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CIRCULAR OF THE ENTOMOLOGICAL SOCIETY OF NEW SOUTH WALES Inc

This month's member spotlight is Peter Miller. Peter is a longstanding member of the Society and retired Associate Professor at UTS. Peter continues his entomological work through the contract research company, Pest Research, based at Kurnell in Sydney.

Thomas Heddle has provided an update on some current research on dung beetles attempting to identify preferences for different types of pasture.

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

Kind Regards

Garry Webb

Circular editor

Member Spotlight
PETER MILLER

My interest in entomology started at school. I liked science, particularly biology and I studied zoology as one of my subjects for the UK equivalent of the HSC. I remember being particularly fascinated by the life history of *Plasmodium vivax*, the malaria parasite, and its mosquito vector. I then had to choose what I would study at university. I had an interest outside school in archaeology and was torn between that and zoology. There wasn't the pressure back then to choose "job ready" degrees, most students studied the subjects at university they enjoyed or were good at - hopefully both. Having said that my father thought archaeology did not offer a career- a dead end! He was not sure about the job prospects for zoology ("where will you work in a zoo?) and so I duly enrolled in joint honours degree in zoology and chemistry at the University of Manchester. I cannot remember much about the chemistry, which I passed but dropped at the end of first year, however the zoology course and the staff who taught it were a revelation. The focus was taxonomy and first year was a walk through the animal kingdom starting at protozoa and ending with the Chordates-and not many Chordates as most of the staff worked on invertebrates. There was lots of microscopy and dissections and careful recording, by drawing our observations. Later years enabled specialisation in areas such as entomology, mammology, physiology, palaeontology ecology and genetics. My interest was in entomology and ecology and those courses established the foundation interests which determined my career. I decided that applied entomology and agriculture would provide interesting opportunities. I was lucky to have two outstanding teachers and researchers in entomology and ecology. Dr Richard Askew was an expert in parasitic Hymenoptera particularly Chalcidae and Mr Gordon Blower was the Reader in Ecology and a specialist in Diplopoda- millipedes and soil biology. Both were excellent taxonomists with a strong interest in ecology. My principal interest was ecology, but I was very aware that to be a good field ecologist one needed taxonomic skills. I was offered a job as a research assistant to Mr Blower working on the life cycle, growth, food consumption and ecology of the millipede *Ophyiulus pilosus*. However, I did not abandon entomology. I also enrolled in an MSc by research with Dr Askew. The topic was "The biology of some *Phyllonorycter* species on oak and beech". *Phyllonorycter* (previously known as *Lithocolletis*) are small leaf mining moths. The study involved researching the density, distribution, and seasonal occurrence of three species of the moths on oak trees and one species on beech trees over a two-year period. A major aspect of the study was looking at the parasitic Hymenoptera species found in the leaf miner larvae and their possible effect on the survival and density of leaf miners. This involved collecting leaves cutting out the leaf mines and storing them in small vials to determine the viability of the moth larvae, the species of parasitic Hymenoptera, and the impact of the parasites on host numbers. A total of 15 parasites were bred from the mines on oak and eight parasites from the beach mines. I was a awarded my MSc in 1970. The MSc thesis gave me a great introduction to field ecology, studying and counting populations, taxonomy, and biological control. It was useful foundation for a career in applied entomology. But where next?

My work as a research assistant was on going and I was becoming very involved with the biology of millipedes and the rich fauna of the forest floor. I decided to enrol in a PhD with Mr Blower. The thesis title was “The consumption and utilisation of food by millipede populations”. The PhD thesis focused on two species *Ophyiulus pilosus* and *Iulus scandinavius,* their life history, food consumption, growth rates and ecology. While I was a student we hosted, and I helped organise, the Second International Conference of Myriapodology at Manchester University in 1972. Myriapoda include millipedes, centipedes, symphyla and pauropods - but I expect you all knew that! This was great opportunity to meet the leaders in the field and I presented three paper which later appeared as chapters in my PhD thesis.

BIOLOGICAL AND CHEMICAL RESEARCH INSTITUTE, NSW

By 1972 I was finalising my lab and field work on millipedes, and it was time to look for a job. Job prospects in entomology were much better than those in millipede biology (non-existent!) and I still had the desire to work in applied entomology. I cast my net wide and applied for jobs in the UK and in any country where I spoke the language and where we could live for the rest of our lives. Late in 1972 I was interviewed at the Australian High Commission in London for a job at the NSW Department of Agriculture as an entomologist at the Biological and Chemical Research Institute, Rydalmere (BCRI). I was offered the job to start as soon as possible to work on Australian Plague Locust. It was now a race to finalise my PhD, including my oral examination, pack up our life in the UK and say goodbye to family and friends. This was to be a lifelong commitment not just a few years in another country.

On Australia Day 1973 after 36 hours in a rather small Boeing 707 I arrived with my wife in Sydney. At the airport there was a friendly welcome from two entomologists from BCRI Greg Shanahan and Graham Goodyear, and a good introduction to our new country. There were around 20 entomologists in the entomology section plus technical support staff. Each entomologist specialised on a crop and had a role in research and extension. There was an excellent insect collection managed by two taxonomists. This was a great start for an applied entomologist. NSW was undertaking a rapid expansion in growing wine grapes, and it was decided that they had enough locust entomologists, and I would become the entomologist specialising in pests of grape vines-both wine and table grapes. I started to look at the pests on grape vines and their impact with a view to develop an integrated pest management program. At that stage farmers tended to rely on “Spray Calendars” rather than assessing pest numbers and treating as necessary. Pests included Grape vine moth *Phalaenoides glycinae* and Grape blister mite *Colomerus vitis*. The principal areas where I worked were Mudgee, Hunter Valley and Camden carrying out field work and meeting viticulturists and occasionally sampling the wine. The plan was that I would re-locate to Tocal Agricultural College at Patterson closer to the Hunter Valley.

FLICK PEST CONTROL

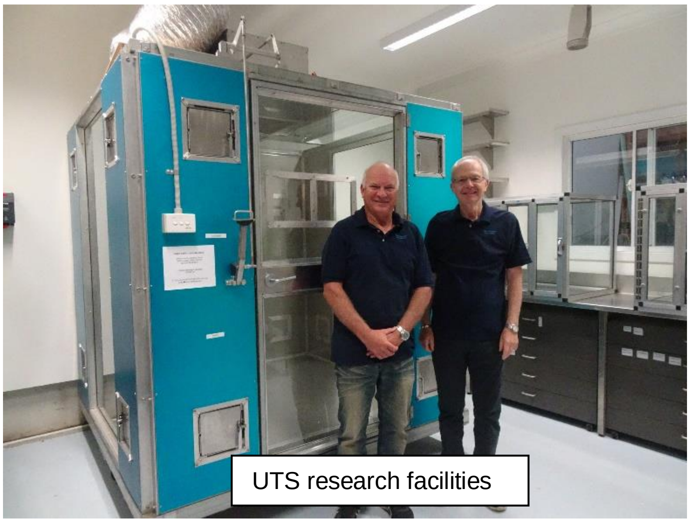
It was great working with an excellent group of entomologists at BCRI but then chance intervened. A friend, who was an electrician, said he had been looking for a job in the back pages of the paper and saw an ad for an entomologist in the “E” section at Flick pest control. I was not looking for a job and I would never have looked there. I applied and in April 1974 I was the entomologist at Flick. I was bonded to NSW agriculture for three years and had to payback half my bond, but the Flick salary and car covered that.

I now needed to learn about household and industrial pests -ants, fleas, cockroaches, spiders and most importantly termites. Termites were a major focus of their work and treatment, and I received excellent on the job training including the art of using arsenic dust. There were no baits at that time and dusting leads and barrier treatments using organochlorines was the standard approach. Flick had branches over Australia and some overseas branches in the Pacific and SE Asia and I travelled widely to train staff and troubleshoot difficult jobs. I was also involved in trials of new control procedures and insecticides with companies who long ago abandoned pesticides such as Shell, ICI and Wellcome.

NSWIT AND UTS

I now was thinking of getting a job in education and early in 1977 I started a job as a lecturer in the Biology Education Unit at the New South Wales Institute of Technology (NSWIT). I was teaching courses in biology-the animal and plant kingdom, physiology, genetics, and human biology. There were ecology subjects but not much entomology. I introduced entomology into a one of the subjects, a subject in pest control and toxicology and an MSc by course work in Environmental Toxicology. The major focus was teaching but NSWIT was starting to do more research and eventually became the University of Technology (UTS). I decided my research area would be urban entomology and was particularly interested in pest cockroaches. As an ecologist I had spent a lot of time travelling long distances to sample populations and the and idea of a pest which was at your backdoor, sometimes literally, was very appealing. They were an easy insect to breed for laboratory work and I also had a potential source of industry funding. Pyrethroids were being introduced and I started laboratory studies at NSWIT to determine their efficacy. Field studies in Sydney on German cockroach and Townsville on American and Australian cockroach followed for promising formulations. Bryce Peters, who had been one of my students, joined the staff after working at BCRI. He saw me working on some cockroach bioassays in the laboratory and asked to get involved. That was the beginning of a working relationship and friendship which is still strong and productive. We were also involved in the development of cockroach baits and gels. I was skeptical at first, but gels revolutionised cockroach control.

Counting mosquito landings in the field



UTS research facilities

At this point a new class of insecticide, Insect growth regulators, based on juvenile hormone (IGR's) were showing promise. These were effective at low doses; they did not kill the insect but stopped reproduction. Hydroprene was useful in cockroach control in preventing reproduction– but it took a while for the population to crash. Methoprene was remarkable against fleas as it stopped development at the pupal stage so there were no biting adults. This opened a very productive few years working on Cat flea (*Ctenocephalides felis*). Breeding them was a bit trickier than breeding cockroaches and when they escaped people were not happy, especially the Dean. Good fogger products were developed and were successful, however with animal treatments (spot-ons and tablets) showing promise our focus moved to field trials in Cairns on cats and dogs. Cairns was chosen because it has year-round flea pressure. These trials were a major undertaking as they were yearlong and involved weekly then monthly flea counts. The trick was to find friendly dogs and cats which also had fleas. Flying insects were the final area of study- Dengue mosquito *Aedes aegpti ,* Brown house mosquito, *Culex quinqefasciatis,* Bush fly *Musca vestutissima ,* House fly *Musca domestica* Biting midges *Culicodes* and European wasp *Vespula germanica*

Much of the work was on the efficacy of personal insect repellents (PIR's) and area repellents. Area repellents are products like coils or electrical emanators. Mosquito PIR's were screened in the laboratory using human subjects. Field trials were conducted in mangrove swamps in Darwin or Cairns. Field trials on other pests meant travel to places with good populations to enable replicated studies, Tasmania for European wasp, Dalby for Bush flies and Tennant Creek for House flies.

RETIREMENT

From my experience entomologists never retire and I am no exception. I retired from UTS in 2009 but maintained an honorary position and laboratory space. Eventually I set up an independent research laboratory with Bryce Peters and I have continued at a slightly more relaxed pace. I have never looked back on my career, but this article made me realise that choosing a degree in zoology, good mentors and colleagues, fortuitous chances and taking a few risks contributed to a fulfilling career in applied entomology - oh and having a vague plan! I do still dream about archaeology but it has become a great hobby.

The attraction of dung beetles to dung derived from different pastures

By Thomas Heddle, Zac Hemming and Nigel Andrew

One of the issues with studies of community structures of coprophagous insects (especially dung beetles) has long been the potential for interspecies variation in the attractiveness of baits. Australia has a wide breadth of landscapes, with various pasture types which grow and are utilised in these landscapes which results in differing quality in the dung. Here on the Northern Tablelands of NSW the typical pastures grazed by cattle are unimproved native pasture, native pasture inter-sown with introduced pasture species (improved), along with smaller paddocks of introduced forage pastures. Over the last seven months, I have utilised cattle dung from three of these pasture types (improved native, rye/clover & forage oats) to determine whether individual dung beetle species display preferences for dung derived from these pasture types in the field (Fig. 1). As happens with so much research in-situ, the preliminary results raised so many thoughts and give a snapshot of what will hopefully be exciting and cutting edge results!

The results thus far from the field research has identified ten dung beetle species across all pasture types. All ten dung beetle species have been identified in the rye/clover and the improved native pastures. The forage oat dung only recorded nine species with the species missing being *Onitis pecuarius*. Typical of the New England Tablelands winter activity was minimal in July, with no sampling occurring in August due to COVID-19 lockdown. In September, the rye/clover pasture was least preferred with the preference being for the improved native pasture. The pattern for total abundance from October 2021 to December 2021 has seen a preference for dung derived from rye/clover pastures first, improved native pasture second, and forage oats being least preferred (Fig. 2). In January 2022, the rye/clover pasture was preferred over the other two pasture types, but forage oat was equal in abundance to the improved native unlike the previous months. *Onthophagus binodis* had the highest abundance in rye/clover pastures while *Aphodius lividus (nr cincticulus)* had the highest abundance in improved native pasture dung. Over the next five months, we expect to observe a preference for rye/clover to continue though a general decline is expected from March onwards. Updates will be provided over the coming months.

New Entomological Research

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

Insect repellents work – but there are other ways to beat mosquitoes without getting sticky

Summer can be hot and sticky. And insect repellent creams, lotions, and sprays can make it stickier. Stopping mosquito bites is key to avoiding itchy bumps and mosquito-borne disease. Thankfully, there are several methods can you try – and some things to avoid – for a mozzie bite-free summer. Insect repellents are a safe, effective, and affordable way to prevent mosquito bites. They are promoted by health authorities in Australia as the best way to avoid mosquito bites. Products sold in Australia must be approved for sale by the Australian Pesticides and Veterinary Medicines Authority (APVMA) which checks products for safety and effectiveness. If applied as recommended – a thin and even coat over all exposed areas of skin – insect repellents can prevent mosquito bites. How long bite protection lasts varies with the strength of the formulation but research has shown it can last for many hours.

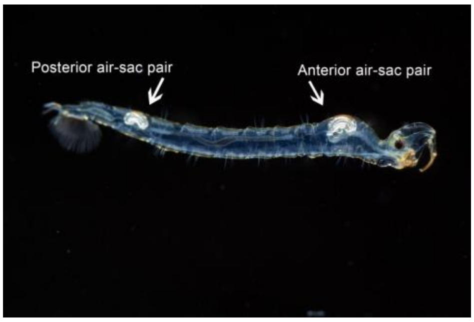
New species of 'incredibly rare' insect discovered

A British scientist has discovered a new species that belongs to a group of insects so rare that its closest relative was last seen in 1969. Dr Alvin Helden of Anglia Ruskin University (ARU) found the new species of leafhopper, which he has named *Phlogis kibalensis*, during field work with students in the rainforest of the Kibale National Park in western Uganda, and the discovery has been announced in the journal *Zootaxa*. The new species, which has a distinctive metallic sheen, pitted body, and, in common with most leafhoppers, uniquely-shaped male reproductive organs -- in this case partially leaf-shaped -- belongs to a group, or genus, called *Phlogis*. Prior to this new discovery, the last recorded sighting of a leafhopper from this rare genus was in Central African Republic in 1969.

Rise of termite clone queendoms offers clue to curb invasions

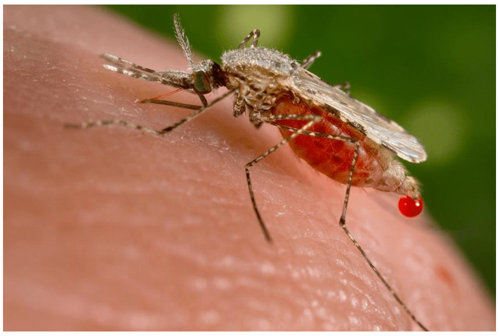
Four years ago, entomologists at the University of Sydney discovered the existence of all-female, forest-dwelling drywood termite colonies in Japan. Now, they have determined how they evolved, and the implications of insect 'girl power' for established termite species (hint: they're bad). Their new research shows all-female colonies of drywood termites (*Glyptotermes nakajimai*) developed through unwitting human-assisted hybridisation some time in the last century. Females from one lineage mated with males from another, as one lineage was unknowingly moved from a smaller island to mainland Japan, likely via boat. Their hybrid offspring are more genetically diverse, and likely to be more robust. In addition to stronger offspring, the all-female colonies can clone themselves and do not require a male to procreate, resulting in double the amount of breeding. According to the researchers, this is bad news for the incumbent, non-hybrid species, which can be outcompeted by its hybrid relatives.

Zoologist Solves the Bizarre 100-Year-Old Mystery of the Floating Phantom Midge



In spring 2018, Dr. Philip Matthews spent a typical afternoon capturing dragonflies in the University of British Columbia's (UBC) experimental ponds. Little did the zoologist know he was about to embark on a journey to solve a century-old entomological mystery involving a much smaller, but equally intriguing, insect. As he worked in the ponds, larvae floating in rainwater in a nearby cattle tank caught his eye. The insects were the freshwater aquatic larvae of the *Chaoborus* midge, also called the 'phantom midge' due to its near transparency. The transparency makes the larvae resemble tiny ghosts as they move through lakes, ponds, and puddles. "These bizarre insects were floating neutrally buoyant in the water, which is something you just don't see insects doing," said Dr. Matthews. "Some insects can become neutrally buoyant for a short time during a dive, but *Chaoborus* larvae are the only insects close to being neutrally buoyant."

Let It Be B: In the Search for Blood, One Mosquito Species Has a Type



Mosquitoes need blood. While they can get blood from a range of animals, it's their propensity to bite people that causes so many pest and public health risks around the world. Over half a million people die each year due to a mosquito-borne disease and, even during the COVID pandemic, mosquito bites will infect hundreds of millions of people across the globe with pathogens, such as arboviruses and malaria parasites. We know mosquitoes bite people, but why do they pick you out from the crowd? It's a phenomenon commonly observed, especially by scientists who need to ensure their volunteers attract enough mosquito bites to ensure the reliability of their insect repellent research and assessments. But what is going on with those people more likely to be bitten by mosquitoes? Is it really because they have "sweet blood," or is that just the kindest thing we can say to our itchy, bite-covered friends and family?

The evolutionary puzzle of supercolonies

Humans are not alone in having achieved global dispersal and colonization of the planet. Ant societies have also reached extraordinary ecological success and currently dominate most terrestrial ecosystems by absolute numbers and diversity (Wilson, 1990). Among the various social and spatial organizations characterizing different ant species, supercoloniality is one of the most spectacular. Invasive ants are typically supercolonial, the paradigmatic example being the Argentine ant *Linepithema humile* with a supercolony spanning several continents.

Along the Mediterranean and Atlantic coasts in Southern Europe, the distribution of the population covers more than 6000 kilometres and acts as a single unit without aggression between workers from nests at the opposite ends of the range (Giraud et al., 2002).
Not all supercolonial special are invasive, however. What exactly are these supercolonies and how do they arise and persist? The review by Heikki Helanterä (Helanterä, 2022) provides us with answers at multiple levels by illustrating the main behavioural, ecological, and genetic processes characterizing supercolonial species and highlighting future directions for the theoretical understanding of the supercolonial lifestyle.

Leaf at first sight: how leaf-curling spiders pair up and build a family home

Have you recently spotted a spider peeking out from a brown, curled-up leaf in your garden? Chances are you're sharing your yard with the leaf-curling spider, *Phonognatha graeffei* (pronounced fon-og-natha greef-e-i), a fascinating member of the orb-weaving spider family Araneidae (pronounced aran-ee-i-dee). This spider – found in each state and territory in Australia – builds its orb web in plants and places in it a special custom-built hiding spot: a curled up leaf. Similar to other orb-weaving spiders, the leaf-curling spider lives for only one year and is most commonly seen in late summer. They are found in woodlands as well as urban gardens and greenery and have particularly interesting family arrangements.

Torres Strait butterflies documented by Trevor Lambkin in mammoth research task

The wings of long-dead butterflies are time capsules. Collected decades or even hundreds of years ago, butterflies now on display at museums, or stored in cool dark rooms, each tell a story. Where they were trapped, who collected them and when, is written down alongside each tiny, delicate insect for future generations. A brief moment in time preserved. For Trevor Lambkin, a University of Queensland researcher and entomologist, writing the story of butterflies is his life's work. Dr Lambkin has spent decades travelling to the Torres Strait at the northern tip of Australia, tracking, recording, and even discovering new butterfly species. "My true love is butterflies, and my true, true love is butterflies in the Torres Strait," he said. Recently completing a master of philosophy at UQ, Dr Lambkin has compiled a unique database of butterfly history from 1843 onwards, across the islands, islets, and cays of Torres Strait. The database will be presented to the Torres Strait Islander communities, with whom Dr Lambkin has worked closely throughout his 38 years of visits to the region.

[Moths eating your clothes? It's actually their hungry little caterpillars – here's how to get rid of them]

Have you opened your post-lockdown wardrobe, only to discover some of your beautiful summer clothes have holes in them? You're probably blaming clothes moths but the real culprits are the larvae (caterpillars). But who are these moths? The fact that they're feeding on your precious clothes, fabrics and yarn actually reflects an interesting and – for moths – unusual biology. Early references to clothes moths in Greek and Roman literature suggest humans have been battling clothes moths for thousands of years. Clothes moths are part of an ancient lineage of moths (Tineidae) and as such have preserved some quirky behaviours and adaptions that have led to a few species becoming pests. The most well-known species of clothes moths in Australia are the webbing clothes moth (*Tineola bisselliella*) and the case-making clothes moth (*Tinea pellionella*). These common names refer to the appearance of silk spun by the caterpillars as shelter. The adult clothes moth ranges in size from 4mm to 9mm – about the size of a grain of rice. Once the larvae turn into adult moths, they never eat again.

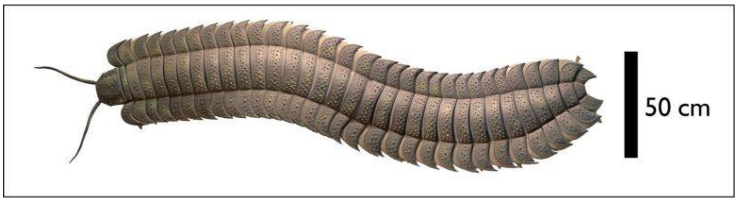
[E.O. Wilson's lifelong passion for ants helped him teach humans about how to live sustainably with nature]

E. O. Wilson was an extraordinary scholar in every sense of the word. Back in the 1980s, Milton Stetson, the chair of the biology department at the University of Delaware, told me that a scientist who makes a single seminal contribution to his or her field has been a success. By the time I met Edward O. Wilson in 1982, he had already made at least five such contributions to science. Wilson, who died Dec. 26, 2021 at the age of 92, discovered the chemical means by which ants communicate. He worked out the importance of habitat size and position within the landscape in sustaining animal populations. And he was the first to understand the evolutionary basis of both animal and human societies. Each of his seminal contributions fundamentally changed the way scientists approached these disciplines, and explained why E.O. – as he was fondly known – was an academic god for many young scientists like me. This astonishing record of achievement may have been due to his phenomenal ability to piece together new ideas using information garnered from disparate fields of study.

How transparency in butterflies and moths helps ward off predators

Transparent wing patches may do more than allow butterflies and moths to hide -- they may also warn predators to leave them alone, suggests a study published today in *eLife*. The findings shed new light on how some butterflies and moths that have partially transparent wings have evolved to mimic other species that already had this feature. They also provide new details on the tiny structures that allow light to pass through the wing. Despite their delicate look, butterflies and moths have numerous defences. They may use camouflage or transparent patches on their wings to escape a predator's notice, or they may use bright, contrasting colours to warn predators that they are toxic or otherwise unpalatable. These warning colour patterns are so effective at warding off predators that other butterfly and moth species -- even ones without toxic defences -- evolve to mimic them. While transparency usually allows butterflies and moths to escape predators by blending into their surroundings, some species have evolved both transparent patches and vivid warning colours.

Giant Millipedes "As Big as Cars" Once Roamed Northern England – "Complete Fluke of a Discovery"



The largest-ever fossil of a giant millipede – as big as a car – has been found on a beach in the north of England. The fossil – the remains of a creature called *Arthropleura* – dates from the Carboniferous Period, about 326 million years ago, over 100 million years before the Age of Dinosaurs. The fossil reveals that *Arthropleura* was the largest-known invertebrate animal of all time, larger than the ancient sea scorpions that were the previous record holders. The specimen, found on a Northumberland beach about 40 miles north of Newcastle, is made up of multiple articulated exoskeleton segments, broadly similar in form to modern millipedes. It is just the third such fossil ever found. It is also the oldest and largest: the segment is about 75 centimeters long, while the original creature is estimated to have measured around 2.7 meters long and weighed around 50 kilograms. The results are reported in the *Journal of the Geological Society*. The fossil was discovered in January 2018 in a large block of sandstone that had fallen from a cliff to the beach at Howick Bay in Northumberland. "It was a complete fluke of a discovery," said Dr. Neil Davies from Cambridge's Department of Earth Sciences, the paper's lead author. "The way the boulder had fallen, it had cracked open and perfectly exposed the fossil, which one of our former PhD students happened to spot when walking by."

Hibbert's flowers and Hitler's beetle – what do we do when species are named after history's monsters?

"What's in a name?", asked Juliet of Romeo. "That which we call a rose by any other name would smell as sweet." But, as with the Montagues and Capulets, names mean a lot, and can cause a great deal of heartache. My colleagues and I are taxonomists, which means we name living things. While we've never named a rose, we do discover and name new Australian species of plants and animals – and there are a lot of them! For each new species we discover, we create and publish a Latin scientific name, following a set of international rules and conventions. The name has two parts: the first part is the genus name (such as *Eucalyptus*), which describes the group of species to which the new species belongs, and the second part is a species name (such as *globulus*, thereby making the name *Eucalyptus globulus*) particular to the new species itself. New species are either added to an existing genus, or occasionally, if they're sufficiently novel, are given their own new genus. Some scientific names are widely known – arguably none more so than our own, *Homo sapiens*. And gardeners or nature enthusiasts will be familiar with genus names such as *Acacia*, *Callistemon* or *Banksia*. This all sounds pretty uncontroversial. But as with Shakespeare's star-crossed lovers, history and tradition sometimes present problems.

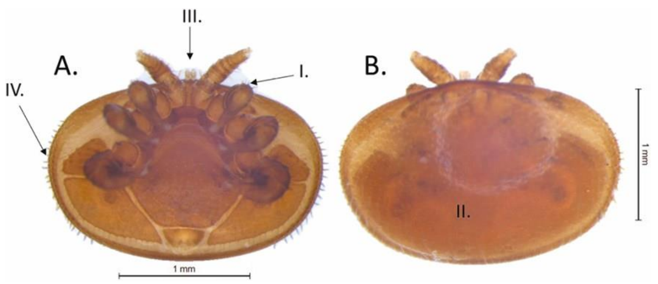
First True Millipede Discovered – New Species With More Than 1,000 Legs Found Deep Underground in Australia

The discovery of the first millipede with more than 1,000 legs is reported in *Scientific Reports* this week. Prior to this, no millipede had been found with more than 750 legs. Paul Marek and colleagues discovered the millipede 60 meters underground in a drill hole created for mineral exploration in the mining area of the Eastern Goldfields Province of Australia. It has 1,306 legs — more than any other animal — and belongs to a new species that has been named *Eumillipes persephone*. The millipede's name derives from the Greek word *eu-* (true), the Latin words *mille* (thousand) and *pes* (foot), and references the Greek goddess of the underworld, Persephone. The authors measured four members of the new species and found that they have long, thread-like bodies consisting of up to 330 segments and are up to 0.95mm wide and 95.7mm long. They are eyeless, have short legs, and cone-shaped heads with antennae and a beak.

Queen's genes determine sex of entire ant colonies

Researchers have discovered the genetic basis for a quirk of the animal kingdom -- how ant queens produce broods that are entirely male or female. "It's weird to have any parent that's only producing one sex or the other," said UC Riverside entomologist and study author Jessica Purcell. Scientists have known for some time that ant colonies can specialize in producing all-male or all-female offspring. For the first time, UC Riverside scientists have located a set of genes on a single chromosome that are associated with this phenomenon. Their discovery is described in a new article published by the *Proceedings of the National Academy of Sciences.* When humans mate, both parents contribute one copy of the genome to their offspring. However, female ants are the only ones that carry two copies, like humans and most other animals do, while the males carry only one copy. "Male ants develop from unfertilized eggs their mother lays," said UCR evolutionary biologist and senior study author Alan Brelsford. "Therefore, male ants, as well as bees and wasps, genetically have a mother but no father."

Can Honey Bees Survive Varroa Mites? The Challenges, the Tactics, the Future



Varroa mites have been the bane of commercial and hobby beekeepers for decades. The mites latch onto the bodies of honey bees and hitch a ride back to the hive, where they infest both adults and immature bees, reproduce on developing larvae and pupae, and, along the way, transmit deadly viruses that can lead to the collapse of the colony. Originally native to Asia and a parasite on Asian honey bees (*Apis cerana*), the mites began parasitizing honey bees (*Apis mellifera*) sometime near the middle of the 20th century and swiftly expanded around the world. For instance, the mites arrived in the United States in 1987 and, within a couple decades, spread into virtually every colony throughout the country. Today, the mites are considered the world's most devastating pest of honey bees and cause huge losses in both honey production and pollination services. For several reasons, these 2 millimeter-wide, oval-shaped parasites have eluded suppression efforts, says Cameron J. Jack, Ph.D., of the Honey Bee Research and Extension Laboratory at the University of Florida. But all is not lost. He and fellow researcher James D. Ellis, Ph.D., published an article in the open-access *Journal of Insect Science* in September outlining current management options for *Varroa* mites and describing those on the horizon.

Strange Biology: The Very Venomous Caterpillar

The venom of a caterpillar, native to South East Queensland, shows promise for use in medicines and pest control, Institute for Molecular Bioscience researchers say. The *Doratifera vulnerans* is common to large parts of Queensland's south-east and is routinely found in Toohey Forest Park on Brisbane's southside. Dr. Andrew Walker has been researching the striking looking caterpillar since 2017. Dr. Walker's research found the caterpillar has venom toxins with a molecular structure similar to those produced by spiders, wasps, bees, and ants. The research also unlocked a source of bioactive peptides that may have uses in medicine, biotechnology, or as scientific tools. "Many caterpillars produce pain-inducing venoms and have evolved biological defenses such as irritative hairs, toxins that render them poisonous to eat, spots that mimic snake eyes or spines that inject liquid venoms," Dr. Walker said.

SOCIETY POSTAL ADDRESS	MEMBERSHIP FEES 2021	
C/- ENTOMOLOGY DEPARTMENT	ORDINARY MEMBERS	$50 ($45 if paid by next AGM)
THE AUSTRALIAN MUSEUM	COMPANY ASSOCIATES	$60
1 WILLIAM STREET	STUDENT MEMBERS	$25 ($20 if paid by next AGM)
SYDNEY NSW 2010	CORPORATE MEMBERS	$150

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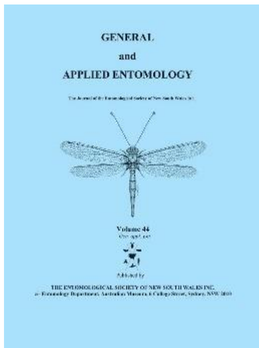

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