales of production and implications for sustainability," in the journal *Environmental Research Letters*, challenges some of the assumptions about edible insects and their potential to combat climate change and inequality.

'Jewel of nature': scientists fight to save a glittering green bee after the summer fires

The green carpenter bee (*Xylocopa aerata*) is an iconic, beautiful native species described as a "jewel of nature" for its metallic green and gold colouring. Carpenter bees are so named because they excavate their own nests in wood, as opposed to using existing holes. With a body length of about 2 centimetres, it is among the largest native bees in southern Australia. While not used in honey farming, it is an important pollinator for several species of Australian native plants. Last summer's catastrophic bushfires significantly increased the risk of local extinctions of this magnificent species. We have studied the green carpenter bee for decades. For example, after the 2007 fires on Kangaroo Island, we bolstered the remaining population by providing nesting materials.

Researchers convert female mosquitoes to nonbiting males with implications for mosquito control

Virginia Tech researchers have proven that a single gene can convert female *Aedes aegypti* mosquitoes into fertile male mosquitoes and identified a gene needed for male mosquito flight. Male mosquitoes do not bite and are unable to transmit pathogens to humans. Female mosquitoes, on the other hand, are able to bite. Female *Aedes aegypti* mosquitoes require blood to produce eggs, making them the prime carriers of the pathogens that cause Zika and dengue fever in humans. "The presence of a male-determining locus (M locus) establishes the male sex in *Aedes aegypti* and the M locus is only inherited by the male offspring, much like the human Y chromosome," said Zhijian Tu, a professor in the Department of Biochemistry in the College of Agriculture and Life Sciences. "By inserting Nix, a previously discovered male-determining gene in the M locus of *Aedes aegypti*, into a chromosomal region that can be inherited by females, we showed that Nix alone was sufficient to convert females to fertile males. This may have implications for developing future mosquito control techniques."

Influence of insect and microalgae feeds on meat quality

Worldwide there is a growing demand for animal products for human nutrition, despite vegan and vegetarian diets becoming more popular in Western countries. Changing diets necessitate a substantial amount of protein as an input for animal production. Future protein feedstuffs will need to become independent of arable land in order to avoid further land use changes, such as deforestation. The cultivation of insects as well as microalgae are up-and-coming sectors in Germany, as well as globally, to meet protein demands for humans and animals alike. Therefore, a research team at the University of Göttingen investigated whether these alternative protein sources alter typical meat quality. Their results have been published in the *Journal of the Science of Food and Agriculture (JSFA)*.

Bees? Please. These plants are putting ants to work

In a world first, Edith Cowan University (ECU) researchers have discovered a plant that has successfully evolved to use ants -- as well as native bees -- as pollinating agents by overcoming their antimicrobial defences. ECU PhD student Nicola Delnevo discovered the trait in a group of shrubs found the Swan Coastal Plain in Western Australia. Mr Delnevo said ant pollination of plants was incredibly rare. "Ants secrete an antimicrobial fluid that kills pollen grain," he said. "So ants have traditionally been considered to be a menace -- nectar thieves whose aggression keeps other potential pollinating insects at bay. "However this group of plants in WA, commonly known as the Smokebush family (*Conospermum*), has evolved a way to use ants to their advantage." Mr Delnevo tested the effect of the antimicrobial secretion from three ant species found locally on the flowers of six WA plant species, with startling results. "We found evidence that *Conospermum* plants have adapted the biochemistry of their pollen grains to cope with the antimicrobial properties of the ants. "This is the first plant species found to have adapted traits that enables a mutually beneficial relationship with ants," Mr Delnevo said. "About 46 examples of ant pollination have been documented around the world, but these have been due to the ants producing less toxic secretions that allow them to pollinate."

Photo Corner

All Society member are encouraged to submit any entomological photographs of interest together with a short (or long) description of your observations.

Soldier beetles (*Chaulignathus pulchellus*) (Cantharidae) swarming over *Angophora hispida* flowers (Photo. Garry Webb, Menai, Nov. 2016)

Jewel beetle (*Castiarina sexplagiata*) and clerid (*Eleale* sp.) on *Actinotus helianthi* (Photo. Garry Webb, Kurnell, Sep. 2019)

Jewel beetle *Themognatha variabilis* on *Angophora hispida*
(Photo. Garry Webb, Menai, Dec. 2019)

Jewel beetles *Stigmodera macularia* and *Castiarina sexplagiata* on *Kunzea ambigua*
(Photo. Garry Webb, Menai, Nov. 2019)

Ant adventures in the Philippines
(2012-15, Garry Webb)

Evaluating control options for ants infesting pineapple and banana plantations - Yellow crazy Ant (*Anoplolepis gracilipes*), tropical fire ant (*Solenopsis geminata*) and black ant (*Dolichoderus thoracicus*) attending mealybug.

Rice, a staple of the Phillipines, and drying rice on the roadway

Philippino culture is deeply entrenched and promoted in schools

Modes of transport for produce in rural areas

Vast pineapple plantations in the south at General Santos on Mindanao Island, and sunburn protection for pineapples. Pineapples are a major export crop (mostly canned)

Experimental bait testing (yes that is Goodo dog food – ants love it)

Traditional spray method to control ants in bananas and fungicide soaks at all entrances to restrict panana disease (fusarium wilt).

Black ant Dolichoderus thoracicus nesting under banana leaves and tending mealybug

Yellow crazy ant at honey lures

Military checkpoints into Davao – The island of Mindanao has been racked by separatists activity in the recent past

SOCIETY POSTAL ADDRESS	MEMBERSHIP FEES 2019	
C/- ENTOMOLOGY DEPARTMENT	ORDINARY MEMBERS	$50 ($45 if paid by AGM 2019)
THE AUSTRALIAN MUSEUM	COMPANY ASSOCIATES	$60
6 COLLEGE STREET	STUDENT MEMBERS	$25 ($20 if paid by AGM 2019)
SYDNEY NSW 2010	CORPORATE MEMBERS	$50

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