Bulletin of the Royal Entomological Society Winter 2010 Volume 34 (1)

antenna

REFLECTING ON ENTOMOLOGICAL HISTORY

meetings of the society

for more information on meetings and contact details see meetings page on www.royensoc.co.uk

2010

March 3	**Verrall Lecture** **Venue: Natural History Museum, London** Professor Chris Thomas.
April 7	Tracking insects: Techniques and Analysis **Venue: The Mansion House, St Albans.** Convenor: John Badmin
May 13	Electronics and Computing Technology Special Interest Group **Venue: Rothamsted Research or The Mansion House** Convenor: Dr. Mark O'Neill
June 2	**Annual General Meeting and President's Address** **Venue: Rothamsted Research, Harpenden**
June 22	**Infection and Immunity Special Interest Group** **Venue: Oxford University.** Convenor: Dr. Petros Ligoxygakis
June 21-27	National Insect Week 2010
July 26-28	**RES Annual National meeting** **Venue: Swansea University** Convenors: Dr. Miranda Whitten Prof. Tariq Butt Dr. Ed Dudley Dr. Alyson Bexfield Prof. Norman Ratcliffe
Aug. 22-27	9th European Congress of Entomology **Venue: Budapest, Hungary.** RES Representative Dr. Scott Johnson
Sept. 22	Aphid Special Interest Group **Venue: Syngenta at Jealott's Hill** Convenor: Dr. Rob Lind
Oct. 27	Climate Change Special Interest Group **Venue: The Food and Environment Research Agency (FERA), York** Convenors: Dr. Howard Bell Dr. Richard Harrington
Nov. 3	Orthopterists' Special Interest Group **Venue: Natural History Museum, London.** Convenors: Dr. David Robinson Mrs. Judith Marshall
Nov. 26	Insect Parasitoid Special Interest Group **Venue: Biology Department, University of York** Convenor: Dr. Peter Mayhew
Dec. Convenor:	Aquatic Insects Special Interest Group **Venue: Glasgow** Craig Macadam

Special Interest Group meetings occupy either a whole day or an afternoon (check www.royensoc.co.uk for details).

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COVER PICTURE

G. C. Bignell's library plate.
Scan by Jan Freedman, Plymouth City Museum.

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Bulletin of the Royal Entomological Society

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EDITORIAL

Wintertime

Welcome to the winter edition of *Antenna*.

This edition has a bias towards the history of entomology with an account of the life and work of the Victorian coleopterist G C Bignell and a history of William Jones' collection of paintings of Lepidoptera which was published as The Icones'. John Feltwell looks back at the societies celebratory expedition to Sulawesi and we also have a fascinating account of the collection and use of spider silk past and present from the artist Elanor Morgan. Continuing the theme of artists engaging with entomology, we have Pat Ellcots Bug Project, which explores her fascination with the insect world and records the enthusiasm with which her local schools engaged with the project, collecting, studying and drawing insects found in their school grounds. Also Roger Kemp drops a pebble into the entomological pond, offering an interesting idea for consideration and comment.

Greg and I are pleased to see such a wide range of subjects being offered to *Antenna*, as breadth of subject material is one of *Antennas* strengths. However, one area that has been under represented in recent issues is the short scientific communication. So this is a call for more science to mix in with the general interest articles. We are looking for those short speculative papers that were the mainstay of The Entomologist' and articles that convey your research to a general audience. As scientists we have a duty to convey our work to a wider audience, communication and the exchange of ideas are the very essence of our discipline. *Antenna* is an ideal vehicle with which to do this. In the high pressure world in which we find ourselves time is often the one thing in short supply, so reading around journals at the edge or outside of one's field is not tenable. However scanning an article in *Antenna* can bring to your attention ideas or tools of which you may not have been aware. An article summarising your work in *Antenna* will take your research to entomologists around the world thus increasing the chance of a serendipitous connection. The circulation of *Antenna* is greater than that of the average journal and reaches entomologists in every field. So take advantage of this opportunity to disseminate your work as widely as possible and once published, condense your work into an article and bring it to the attention of the wider entomological community.

Peter Smithers

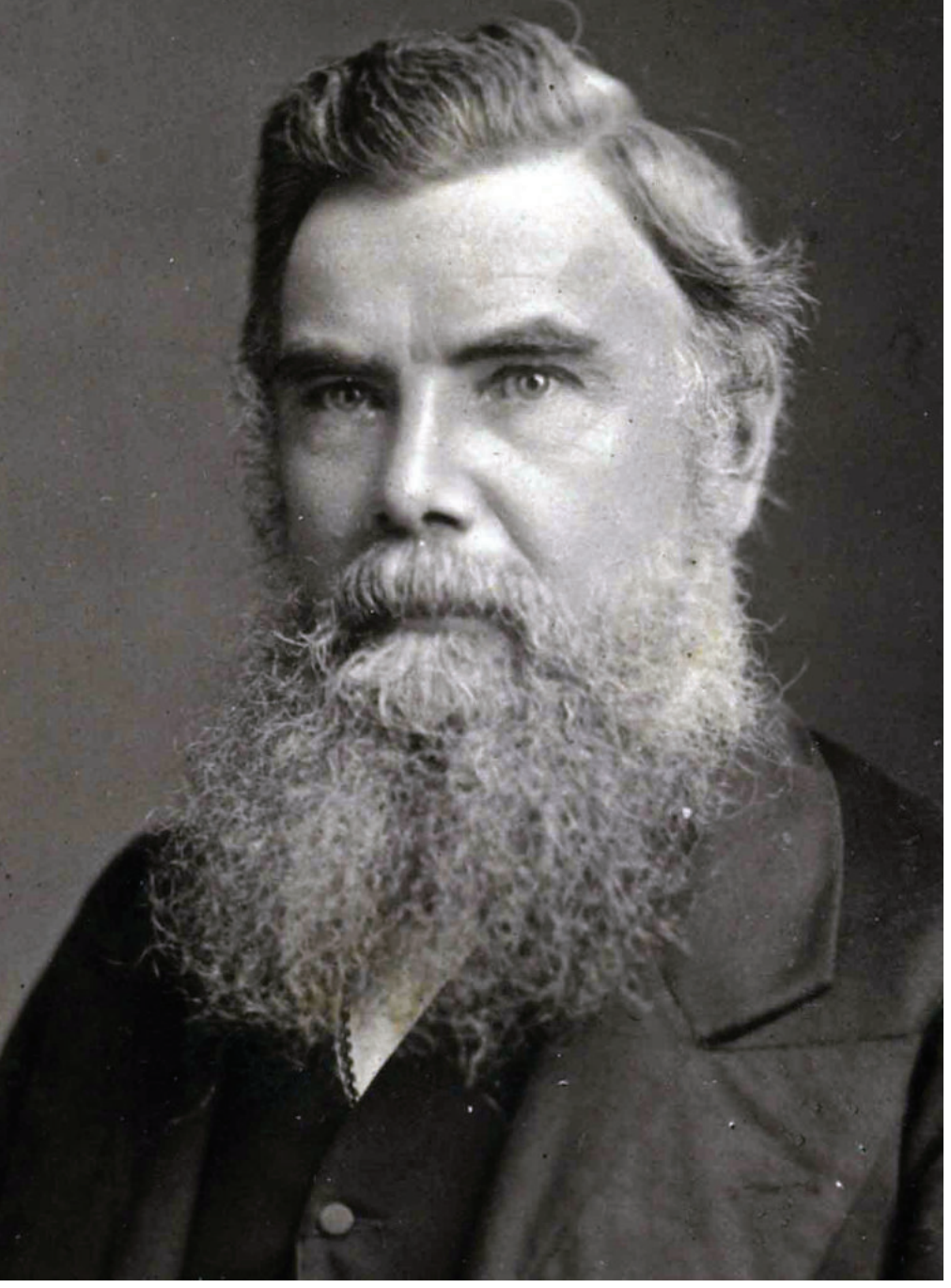
CORRESPONDENCE

High cost of electronic access to RES Journals

Given the importance now of electronic access to Journals and the way we now access papers online I would like to question why the RES charges so much for e-access to its Journals for its membership. At present the basic membership (Fellows) is £49. If you want electronic access it will cost an additional £35 as long as a hard-copy Journal is also taken! So if one added, for example, *Systematic Entomology* at £83 that comes to an eye-watering £119. This seems extortionate compared with what other Societies offer their membership. The Linnean Society charge £45 for membership plus just £15 for e-access to all journals; The British Ecological Society charge £40 plus £15 (plus VAT for the UK subscribers). Last in my small survey- the Entomological Society of America charges $130 (currently around £86) for annual membership but that automatically includes full online access to all it's journals (and going back through older issues). I used to think this was on the high side but compared with RES it is a positive bargain.

So does the membership/Fellowship have an explanation on these charges? Council should be urged to look at pricing policy for both Journals and e-access in the light of the interests of members/fellows. It might be that a rate of say, £20, for access to all journals would be a great incentive to recruitment and retention of membership. Many no longer want to paper Journals anyway and not having to subscribe would save printing and postage costs- an environmental advanatge as well.

Dr Michael R. Wilson



"The reputation of the late Mr. G. C. Bignell as an entomologist is too well known to need any comment of mine…"
(Hodgson, 1917)

The Life and Entomological Collections of George Carter Bignell

ARTICLE

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Many museums contain wonderful and scientifically important entomological collections from the nineteenth century. This was a time when the new pastime of collecting animals and plants was at its most vibrant, inspired by the curiosities of the natural world. These early pioneers set the precedence of entomological collections, with their meticulously detailed labels and incredible patience in mounting and organising their finds. The scientific and educational importance of these early collections has been invaluable to our knowledge and understanding of taxonomy and ecological diversity (Forty, 2009). Museums are continually restoring collections to increase access to researchers, students and members of the public (for example, see Scoble and Mendel, 2009; Rotheray, 2009; Mann and Simmons, 2009).

Plymouth City Museum and Art Gallery (PCMAG) opened in 1910, to provide enlightenment and education to people of Plymouth. Many specimens and objects were acquired and donated before the museum opened, including collections of art, human history objects and natural history specimens. One natural history donor in particular has become one of the museum's most important collectors.

Figure 1 (above). Photograph of a young George Carter Bignell, in his Royal Marine uniform. (image Image reproduced with permission from David Hodge)

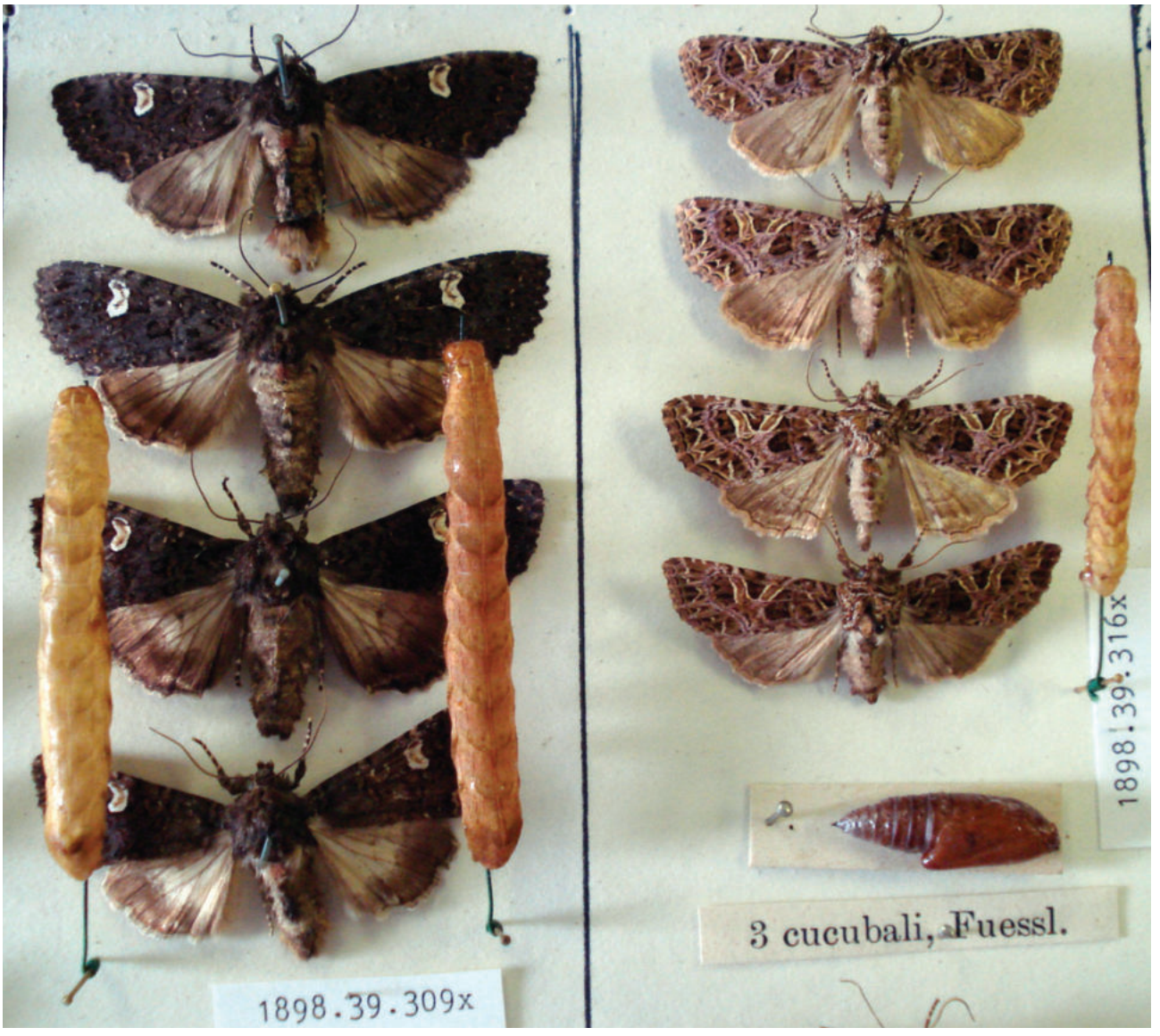
The explorer

George Carter Bignell was born in Exeter on 1st March 1826. Leaving school at the age of twelve, due to the death of his father, he worked in a booking office, where he received parcels and booked passengers on carriages (Baring-Gould, 1909). At the age of sixteen, he enlisted in the Royal Marines at Stonehouse, Plymouth, "longing for glory" and adventure (Figure 1) (Adams, 1958). Bignell served on-board *HMS Superb* which was deployed, in 1847, to assist in the civil war in Spain (Baring-Gould, 1909).

After *HMS Superb* was paid off, Bignell was stationed at the barracks in Plymouth, and was there for the remainder of his employment with the Royal Marines (Baring-Gould, 1910). It was whilst serving in the barracks he found he had time on his hands to investigate and collect insects.

After 22 years of service in the Royal Marines, and being awarded the Silver Medal, Bignell was discharged and he was appointed Registrar of Births, Deaths and Marriages for Stonehouse and Poor Law Officer for the Stonehouse Board of Guardians. He had enough spare time to pursue his interest in entomology by joining societies and avidly

Figure 3 (below). Specimens of *Mamestra persicariae* (left) and *Dianthecia cucubali* with pupae and imago stages. (Image copyright PCAMAG.).



collecting (Baring-Gould, 1909). Bignell became a member of the Plymouth Institution, then the scientific centre of Plymouth, and soon became President of the Institution. He became a fellow of the Royal Entomological Society in 1880 (Figure 2). He had numerous scientific contacts around England, and swapped specimens with his friends to enhance his collection. Some of Bignell's specimens, which were swapped between himself and Claude Morley, are held at Ipswich and Colchester Museum.

A plethora of interests

Bignell donated many specimens to PCMAG. His donations were all natural history specimens and, glancing at the list, it is clear that he had a wide wide-ranging interest:

Millipedes (1899)

'Maize, Etal' (1902)

Reptiles in spirit from West Africa (1904)

Land and fresh water shells (1907)

A 'few foreign insects' (1908)

Bignell was an entomologist, botanist and artist, and whereas some collectors have one specialist group they preferred, Bignell had many! During his life, he amassed an enormous collection of Lepidoptera, Hymenoptera (mainly Ichneumonidae), and pressed flowering plants and marine algae. He also invented the 'Bignell beating tray', a piece of equipment still sold and used by entomologists today.

Bignell passed away on the morning of his 84th birthday, in 1910. PCMAG purchased a large proportion of his collection in 1908 for the then small amount of £240, which is equivalent to £22,000 today. A substantial amount of Ichneumonidae were donated to the Natural History Museum, London before he passed away.

Lepidoptera

The collection contains over 9,500 specimens of British Lepidoptera, covering over 70 species of butterfly and 1,040 species of moths. Many species have specimens of the larval, pupal and imago stages, and almost all species have more than one specimens, illustrating variation within species and polymorphisms (Figure 3). The collection includes many migrant, vagrant and exotic species of butterfly and moth. Associated parasitoid wasps are mounted next to the butterfly or moth species they parasitized. The Lepidoptera cover a large range of sizes, from the large Monarch butterfly (*Danaus plexippus*) and Death's-Head Hawk-moth (*Acherontia lachesis*), to over 300 species of moth classified as microlepidoptera.

Hymenoptera

Bignell's hymenoptera collection covers ants, wasps (excluding the Ichneumonidae, which Bignell had stored as part of a separate collection) and bees. The collection contains over 3,000 specimens, representing over 260 species (with a large majority British species). Bignell's hymenoptera collection also includes two type specimens of Ant:

Ponera contracta (Latreille, 1802)

Myrmica ruginodis (Nylander, 1846)

Ichneumonidae

Perhaps Bignell's real interest lies with the parasitic wasps. His parasitic wasp collection contains over 3,000 specimens, including several type specimens. Bignell discovered 51 new species, including 32 new species to Britain (Baring-Gould, 1909). Bignell had three species named after him (Baring-Gould, 1909; Broad, 2009, *pers. comm.*):

Mesoleius bignellii

Apanteles bignellii (now *Cotesia*)

Iphiaulax (now *Atanycolus*) *bignelli*

The Ray Society published nine volumes on Larvae of British Butterflies and Moths (Buckler, 1886; 1887; 1889; 1891; 1893; 1895; 1897; 1899; 1901). Bignell assisted with the publications, by producing a list of parasites that preyed on the different larval species.

Figure 4. One example of Bignell's type specimens held in PCMAG. These are specimens of a species of parasitic wasp, *Apanteles astrarches*. (Image copyright PCMAG.).

His large collection includes numerous types, syntypes, holotypes, paratypes and paralectotypes (see Figure 4):

Types

Apanteles bignellii (Marshall, 1885)

A. rubecula (Marshall, 1885)

A. geryonis (Marshall, 1885)

A. zygaenarum (Marshall, 1885)

A. praetor (Marshall, 1885)
A. caberae (Marshall, 1885)
A. marshalli (Bignell, 1901)
A. butalidis (Marshall, 1888)
Cotesia gonopterygis (Marshall, 1885)

Holotypes

Diolcogaster spreta (Marshall, 1885)
Cotesia brevicornis (Wesmael, 1837)
C. limbatus (Marshall, 1885)

Co-types

Bracon epitriptus (Marshall, 1885)
B. praetermissus (Marshall, 1885)
Chelonus carbonator (Marshall, 1885)
Apanteles pallidipes (Marshall, 1885)
A. melitaearum (Wilkinson, 1937)
A. obscurus (Nees, 1834)

Paratypes

Pimpla bridgmani (Bignell, 1894)
Cotesia salebrosa (Marshall, 1885)

Paralectotypes

Mesochorus formosus (Bridgman, 1882)
M. facialis (Bridgman, 1884)
Glyptapanteles lateralis (Haliday, 1834)
Limneria rufa (Bridgman, 1882) (= *Hyposoter orbator* (Gravenhorst 1829))
L. teucrii (Bridgman, 1889) (= *Hyposoter barrettii* (Bridgman, 1881))

A small number of holotypes and lectotypes from his ichneumonid collection were transferred to the Natural History Museum, London, on long-term loan in 1975:

Holotypes

Nyxeophillus corsicus (Marshall, 1901) (= *Ecthrus reluctator* (Linnaeus, 1758))
Hemiteles distinctus (Bridgman, 1883) (= *Acrolyta rufucincta* (Gravenhorst, 1829))
Limneria brischkei (Bridgeman, 1882) (= *Hyposoter brischkei* (Bridgeman, 1882))
Pimpla bridgmanii (Bignell, 1894) (= *Schizopyga pictifrons* (Thomson, 1887))

Figure 5. One of G. C. Bignell's microscope slides. The slide holds a wing of *Dicranomyia chorea* (Meigen, 1818).

Lectotype

Pezomachus hieracii (Bridgman, 1883) (= *Gelis papaveris* (Förster, 1856))

Tipulids

Bignell had a fascination with tipulid (crane-fly) wings, collecting and preparing 128 microscope slides (Figure 5). His slides of wings are accompanied by small handmade photographic glass plate negatives of the wings on these microscope slides. The wings cover British species, and were most likely used as a key to identify between different species of Tipulidae.

Friends reunited?

It is very possible that Bignell personally knew another of PCMAG's great collectors; James Higman Keys (1855-1941). Keys lived in Plymouth and, whilst working full time in his father's book printing business, amassed a large and important collection of British Coleoptera. The two contemparies contemporaries were experts on different Orders of insects, lived in Plymouth, and were fellows of the Royal Entomological Society during 1900 and 1910. Both Keys and Bignell have bookplates which were designed by 'J. M. Lauchton' (Figures 6 and 7). A recent discovery of a letter in the history files at PCMAG, confirmed that Keys definitely printed Bignell's bookplates; on the 13th June 1956, Mr Adams, the Keeper of Natural History at PCMAG, wrote a letter to J. H. Keys' daughter:

"The bookplates are most interesting because they are rather like the plates which your father produced for Mr Bignell's books."

Acknowledgements

Thank you to Norma Chapman, G. C. Bignell's granddaughter daughter-in in-law and Tony Hodge, G. C. Bignell's grandson, for sharing interesting stories about George Carter Bignell and additional background information. Thanks to Jerry Browdry, Senior curator of Natural History at Ipswich and Colchester Museum for his correspondence regarding swapped Bignell specimens. A big thank you to Holly Palmer, natural history volunteer at Plymouth City Museum and Art Gallery, for her time in researching the ichneumonids and to David Norton and Gavin Broad, at the Natural History Museum, London for their assistance with the taxonomic and specimen status of the Ichnumonids ichneumonids in this paper.

Figure 6. George Carter Bignell's bookplate, printed by James Higman Keys. Note the image of Bignell at the bottom right using his beating tray.

Figure 7. James Higman Keys' bookplate, similar in design to Bignell's. (Image copyright PCMAG.).

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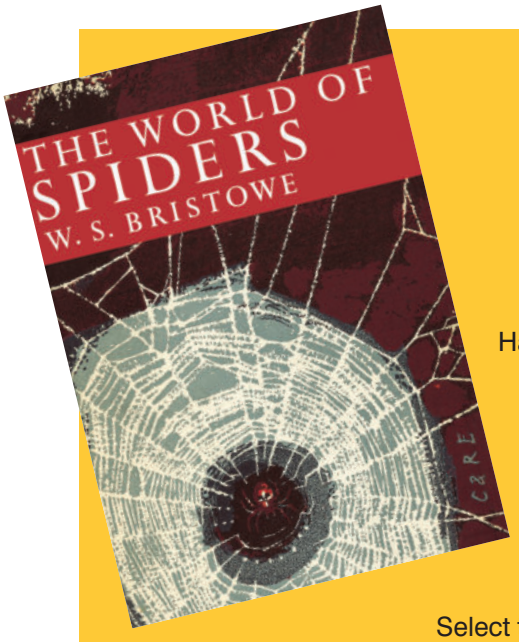

ARTICLE

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A short history of spiders' silk spinning machines

This autumn an 11 foot by 4 foot piece of golden coloured fabric went on display at the American Museum of Natural History in New York. It is created entirely from spiders' silk, collected from the Golden Orb spider of Madagascar. Under the guidance of art historian Simon Peers, a group of locals collected around 3,000 spiders each day from trees and telegraph poles. The spiders were then handled by a group of women weavers, who extracted the silk from the creatures' spinnerets onto a spool from where it was woven on a loom. It took four years to create the cloth, which is the largest known spiders' silk fabric in existence. However, this is certainly not the first attempt to harvest silk from spiders. Throughout history people have experimented with using spiders' silk to create fabrics and clothing, yet most of these items have disappeared – are perhaps still waiting to be found in various museums and attics. Simon Peers himself was inspired by the story of a 19th century French missionary Jacob Paul Camboué, who had woven the silk of the Madagascan Golden orb Orb spider into bed hangings. These were to be exhibited at the 1900 Paris Exposition, although I can find no record in the exhibition catalogue of any spiders' silk bed hangings. As perhaps befits such a magical material, the history of people weaving with spiders' silk is intertwined with myths and vague accounts. Having researched the notes, letters and sketches of some of these individuals, I would like to present a short history of some spiders' silk collectors, the machines they created and the spiders that they worked with. The prints accompanying this story are my own, created from the written descriptions or drawings I have found.

Humans have collected spiders' silk for centuries. A naturalist in the 19th Century records seeing women in Bermuda using spiders' silk for sewing, ; Australian aboriginal communities used it to make fishing nets and lines, and since the time of the Ancient Greeks, spider webs have been used to help heal wounds – a possibility still being explored today with artificial silk in biomedical research. More recently, strands of spiders' silk were used as crosshairs in gun sights and telescopes. There is also a story of the 17th Century Mughal Emperor Aurengzebe, who reproved his daughter for "the indelicacy of her costume, although she wore as many as seven thicknesses of spider cloth" (McCook, 1889, p.84).

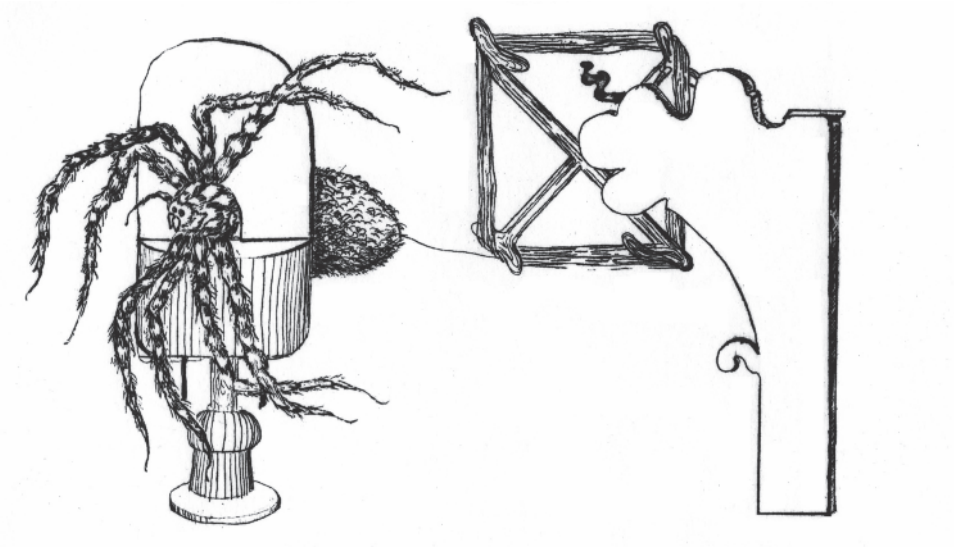


Figure 1. Abbe Ramon de Termeyer's silk extraction device.

The first recorded attempt that I have come across to turn spider silk collecting into a commercially profitable activity was made by in 1709 by Monsieur Le Bon, President of the court Court of accounts Accounts in MontpelierMontpellier. He collected spider's' nests, which he boiled in water and gum arable - a technique similar to those used for collecting silk from silk worms. Indeed, the interest in the commercial possibilities of spiders' silk was partly in response to the desire for domestic European silk production, which would not rely on Asian imports, or on the delicate demands of the silk worm unsuited to the European climate and agricultural traditions. After boiling the cocoons, Le Bon dried and spun the silk into three pairs of spider silk stockings, two of which he presented to the Royal Academy of Sciences in Paris and the third to Sir Hans Sloane at the Royal Society in London (de Bon, 1739). In response to Le Bon's research, the Royal Academy commissioned the prolific scientist René Antoine de Réaumur to investigate the commercial possibilities of spiders' silk.

Using Le Bon's technique of boiling spider's nests, Reaumur concluded that spiders' silk could not be of any commercial value. He listed a number of limiting factors: the first was the difficulty of collecting and housing the spiders – particularly the problem of trying to prevent the spiders from eating each other, the second was supplying the animals with fresh prey, and the last was the inferior quality and yield of spider's silk compared to with that of the silk worm. However, Reaumur had been studying the silk of spider's' nests, a very fine material that most closely resembled that of silk worms. It was not until 1762 that a Spanish Jesuit priest discovered that the strongest silk came not from a spider's nests, but directly from her body (Termeyer, 1866).

Abbe Ramon de Termeyer was a missionary and amateur naturalist. His wide and varied research included experiments on electric eels, a proposal for an antidote to viper venom and a short paper on how to keep eggs fresh during long journeys. But his main passion was spiders. His house in Milan was filled with thousands of them. They were suspended from separate canes all around the house, and were fed by a steady supply of flies that bred in the piles of rotten meat that Termeyer had put out for them.

Termeyer noticed that if he gave a fly to one of these spiders, it would quickly envelope it with silk from its abdomen. He went about devising a machine that could collect this silk directly from the spider's body. He came up with this contraption (Figure 1), in which the spider was held between two plates, while her silk was collected onto a spool. Termeyer described the silk he collected of appearing like a mirror, or polished metal. He was convinced of its commercial possibility. He had solved the problems that Reaumur had listed – he kept his spiders on separate canes so they could not eat each other; they had a steady supply of food which was easy to provide; and he had discovered that the silk they produced on his machine was stronger and more vibrant than that of the silk worm. He was now faced with the problem of how to spin the silk. It was too thin as it was, so the strands had to be twisted together. Yet, this led to the silk loosing losing its lustre, looking more like white cotton than silk. In the end, he reverted to the tried and tested technique of boiling up the spiders' nests. He then spun the silk into pairs of stockings. Over the next 20 years, Termeyer sent these spiders' spider silk stockings to various monarchs, including Charles III of Spain, Catherine the Great and Archduke Ferdinand. He also sent some stockings to Napoleon and Josephine, in spite of the fact that his own house had been blown to pieces during the Napoleonic invasion of 1796 (de Asúa 2008). Unfortunately, I am yet to find any record of what happened to these many pairs of silk stockings.

Termeyer recorded his spider research in a small pamphlet, of which only one copy exists. It remained largely forgotten in a library in New York until 1866 when it was discovered by a US army Army Surgeon.

But first, a quick stop at somewhere closer to home – to 21 Friday streetStreet, Cheapside, London, where in the autumn of 1829 Daniel Bransdon Rolt was struck by the beauty of the light on the spiders' webs in his garden (Rolt, n.d.). He began to pull the silk from a spider, and was able to collect a few yards before the spider broke the thread with her legs. He proceeded to collect

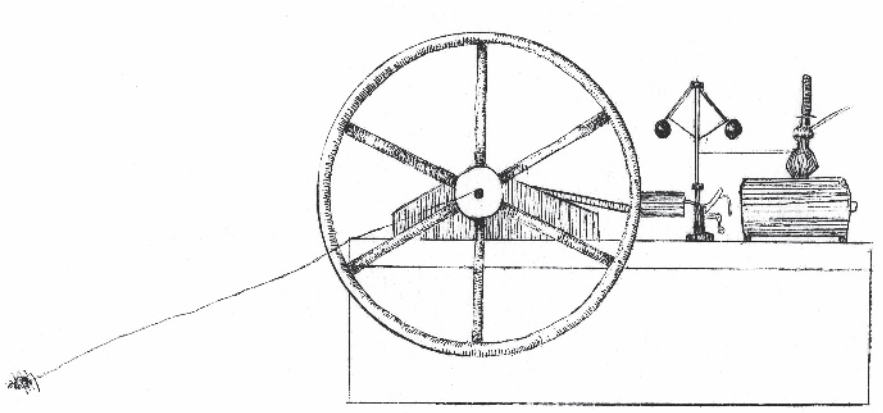


Figure 2. Daniel Bransdon Rolt's silk extraction device.

100 of these garden spiders, and kept them in separate boxes in his room to prevent any cannibalism. Underneath the boxes was a large drawer containing rotten meat. This attracted flies, some of which would fly through tiny holes into the spider's dens above. He was thereby able to keep a large number of spiders alive while he devised a way of collecting their silk. In the end, he attached the spider to a steam engine, which he had borrowed from the factory that he worked in (Figure 2). She was attached to a reel, which he turned at a rate of 150 foot feet per minute. Every 10 minutes he would change the spider for another. Over the course of two hours, he was able to collect 7,200 feet of silk. Rather than tying the spider down, as with Termeyer's machine, he simply let them crawl along the floor, or over his hands. Perhaps the rhythm and speed of the machine was such that the spider could not cut the thread with her legs.

Rolt submitted his findings, along with a scrap of silk and one of his spider houses, to the Royal Society of Arts, where he was presented with a silver medal in manufacturing, and praised for the novelty and ingenuity of his experiments. However, the Society saw no commercial possibility in the spider compared with the silk worm.

I return now to the US Army Surgeon, who found Termeyer's forgotten manuscript just after the end of the American Civil war. His name was Dr Burt Green Wilder. In 1863, Wilder joined the 55th Massachusetts regiment and was stationed on a marshy sand bar just south of Charleston, named Folly Island. To pass the time on Folly, he would explore its desolate terrain, and it was on one of these walks that he discovered a huge spider sitting in the centre of a golden coloured web, a web that stretched 10 feet between the trees. He collected the spider in his hat and carried it back to his tent. Here, he describes the scene:

'The insect was very quiet, and did not attempt to escape; but presently, after crawling slowly along my sleeve, she let herself down to the floor, taking first the precaution, after the prudent fashion of most spiders, to attach to the point she left a silken line, which, as she descended, came from her body. Rather than seize the insect itself, I caught the thread and pulled. The spider was not moved, but the line readily drew out, and, being wound upon my hands, seemed so strong that I attached the end to a little quill, and, having placed the spider upon the side of the tent, lay down on my couch and turned the quill between my fingers. " (Wilder 1866, p.132)

He continued at this for an hour and a half, after which time he had collected over one hundred and fifty yards of "the most brilliant and beautiful golden silk I had ever seen".

The spider that Wilder had found was the Nephila, or golden Golden orb Orb spider. Wilder was not the only soldier on Folly Island to have discovered this spider. Sigourney Wales, a lieutenant in the same regiment, had been passing the long hours on lookout duty by carving trinkets and mementoes, which he sold to the other men. He came across the Nephila, and like Wilder, realised that he could pull silk directly from the spider's spinnerets. He attached the thread to a spool and wound the yellow silk onto rubber rings, which apparently he was able to sell as real gold jewellery.

Wilder and Wales discussed their use of the spider, which led to Wilder's creation of a spider silk spinning machine, similar to that of Termeyer. The spider was held in place upside down, which gave easier access to the spinnerets and was apparently more comfortable for the spider. In the autumn of 1864, while the union bombardment of Charleston was at its height, Wilder was able to wind almost two miles of golden silk on this machine.

After the end of the war, Sigourney Wales became a salesman in New York, while Burt Wilder became professor Professor of zoology Zoology at Cornell University where he continued his investigations into spiders. He was interested not only in the biology of the spider, but also in the commercial potential of its silk. The thread was too thin to spin like cotton, so he tried various ways of twisting the threads together to make a thicker strand. In one of his attempts (see fig 3), he secured spiders to the top of a disk, and attached their silk to a stationary disk underneath. As the top disk turned, the silk was wound together. Using this process he was able to make a small strip of spider's silk ribbon. In 1867, encouraged in his belief in the commercial potential of spiders' silk, he submitted a patent claim for his spider silk spinning machine.

I found Wilder's patent a few years

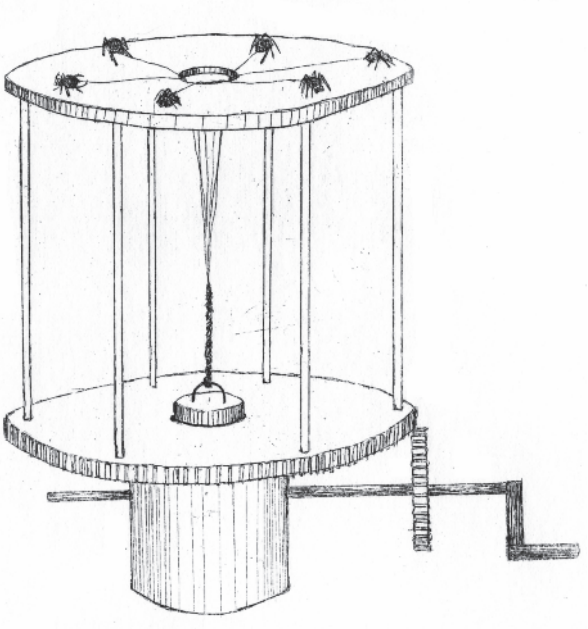
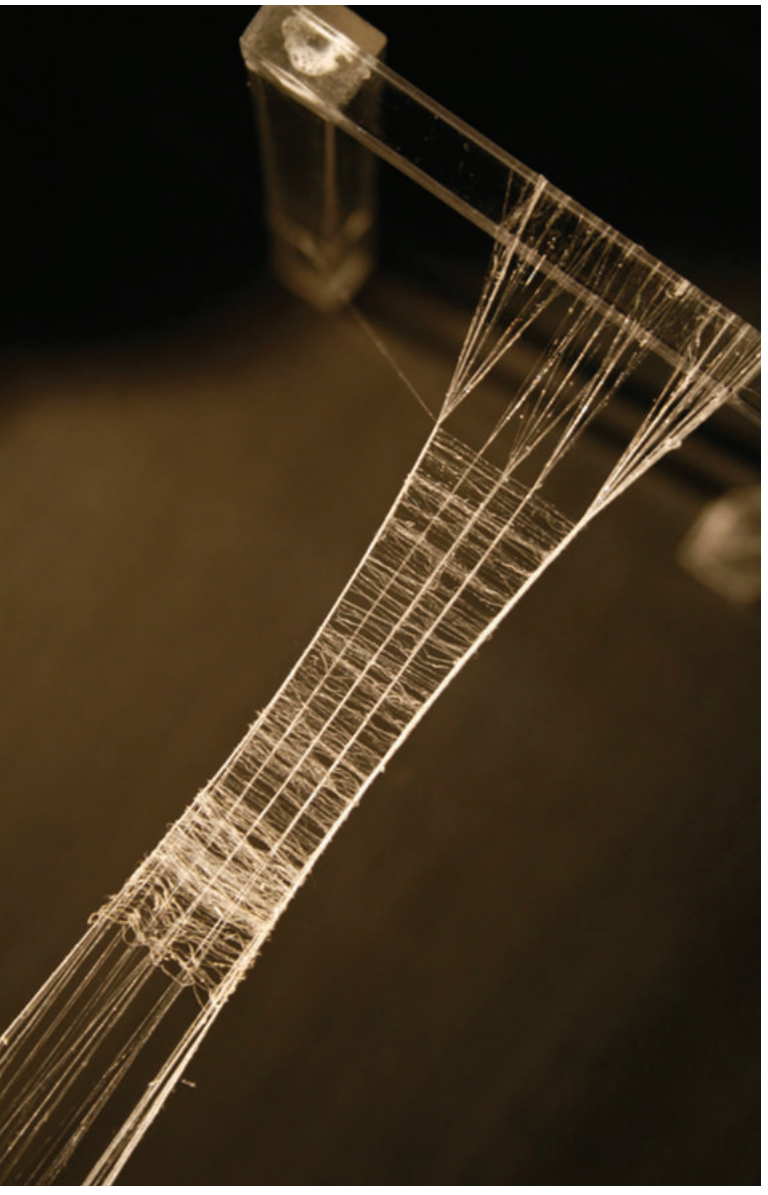


Figure 3. Sigourney Wales silk extraction device.

of Scientific American. I was already a silk spinner myself, but I did not know that there had been others. I collect silk from the European Garden Spider, which I weave into drawings or sculptures. It began in my studio, while I was staring at the many spider webs catching the dust and light in the corners of the room. I wanted to see what a sculpture made from spiders' silk would actually look like – could the strands of silk retain their magical glow when woven together? There were practical decisions to be made: How would I collect the silk? And once I had collected it, how would I weave such a fine material, better suited to spiders' legs then than to clumsy human fingers? To begin, I constructed small wooden frames, which I placed behind the webs and pulled towards me, so that the strands of silk stuck to the frame. I then returned to my studio and tweezed apart the individual strands of silk. It was a slow and inefficient process, as I had to extract the dry, strong threads and discard the rest. I soon discovered a much better method. I found a huge web attached to the branches of a tree, with a European garden Garden spider Spider sitting in the centre. As before, I put my wooden frame behind the web and drew it towards me. The spider ran top right, off the web and onto a leaf. I turned the wooden frame, and the spider was still attached to the web with silk coming from her spinnerets. As I rotated the frame, I realised that I was extracting silk directly from her abdomen. I was able to collect at least two metres of silk before she cut the thread with her back legs.

It is unsettling to realise that one is extracting silk from a spider and is able to feel the bodily resistance of another animal through one's hand. It is a moment that is described with amazement by many of the silk collectors. For me, the oddest experience is when I am weaving the silk on a loom. I stare at the silk for hours, and I can only see the threads clearly by using a strong spot light, so that when I close my eyes I can still see them as lines of light. At first I tried to work with tweezers, but the silk is more attracted to skin. So I hold and weave the silk between my hands. Often I cannot see it, so I seem to be gesturing at nothing. When collecting silk from spiders, and weaving these threads on the loom, I start dreaming of the silk, the feel of it on my hands and the look of the strands on the loom. Perhaps this is as close as we can get to the dreams of spiders.



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Wilder, B.G., 1866. How my new acquaintances spin. *The Atlantic Monthly*, 18(106), 129-145.

The following may also be of interest to readers:

A Discourse upon the Usefulness of the Silk of Spiders. By Monsieur Bon, President of the Court of Accounts, Aydes and Finances, and President of the Royal Society of Sciences at Montpellier. Communicated by the Author

Monsieur Bon

Philosophical Transactions (1683-1775),

Vol. 27, (1710 - 1712), pp. 2-16

(article consists of 19 pages)

Published by: The Royal Society

Available on http://www.jstor.org/pss/103101

The editors would like to thank Eddie Johns for bring it to our attention.

The Marbled White, *Melanargia galathea*. Photograph courtesy of John Walters

Mycophily – A New Science for Insect Conservation

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ARTICLE

For many years I have felt there is an unknown key factor which determines butterfly and moth numbers. The old explanations of loss of habitat and climate change did not seem to me to tell the whole story. Habitat destruction clearly changed the macro-environment: contrast, for example, the still undamaged meadows and woodlands of Eastern Europe with those in the UK. This wholesale habitat destruction took place mainly before the Second World War. Since then, butterfly numbers have carried on mainly decreasing within the remaining scarcer habitats. The future effects of climate change have been predicted but opinions differ, and it is difficult to blame future climate change for what has already happened. Some butterfly and moth numbers are fluctuating dramatically, some down, some up.

So what is this other factor? I believe I have found the answer, but first how did I get here. My interest in butterflies started when 6 or 7 years old in the early 1950s in the Earley area of Reading. By far the commonest butterfly in gardens, waste ground and general countryside was the wall, *Lasiommata megera*. This species has now disappeared from inland southern England and is confined to more coastal regions. No loss of habitat or significant climate change here, so what is the cause?

In the mid 1990s I discovered an alternative larval foodplant (in my wildlife garden in the Vale of Aylesbury) for the brown argus, *Aricia agestis*. Whereas this butterfly locally uses the perennial rockrose, *Helianthemum nummularium*, as a larval foodplant on the Chiltern chalk

downland, off the chalk, in the agricultural clay vale, it was using cut-leaved crane's-bill, *Geranium dissectum* (Kemp,1998). The interesting point about this plant is that it is an autumn-germinating annual. The relevance of this will be apparent later. This prompted me to look at the relative use of annuals as larval foodplants by butterflies. It turns out that both butterflies and moths rarely use annuals and this applies not only in the UK but on mainland Europe as a whole (Kemp et al., 2008).

It can be argued that it is an advantage for Lepidoptera to have foodplants which are always readily available year after year rather than depend on rainfall to facilitate annual germination. Indeed I showed at the Butterfly Conservation Symposium in 2003 (not published) how the amount of rain that falls in the August of a year affects the availability of *G. dissectum* as a foodplant for the second generation larvae of the brown argus. The resulting adults emerge as the first generation the following year. This dependence on the August rain of the previous year is clearly not as reliable for the butterfly as having a larval foodplant which is always available, rain or no rain. But having said this, I still believed there to be a more fundamental reason why so many abundant and fast growing annual plants are not used, especially as they provide opportunities for habitat expansion, as shown by the brown argus.

I hit on the possible answer whilst on a fungus foray with the Bucks Fungus Group in the Chilterns in late October 2009. We were discussing the 10-15,000 species of fungi in the UK. The air was thick with the smell of mycelia and it occurred to me how dominant fungi were in the habitat. Could it be that fungi were the reasons that Lepidoptera use perennials as larval foodplants? Annuals normally die off in the autumn when fungal activity would be at its height, whereas perennials would be ideal fungal hosts.

I recalled an exhibit by the late Miriam Rothschild and a colleague at a meeting of the RES at Rothamsted in 2001 in which she showed that the toxicity of the marbled white butterfly, *Melanargia galathea*, is probably obtained by the larvae ingesting a pyrrolizidine alkaloid from the endophytic (for definition see later) fungus *Neotyphodium sp*. present in the grass foodplant (Nash and Rothschild, 2001). I knew that orchids (especially the rare ones) require a special cocktail of mycorrhizal fungi for seed germination. Beetle larvae feed on fungi in dead wood rather than the wood itself. Leaf-cutter ants feed off a fungal crop they grow in their underground nests. I had filmed white admiral adults feeding on ergot on grass stems. So there was already evidence of an anecdotal nature. So I then began to desk research the association of endophytic fungi with insects.

To my amazement there are well over 5000 scientific papers connected with this subject and the more I look, the more I am convinced we have here the missing factor. I have selected just a few published papers to illustrate the point and end with the implications for insect conservation. But first a few additional points.

1. I grew mushrooms commercially for nearly 20 years. The *Agaricus bisporus* I grew required narrow temperature and humidity bands for the mycelium to penetrate the cereal substrate and spread throughout the straw. Get this wrong, no growth. In addition if the compost was infected with *Trichoderma sp*., a fungal parasite, there was again absolutely no growth at all. In other words unlike plants, there is no halfway house. It's all or nothing. If endophytic fungi are involved in insect growth, their affects will be dramatic.

2. Preliminary discussions with researchers on plant endophytic fungi indicate that the fungi are everywhere throughout the plant. Endophytic fungi invade the stems and leaves of living plants without causing any symptoms of disease. As far as I know it is not known whether perennials have more endophytic fungi than annuals, although I would expect this to be true.

3. About 400 million years ago on Earth when plants invaded the land from water, they would have been associated with fungi both externally (ectophytic) and internally (endophytic). Later, as herbivorous insects evolved to feed on them they would have developed complex tripartite relationships with both the plant and the fungus. These continue to this day. In fact larvae are not eating just the plant material but a mixture with the fungi, a kind of soup. Just as humans require essential fatty acids, essential amino acids, and vitamins from outside sources, so insects require vital factors from the plant/fungal mix. Insect larvae are normally adapted via specialised mouthparts to prey on one foodplant only and hence rely on this one source for all essential nutrients. They cannot switch but need, in situ, the nutritious fungal/plant mix chosen through natural selection over time. Apart from toxins, maybe pheromones (Boppre, 1986) and other essential ingredients are obtained from this mix. On the other hand, fungi may produce compounds which are toxic to larvae and hence help the plant combat herbivory. For the insect there would be a balance, moveable either way, beneficial sometimes and detrimental other times.

4. Endophytic fungi could explain why closely related plant species are not predated by the larvae of closely related butterfly species. For example, the adonis blue, *Lysandra bellargus*, and the chalkhill blue, *L.coridon*, use only horseshoe vetch, *Hippocrepis comosa*, whereas the common blue, *Polyommatus icarus*, uses only birdsfoot trefoil, *Lotus corniculatus*. One would imagine the actual plant material to be similar but over time they have evolved with different endophytic fungi essential for the butterfly larvae. Again, sometimes totally botanically unrelated plant species are used by one insect species, for example common cow-wheat, *Melampyrum pratense*, and germander speedwell, *Veronica chamaedrys*, are both food plants of the heath fritillary, *Mellicta athalia*. Again, these plants may have similar endophytic fungi associated with them.

As regards published work, apart from those previously referred to, I have selected just three, which should suffice.

Workers in the UK have shown that both the foliar endophyte *Neotyphodium lolii* and the mycorrhizal fungus *Glomus mosseae* affect the larval growth and survival of

the noctuid moth, angle shades, *Phlogophora meticulosa* when it feeds on perennial ryegrass *Lolium perenne*. (Vicari et.al.,2002).

Workers in the USA have shown that endophytic fungi affect the growth rates of the larvae of the noctuid moth *Spodoptera frugiperda* that feed on tall fescue, *Festuca arundinacea*. (Marks and Lincoln, 1996).

Other workers in the USA have shown the various effects of different species of mycorrhizal fungi on the chemical response of ribwort plantain, *Plantago lanceolata*, to herbivory from larvae of the nymphalid butterfly *Junonia coenia*.

So what are the implications for insect conservation? The demise of the wall butterfly mentioned at the beginning could be explained by the disappearance of the relevant endophytic fungi from the habitat. Comparison of old sites with existing sites would confirm this and, if necessary, reinfection of the fungus could be considered on old sites prior to the reintroduction of the butterfly. This would apply to all species.

Climate change could affect endophytic fungi and make dramatic changes to insect species and numbers.

Much research needs to be done on which fungi are involved and which biochemicals are essential for insect development. I have proposed the word MYCOPHILY to mean the association of fungi with living plants and animals, and the word MYCOPHILOGY to mean the study of mycophily. Mycorrhizal associations would be examples of plant mycophily'

I hope that this paper will both stimulate and instigate more research into the important field of insect mycophily.

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Guidelines for submitting photographs

To maintain a high quality we suggest that submissions for *Antenna* be presented via e-mail or on CD. Files must be in a PC-compatible format preferably in MS Word.

Electronic images can be embedded in the Word document but we will also require separate electronic images. These images should be at least 300dpi at an image size that is either equal to, or greater than the expected final published size.

Please do not submit images that have been printed from a computer on a domestic inkjet or laser printer. Even if the camera is a good one and photo quality paper is used, the graininess is very hard to deal with. If plain paper is used, the prints are virtually unusable.

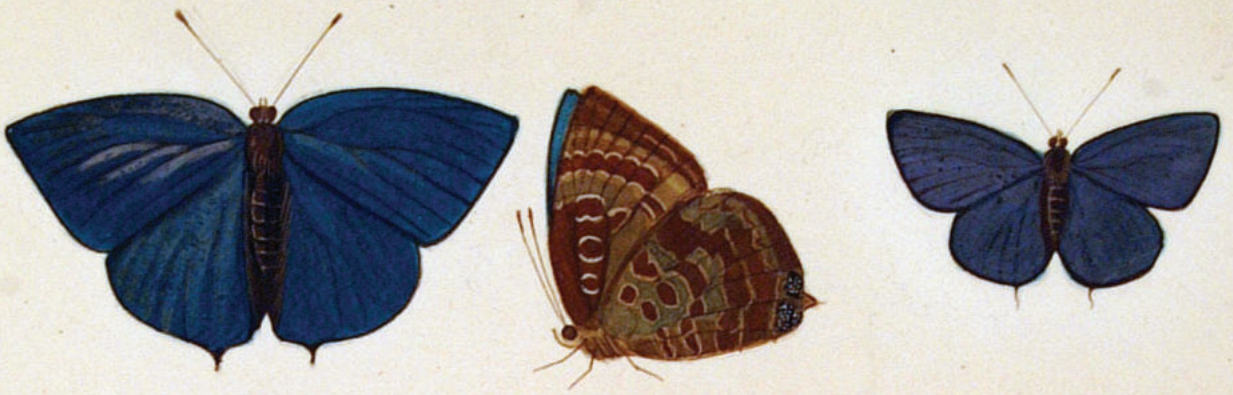
Photos taken on film should ideally be submitted as slides or as reasonable sized prints for us to scan or alternatively they can be scanned in by authors provided the scanner is capable of scanning at up to 1200dpi.

If an image is intended for the front cover then the photograph should be in portrait format (i.e. the shape of the final image) and will need to be quite a large file size (at least 5,000kb) or a good quality slide or print.

To give an idea as to what happens when the image is not of sufficient size, take a look at these two photographs. One is 300dpi and the other is 72dpi.

300dpi   72dpi

Fabricius N° 523 Centaurus Sr Jos kh Banks



Alis caudatis cœrulescentibus, limbo fusco subtus cinereis, maculis baseos ocellaribus. — habitat in novâ Hollandiâ

Fabricius N° 532 Cleon Sr Jos kh Banks Fabricius M615 Licias Sr Jos kh Banks

Alis caudatis fuscis, subtus cinereis, anticis striga, posticis fascia sanguinea, angulo ani Ocello gemino rufo. — habitat in Brasiliâ

Alis tricaudatis: anticis fuscis; macula fulva, posticis subtus albis nigro-maculatis — habitat in fulicando

ARTICLE

William Jones of Chelsea (1745–1818), and the need for a digital, online '*Icones*'

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Biosketch

Dick Vane-Wright has been associated with the Entomology Department of the Natural History Museum for almost 50 years, and is an Honorary Fellow of the Society. Following retirement from the Museum in 2004, he held a three-year NESTA Fellowship for work on attitudes to nature, values and the conservation of biodiversity. Currently he is Honorary Professor of Taxonomy at the University of Kent, Canterbury.

Opposite: Plate 22 from volume 6 of William Jones' *Icones* (OUNHM), painted *circa* 1785. This is a typical Jones plate that would have been studied by J.C. Fabricius in 1787—presumably at Jones' home in Chelsea. Fabricius possibly examined Banks' collection directly at the same time, and certainly did so during earlier visits. Four species of lycaenid butterflies from Sir Joseph Banks collection are shown. The two butterflies at top left represent the upper- and under-sides of what is now the lectotype of *Papilio centaurus* Fabricius, 1793, still present in the Banks Collection and now preserved at the BMNH London (currently placed in the genus *Arhopala* Boisduval, the true type locality of *centaurus* being Java, not "nova Hollandia" [Australia] as stated in the *Icones*: see Vane-Wright & Gaonkar, 2006). At lower left is *Papilio cleon* Fabricius, 1775, and at lower right *Papilio lisias* [sic] Fabricius, 1787. These two nominal species were also based on Banks Collection material; the former is now placed as a species of *Ministrymon* Clench, and the latter is an invalid junior primary homonym treated as a synonym of *Drupadia ravindra* (Horsfield, 1829). The butterfly at top right, apparently included under *centaurus*, represents a fourth species of Lycaenidae, not yet identified. Photographer: Rennison Hall.

Introduction

This great and insufficiently appreciated naturalist
Sir Edward Poulton

William Jones was a wealthy London wine merchant, natural historian and scholar who 'retired to Chelsea', where he lived at No. 10 Manor Street (Faulkener, 1829). He was elected Fellow of the Linnean Society of London in 1791, only three years after its foundation. Jones evidently died in March 1818, as he was buried at the old St Luke's graveyard on 1 April of that year (Poulton *et al.*, 1934). According to church records he was then aged 68, which suggests that Jones was born in 1750 (Salmon, 2000). However, Faulkner (1829) gives his age at death as 83, while his descendant Frederick Dawtrey Drewitt noted his year of birth as 1745 (Waterhouse, 1938) – the date accepted here. If so, Jones would have been about 73 at the time of his death, consistent with the idea that Faulkner's "83" was a typographical *lapsus*.

Jones' Icones

Jones is now mainly remembered for "*Jones' Icones*" – a title for his major work perhaps bestowed in its modern form by J.O. Westwood (John Calhoun, pers. comm. September 2009). However, based on evidence from various data labels in the Linnaean Collection held by the Linnean Society of London, it was probably first referred to as "*Icones Jones*" by the Society's founder, James Edward Smith (1759-1828). For example, a Smith label on a specimen of *Graphium antheus* (Linnean Society butterfly specimen no. 0550)

states "Antheus Fab. 4, 36. S. Leone, Afzelius. Ecaudatus in Icone [terminal 's' apparently cropped] Jones: idem ommino" (http://www.linnean-online.org/view/insects/papilio_.html).

Jones' Icones comprises about 1500 watercolour images of butterflies and some moths, now arranged in six bound volumes (Waterhouse, 1938). Salmon (2000: 120) seems to imply that all the paintings were made during 1783–1785, and this was uncritically repeated by Vane-Wright & Gaonkar (2006: 297) – but this too narrow time period appears to be a misinterpretation of the dates given on the bindings. However, Jones probably did start the majority of the paintings during the 1780s and, although the entire work has been said to have taken about 30 years to complete (Waterhouse, 1938), it does not seem likely that much was added after the early 1790s (John Calhoun, pers. comm.). In addition to certain specimens in his own collection, Jones based most of his images on Lepidoptera in the cabinets of various London-based contemporaries, including those of the famous Joseph Banks, Dru Drury and John Francillon, as well as a few from the British Museum and the Linnean Society collections.

During a family visit to London in 1787 (Armitage, 1958), the Danish scientist Johann Christian Fabricius studied all the paintings that Jones had made up to that time (Hope, 1845). Fabricius (1745-1808) was Linnaeus' greatest entomological student (Vane-Wright, 2007c), and based well over 200 species of butterfly and a few moths new to science on images he found in the *Icones*. Most, if not all of these names, were published in the *Entomologia Systematica* (Fabricius, 1793). Some years later, Edward Donovan (1805) described further new species from the paintings. In many cases the original specimens are now lost, the only significant exceptions being those in the Banks Collection (Fitton & Shute, 1994), a few in the Linnean Society collection, and perhaps some in his own collection now at Oxford (see below). As a result, the 'iconotypes' are of great importance for establishing the true identities and geographical sources of the species so named by Fabricius and Donovan (Waterhouse, 1938; and e.g. Lamas, 1979; Robbins & Lamas, 2006; Vane-Wright & Gaonkar, 2006; Calhoun, 2009; Larsen *et al.*, in press).

The *Icones* was not published in William Jones' lifetime. During 1925-1933 these remarkable paintings, together with specimens from his insect collection, letters and personal papers, were donated to Oxford University by a descendant, Dr Frederick Dawtrey Drewitt (Waterhouse, 1938; Smith, 1986). Many years earlier Dawtrey Drewitt, in collaboration with Westwood, had sought to publish lithographs of many if not all of Jones' paintings, together with an extensive account of his work – but this venture failed (Waterhouse, 1938). Subsequently, G.D. Hale Carpenter, Francis Hemming and others endeavoured to publish the *Icones*, but they were also unsuccessful (Smith, 1979). Eventually, in the late 1970s, the paintings were presented to the public for the first time, in the form of an uncut roll of 35mm colour film, comprising 765 slides issued by Oxford University Museum of Natural History (OUMNH). This slide collection, bought by only a handful of institutions, was issued with a minimal collation and index (Smith, 1979). From time to time a few of the images have been reproduced in papers (e.g. Vane-Wright & Whalley, 1985; Hancock, 1992; Gatrelle, 2004; Vane-Wright & Hughes, 2004; Vane-Wright & Gaonkar, 2006; Hancock *et al.*, 2008, Calhoun, 2009) and books (e.g. Smith, 1986), but no comprehensive account of the paintings has ever been published, and the *Icones* as a whole remains essentially unavailable.

The "Northern Brown Argus", *Aricia artaxerxes* (Fabricius, 1793), was supposedly based on specimens collected at Arthur's Seat, Edinburgh, "by a collector called Jones" (Melling, 1989: 156). While the original specimens were clearly in William Jones' own collection, there is nothing to suggest that Jones was the collector. Based on the data in the *Icones*, Fabricius simply recorded the source as "Anglia"—evidence, according to Salmon (2000: 295), that Fabricius' "knowledge of British geography was clearly limited." However, nothing could have been further from the truth, as Fabricius spent three months in 1767 travelling from Edinburgh to London on horseback! (Vane-Wright, 2007c). The taxonomic status of this little butterfly continues to be discussed (e.g. Descimon & Mallet 2009: 324), and Jones' images and the original material remain relevant to the debate. The individual shown here was photographed in June 2006 at Bishop Middleham quarry, County Durham—part of the population usually placed as a separate subspecies, *A. artaxerxes salmacis* (Stephens, 1828), the "Castle Eden Argus". Photographer: Velela. Copyright: Wikimedia Commons.

The significance of William Jones' work

In addition to the fundamental importance of the iconotypes, research into William Jones and his work could provide valuable insights in at least five other areas: documentation of the insect collections studied by Jones—various misunderstandings still need to be resolved, even regarding the well-known Joseph Banks Collection (Vane-Wright & Gaonkar, 2006); analysis of the sources of exotic material reaching England in the mid-late 18th C, as many of the images remain unidentified to this day (cf. Vane-Wright & Hughes, 2005); an analysis and overview of Jones' contributions to British lepidopterology (cf. Poulton *et al.*, 1934; Salmon, 2000); a re-assessment of Jones' single but highly original paper on butterfly classification that was published in volume 2 of the *Transactions of the Linnean Society* (Jones, 1794; Poulton *et al.*, 1934; de Jong *et al.*, 1996; Vane-Wright, 2007a,b); and an attempt to understand the beliefs of a member of the Enlightenment some 60 years before the emergence of the theory of evolution. Towards the end of his life, Jones became a follower of the Swedish scientist and mystic Emanuel Swedenborg (Faulkener, 1829; Salmon, 2000), a man who stood out among his contemporaries as an anti-materialist. Born in Stockholm in 1688, Swedenborg died in London in 1772. Various churches, societies and foundations continue to explore the significance of Swedenborg's theological ideas (Brock *et al.*, 1988), and it would be fascinating to see what insights concerning Jones' "conversion" could be gained from a study of his notebooks and other personal papers housed at Oxford. What would lead such a close observer of natural objects to a mystical vision of nature, when so many of his contemporaries were moving in an ever more materialistic direction?

The "Two-brand Crow", *Euploea sylvester* (Fabricius, 1793), is one of the most distinctive and widespread members of the large and complex milkweed butterfly genus *Euploea*. This butterfly, like many in the Indo-Australian tropics, occurs in numerous, mostly insular subspecies: currently well over 30 are recognised. It appears that William Jones' illustrations of this butterfly—on which basis Fabricius named it—were painted from material in Jones' own collection, for which no locality was cited. Since the mid-19th century the type locality has been considered to be Cooktown, Australia (Edwards, Newland & Regan, 2001: 319). Hopefully this is the correct interpretation, but it is not clear if the Jones figure or the Jones collection has been checked against our current understanding of this highly polytypic species. The individual shown here belongs to what is currently referred to as subspecies *E. sylvester coreta* (Godart, 1819), photographed at Bangalore, India, in May 2007. Photographer: Vijaybarve. Copyright: Wikimedia Commons.

A William Jones "Programme"

To realise the needs discussed above, four closely connected projects can be envisaged.

1. ***Digitisation and databasing of Jones' Icones***

   This fundamental step would require the creation of approximately 2000 high-quality digital images to cover the entire *Icones*, captured together with all the relevant manuscript annotations and information inherent in the layout of the bound volumes, and the collation issued by OUMNH (Smith, 1979). The care and safety of this unique work and its original bindings would be a special concern. On completion, the database and images could be made accessible to visitors to the Hope Library of Entomology. Making the images and data available on the Internet would be the subject of project 3. However, before that it would be desirable to complete project 2, to enhance the database and collation from the outset.

2. ***Identification of all Lepidoptera illustrated in Jones' Icones***

   Some of the Jones images have never been identified – although there appears to be an unpublished list made by Westwood in the Hope archives (Waterhouse, 1938; Smith, 1986), and another manuscript list due to Francis Hemming in the NHM London. All need checking, documenting and brought to modern standards of understanding for the full value of any otherwise successful imaging project to be realised. During the process, the geographical origins of the species depicted would be determined or inferred as accurately as possible, and links established to the existing literature – most notably for those species named from the *Icones* by Fabricius and Donovan. Research would also be undertaken to locate, wherever possible, any surviving specimens, notably in Jones' own collection (Oxford), the Banks Collection (NHM London), the Linnean Society, and perhaps the Alexander Macleay Collection, Sydney (http://www.usyd.edu.au/macleay/cinsect.htm) and the William Hunter Collection, Glasgow (Hancock, 2004). Wherever possible, images of such

Papilio crino Fabricius, 1793. One of the most beautiful species named by Fabricius on the basis of a figure in *Jones' Icones*. The original material was in Drury's collection, and was said to have been obtained from "Africa"—but this butterfly in reality is known only from southern India and Sri Lanka. The "Common Banded Peacock" illustrated here was photographed at Talakona Forest, Chittoor District, Andrhra Pradesh, India, in August 2008. Unlike many butterflies, *Papilio crino* does not appear to be divisible into subspecies, and thus the precise provenance of the original material is not (currently) critical for nomenclature. Photographer: J.M. Garg. Copyright: Wikimedia Commons.

specimens, could be originated (if they do not already exist) and added to the database. This project would need extensive input from a specialist Lepidoptera systematist.

3. ***Creation of a William Jones website***

   The creation of a website, in the first instance to make the images and associated data gathered by projects 1 and 2 widely and freely available, would be the core element of the entire programme, and could proceed to a first phase immediately after completion of project 1. Updating and expansion would be required after completion of Project 2 and, if it were also to be undertaken, again after completion of Project 4. The most obvious host for such a website would be Oxford University, or perhaps the Linnean Society of London, the Natural History Museum, London, or the Royal Entomological Society.

4. ***Book on William Jones of Chelsea***

   This final project would not only add value to Projects 1-3, but also make full use of the other materials donated to the OUMNH by Dawtrey Drewitt, including Jones' surviving papers, correspondence, and insect collection. The ideal aim would be to create a scholarly but accessible account of the man, his life and work, and his views on natural history, science and religion. What was Jones' motivation for creating his *Icones*? What was the fate of the various collections he worked on? What was the significance of his contribution to science and its pursuit? – notably his work on British entomology (Poulton *et al.*, 1934; Salmon, 2000; Barker & Vane-Wright, 2007), his influence during the founding of the Linnean Society (Smith, 1832; Dawtrey Drewitt, 1928), and the originality of his 1794 paper on butterfly classification (Jones, 1794; Poulton *et al.*, 1934; de Jong *et al.*, 1996; Vane-Wright, 2007b). A specific goal, based on the results of Project 2, would be an analysis of all the materials represented by the *Icones* to reveal the geographical origins of exotic insect material reaching England in the mid-18th Century (cf. Chapter 8 in Vane-Wright & Hughes, 2005). Finally, there is the fascinating question of Jones' embracement of Swedenborg's mystical ideas, and what this may reveal about the thinking of Enlightenment naturalists during the transition from natural theology to evolutionary biology.

The need for financial support

Desirable though these projects may be, the reality is that they will not happen unless the significant funds needed are found, most notably for technical phases 1 and 3. The author of this article would be very pleased to receive realistic suggestions as to how suitable funding for all or part of this work programme could be raised.

Acknowledgements

I am grateful to Audrey Smith, (the late) David Smith, Chris O'Toole, Stella Brecknell, Darren Mann, George McGavin and Stephen Simpson (Oxford) for access, over many years, to *Jones' Icones*, and Rennison Hall (Oxford) for the copyright image from *Jones' Icones* used for one of the illustrations to this article. The images of live butterflies belonging to species named by Fabricius from the *Icones* have been obtained from the remarkable Wikimedia Commons image database resource, for which I am most grateful. I also wish to thank Brian Gardiner and Leonie Berwick (Linnean Society), Gerardo Lamas and John Calhoun for information and encouragement.

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A team of forces personnel including medics, ready to climb a trail carrying essential supplies and supporting equipment. One group like this went on a three-day trek to visit a long-lost Huntuk village of headhunters - fortunately, they had retired.

Getting about on the island (away from the access road to the base camp) was only possible by driving along the palm-fringed coast where people lived. However, the only problem was hitting damp sand where the many watercourses entered the sea. Toyotas were always higher and better in these circumstances than Land Rovers, especially fording rivers.

ARTICLE

Project Wallace

– after 25 years – a personal reflection

John Feltwell, FLS, FRES, CBiol, FSB

Twenty-five years ago, the Royal Entomological Society of London (RES) organised an expedition to the rainforests of North Sulawesi (Celebes) Indonesia. This was called 'Project Wallace' in memory of Alfred Russel Wallace who studied this region in 1858.

The area was also chosen because it is in an area of overlapping tectonic plates and biotic influences from the Philippines and Australia, and it was hoped that there might have been some interesting speciation and endemism to observe. The late Tim Whitmore who was a consultant to the RES organising committee had already written on the subject of the Wallace Line and plate tectonics (Whitmore, 1981).

A total of 107 scientists from 17 countries visited the base camp from January to December 1985. They were supported by a logistical support team of 54 from the forces, who worked on distributing the 50 tons of stores and equipment. The base camp was set up within the eastern part of the Dumoga-Bone National Park (est. 1982) on the banks of the Dumoga River that drains eastwards out of the park. Six sub-camps were set up within the surrounding rainforest with one on the summit of Gunung Poniki (1,817 m) and another on Gunung Muajat (1,780 m) (Army Map Service, 1967).

The habitats available for exploration were i) primary lowland rainforest including ii) areas of thick bamboo, iii) mangrove forest, iv) coastal rainforest (not mangrove), v) river systems and vi) man-altered habitats around the base camp including large areas of newly irrigated land for rice.

At this inferface between primary forest and cleared habitat the insect fauna was rich, especially the Coleoptera where at least one participant was paying local children to bring in empty baked bean cans full of writhing beetles, in which new species could be found.

The general difference between lowland and upland rainforest here is that it is fairly impenetrable and thick at lower levels, whilst the trees start to thin out and one can see much further through the vegetation at higher levels.

One of the sub-camps, which was equipped with a bivouac for sleeping overnight. The ascent was quite challenging so there were drying racks for soaked clothing.

Getting disorientated in the rainforest can be an unnerving experience, and although the trails were cut following known compass directions, stepping off the trail for a moment all around closes in and looks the same. There are no artificial sounds in the forest to use as an aid to orientate.

Trapping methods were many and various. Baited traps (human faeces or bananas) suspended in the canopy brought in good numbers – so long as the black macaques did not get there first. The forest was festooned with the now familiar funnel traps to catch the smoked out insects of the canopy. The powdery wood from the centre of old rotting timbers was collected and put through shakers to find the insects. Light traps were also used and perhaps the most novel were the nets supported on the roof of one of the Land Rovers for trawling the base camp approach roads for insects.

My interest was in butterflies, mostly the papilionids and pierids; the mud-puddling of the papilios on the sandbanks was always an attraction. Clouds of butterflies would gather round patches of damp sand at the waters' edge where animals (including humans) had urinated. It is always fascinating to see butterflies arrive and land in their own species groups, perhaps three or four species all gathered in tight groups, their abdomens pulsating as they draw up fluids in their proboscis and evacuate the excess water from their abdomens.

Routes through the forest (for man and butterflies) were also via the rivers (which could be in spate within minutes from localised torrential rain in the forest). Looking upstream was like looking up a cathedral nave with tall trees rising vertically at the sides. The difference between light and dark, sunlight and shade was profound, and this seems to give an evolutionary advantage to butterflies that had dappled colours, as well as those with black and white.

It was in this river habitat, with ferociously strong sun bearing down and the interior of the rainforest as black as pitch in the near shade, that *Appias nero* was in its element. It was amazing to see butterflies 'pour off' the canopy of these cathedral heights, fall effortlessly to the surface of the river, and then make their way purposefully downstream. Counting the distinctive male *neros* over a 45-minute period (until a tropical downpour) 51 came off the canopy, whilst only six were seen going upstream. Certainly, these *neros* were using the river as a corridor, mostly downstream. They were all males. Where the females were was a mystery. Perhaps they spend their whole life on the canopy and wait for the adventurous males to find them?

Overall, several million insects were collected for The Natural History Museum including approximately 1,172,000 Coleoptera using a variety of methods including Malaise trapping, yellow trays, litter sampling and canopy fogging. The sample area was a 500 ha tract of uniform tropical lowland forest near base camp and this was sampled throughout the year in three, one ha plots (Hammond, 1990).

Sulawesi was indeed found to have high levels of endemism; for instance 73 of the 77 Sulawesi species of cicada (Homoptera: Cicadoidea) were endemic to the island (95%) (Duffels, 1990). Of the butterflies (Lepidoptera: Rhopalocera) 200 species were recorded out of the 460 present on the island (44%) (Vane-Wright, 1990).

In 1990, a series of papers was published recording the results of a special symposium held at the RES on 15-16 September 1988 (Knight and Holloway, 1990). A popular book was budgeted for, but did not materialise.

In terms of biodiversity, Sulawesi is part of the vast island complex known as Wallacea, and is now second only to the Peruvian Amazon as a world hot spot (Conservation International, 2009). This early positive experience of tropical rainforest study led me to further exploration in South and

Other sub-camps were positioned at landmarks such as an emergent tree; here a strangler fig. Note the typical un-branched stems of the younger trees rising up to the canopy and the enormous leaves of the Bird's nest fern (*Asplenium* sp.) a relative of the smaller European species.

Members of a small reconnaissance group explore the coastal mangrove swamps; note the stilt roots of the mangrove, the large leaves of the rainforest and the large beach stones.

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The typical structure of the rainforest is shown in this image showing emergent trees, lianas, epiphytes and dead and decaying trees. This was a remnant piece of forest close to the base camp. Getting pictures inside the dark, dank rainforest was far more challenging before digital cameras and when one had to rely on 400ASA analogue film.

Other sub-camps were positioned at landmarks such as an emergent tree; here a strangler fig. Note the typical un-branched stems of the younger trees rising up to the canopy and the enormous leaves of the Bird's nest fern (*Asplenium* sp.) a relative of the smaller European species.

Members of a small reconnaissance group explore the coastal mangrove swamps; note the stilt roots of the mangrove, the large leaves of the rainforest and the large beach stones.

ARTICLE

The Bug Project

Pat Ellacott
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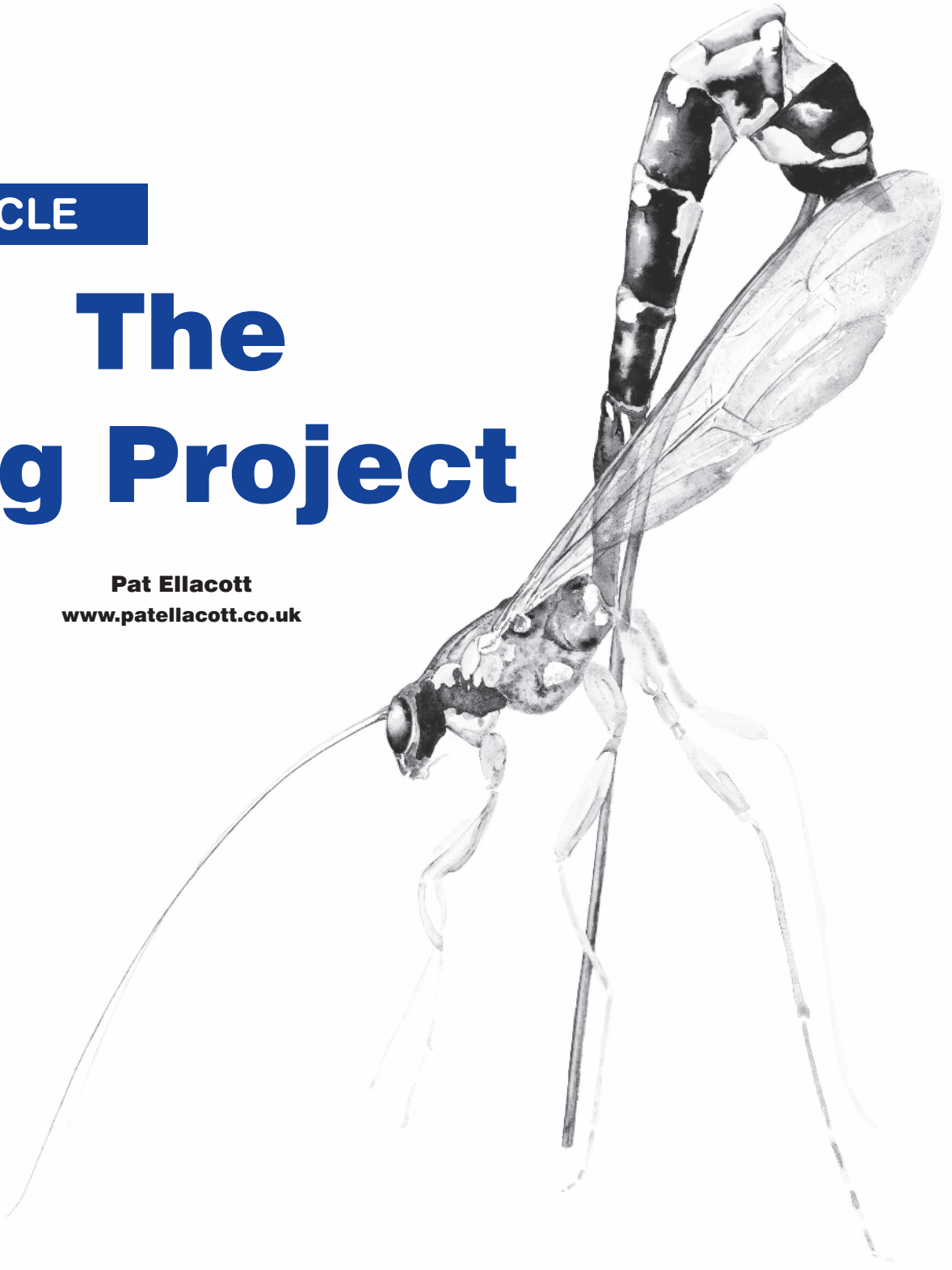


When I was young, my father used to leave the bathroom window open and the light on all night. In the morning there was always a host of different creepy crawlies, which we would duly identify then release. Two years ago, I repeated the activity, only to find the bath black with midges and requiring the use of a vacuum cleaner. This left me wondering what had happened to the diversity of insects of my childhood.

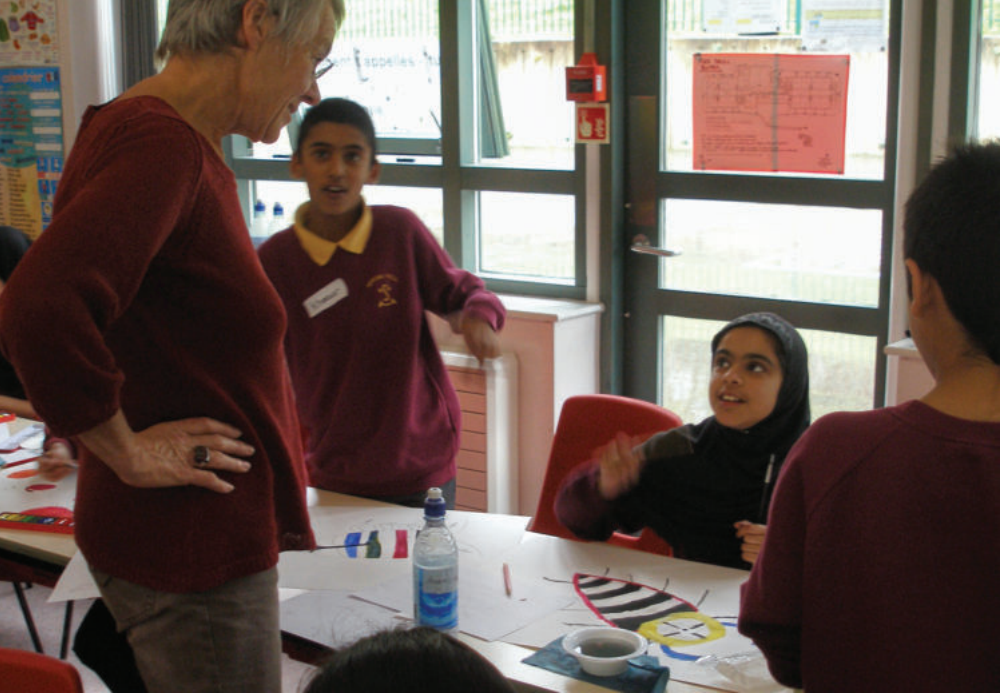
In 2005, after a career in teaching, I completed an art degree at Lancaster University. I spent a couple of years painting, using cows from local farms in the Yorkshire Dales as my subjects. Sadly, cows too are less evident than previously, farmers often having either sold up, or moved to intensive rearing indoors. At the same time I became intrigued by crane flies which despite, or because of, their ungainliness have a particular beauty. These encounters revived my interest in insects.

Early in 2009 I was awarded an Arts Council grant for *The Bug Project*, the purpose of which is to research and produce approximately 20 large drawings and paintings of insects affected by environmental changes in Lancashire and the UK. These will:

- Stimulate cross-curricular workshops at Key Stage 2, in a Primary school with very high intake of pupils with English as an Additional Language (EAL).
- Be exhibited in a number of art, science and environmental venues.

The aims of *The Bug Project* are to:

- Introduce art as an exciting and accessible activity to young people having little experience of the arts;
- Engage viewers in quality art, via unconventional subject matter, promoting invertebrates as an art form;
- Raise awareness of climate change in a wide section of the public;
- Develop collaboration between the arts and sciences;
- Expand my artistic skills and knowledge of entomology.



The choice of invertebrate 'models' to draw is limitless, I wanted to use a range of species, the perceived good, bad and ugly. Many people have an instant, illogical and emotional response towards bugs – spiders and wasps perceiving them as being scary, while ladybirds and bumble bees are seen as sweet. I hope to challenge this perception, by drawing the viewer into the picture, to reveal the creature's fascinating structure and reveal something of its lifestyle.

For centuries scientific illustration, has effectively depicted species as aids to identification. Accuracy is therefore, paramount, although there is some flexibility for layout and design. Photography and electron microscopy have augmented the role of hand illustration allowing it to assume a more imaginative and artistic role.

I believe there is huge scope for the use of entomology in art. An internet search on 'insect art' reveals, among others, the work of Tessa Farmer[i], a Charles Saachi protégée, who collects dead insects and makes tiny insect fairies to interact with them, which she then videos. Christopher Marley[ii] creates stunning kaleidoscope-like pictures with real arthropods, brilliant exotic beetles and butterflies. Stephen R Kutcher[iii] walks his bugs on paper, having dipped their feet in paint or ink. Damien Hirst caused customary outrage with his *Butterfly paintings*, tableaux of real butterflies suspended in paint[iv].

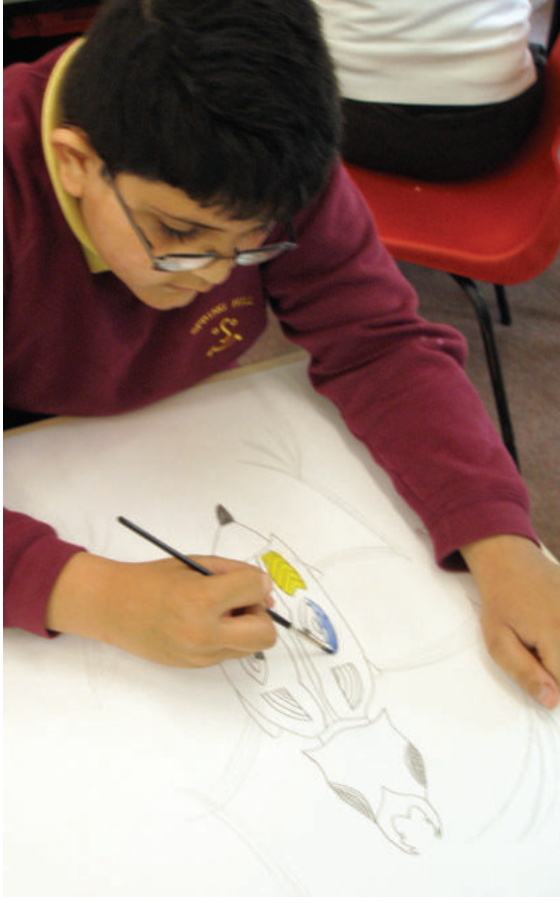
My work is more conventional. Yet what I find nearly all insect artists share is a fascination with tiny, overlooked creatures, whose behaviour is as skilled and bizarre as any human's. This is what I hope to communicate.

My drawings are on paper sized 76 x 56 cm. I use watercolour pencil, graphite powder, pigments, pastels and occasionally paint. They are simple and clear, in the tradition of scientific illustration, but allow for a degree of meditative doodling and mark making (adding lines or marks that have a purely aesthetic function). They are box framed, echoing entomological display drawers.

I worked with two, 'year 6' classes (10-11 year olds) at Spring Hill Community Primary School, in Accrington, Lancashire, where there is a very high proportion of pupils with English as an additional language. I presented them with series of large insect drawings and they were immediately fascinated. In June 2009, we organised a bug hunt in the school grounds, where there is a specified natural area and found the usual array of spiders, woodlice, beetles and slugs, which the children examined with magnifiers before releasing. In October, each class welcomed Roger Swales, the Bug Man, and his far more impressive collection of praying mantis, huge stick insects and crickets, lengthy millipede, enormous snail, scorpion and, of course, tarantula. The children were able to touch or hold many of the bugs, shaming teachers and the headmistress into doing the same.

A week later I spent two afternoons with each class, cramming a term's work into four hours. The children looked at a dreary dead fly, and then, following a PowerPoint illustrated talk on insect groups and life cycles, redrew the fly with the help of magnifiers. They then experimented with different art materials, monochrome and colour, mark making in response to emotive words. The second session included another illustrated talk on past and present insect artists, after which the children planned and invented their own arthropod, the emphasis being on imagination and creativity. Each child had access to new paint boxes, brushes, pencils and watercolour crayons (generously funded by the Arts Council and Ribble Valley and Craven Decorative and Fine Arts Society). Without exception, each worked with enthusiasm and care.

All the children's work, together with my own, and insect specimens from the Bolton and Blackburn entomology collections, are to be



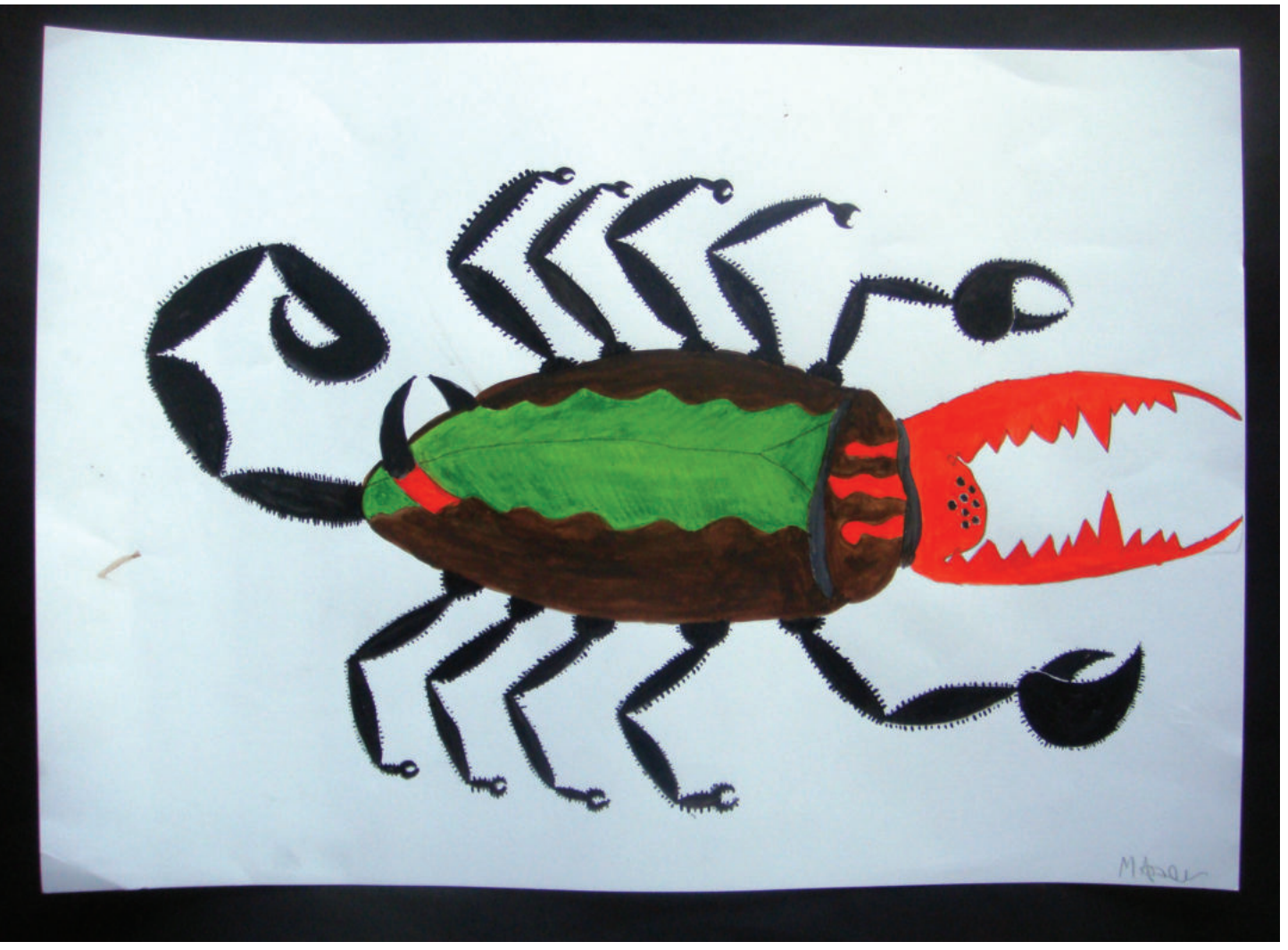
shown at the Haworth Museum and Art Gallery, Accrington in February 2010. Four pieces of their work will be selected for professional framing and will tour alongside mine, initially at the new, prestigious Steward's Gallery at Clitheroe Castle, Lancashire from April to July 2010. At both venues there will be further workshops and activities, particularly during National Insect Week in June. Originals will be for sale, but I also have limited edition giclée prints of most drawings.

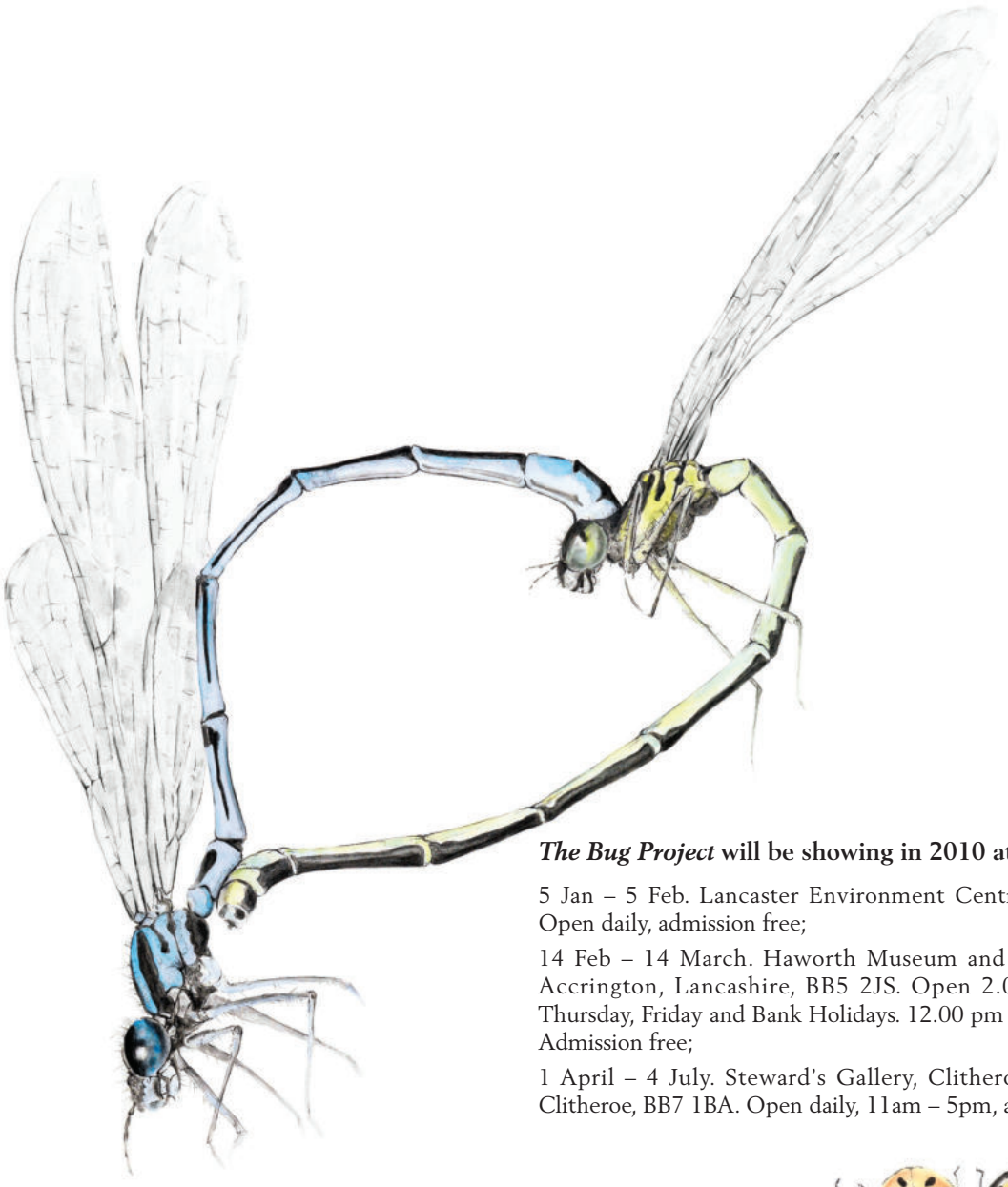
I feel the workshops have been really worthwhile, stimulating children who have relentless pressure to improve their SAT results, thereby missing out on much of the more creative side of the curriculum. They were excited and inspired, the boys producing an impressive number of stings and defence/attack mechanisms. I am sure they will remember *The Bug Project*.

I believe that *The Bug Project* is fulfilling its aims. I have certainly expanded my skills and knowledge of entomology and have been overwhelmed by the enthusiastic and generous support I have had from the scientists I have met, either personally or online, throughout the country. I am amazed at their knowledge. They have provided advice, information, samples, photographs and specimens. I have ventured into a new world of Climate Change meetings, Insect Festivals and museum backrooms, to say nothing of the bottomless pit of information on the web. Time will tell if my work can engage viewers at the exhibitions and encourage them to share my passion for art and insects, but I hope so.

References

i http://www.tessafarmer.com/
ii Marley, C. 2008. Pheromone: *The Insect Artwork of Christopher Marley*, Pomegranate Europe Ltd.
iii http://www.bugartbysteven.com/gallery.htm
iv http://www.whitecube.com/artists/hirst/medicinecabinet/





***The Bug Project* will be showing in 2010 at the following venues:**

5 Jan – 5 Feb. Lancaster Environment Centre atrium, Lancaster University. Open daily, admission free;

14 Feb – 14 March. Haworth Museum and Art Gallery, Manchester Road, Accrington, Lancashire, BB5 2JS. Open 2.00 pm to 5.00 pm Wednesday, Thursday, Friday and Bank Holidays. 12.00 pm to 4.30 pm Saturday and Sunday. Admission free;

1 April – 4 July. Steward's Gallery, Clitheroe Castle Museum, Castle Hill, Clitheroe, BB7 1BA. Open daily, 11am – 5pm, admission free.

If you are interested in showing *The Bug Project*, purchasing prints or originals, or want more information, please contact Pat at:

patellacott@btconnect.com

01200426297 / 07903249334

Amateur Entomologists' Society

P.O. Box 8774 • London SW7 5ZG
http://www.amentsoc.org

THE MICHAEL MAJERUS FUND

A new Grant Scheme will be launched by the Amateur Entomologists' Society (AES) at its Members' Day on 24th April 2010. The Grant is named in memory of the late Professor Mike Majerus, AES President 2005-2009, whose effort and vitality in promoting the AES and encouraging young entomologists is formally acknowledged in the new Grant Scheme.

Marking the 75th anniversary of the AES, the purpose of the Grant is to encourage active involvement in entomology and to engage a new generation of entomologists.

The Michael Majerus Grant will support new projects which aim to advance and communicate amateur entomological study, research or education. Projects involving the promotion of entomology amongst the young will be viewed particularly favourably.

The Grant will initially be funded by donations received by the Society in memory of Mike Majerus. Individuals or organisations wishing to make donations to the Fund, or who would like further information, are invited to contact the Secretary of the Society in the first instance:

AES Secretary, PO Box 8774, London SW7 5ZG.
Email: secretary@amentsoc.org

Further details will also become available over the coming months in AES periodicals and on the AES website www.amentsoc.org

Registered Charity No. 267430

Meeting Reports

Aphid Special Interest Group

Richard Harrington and Lin Field

Photographs by Mark Mallott

Ninety aphidologists attended the meeting held on 16th November at Rothamsted, home of the first such meeting way back when, certainly well before the aphid molecular revolution. Star turn was Alex Wilson (University of Miami) who, on behalf of the Aphid Genomics Consortium, summarised the work being done that makes use of the pea aphid genome. She included an amazing tale of how the aphid and symbiont genomes appear to interact in very complex ways to effect certain metabolic pathways. The remaining talks and posters ranged widely through physiology, ecology (interactions with plants and natural enemies), behaviour, control and taxonomy. Abstracts are available by email from Richard Harrington. Participants were given the chance to tour the Rothamsted aphid labs where they saw work on monitoring and forecasting, electrophysiology and resistance diagnostics, and visited the state-of-the-art insectary facilities. There were six entries for the aphid photographic competition, the winner being Rob Lind from Syngenta with a fine full frontal of *Myzus persicae*. He also came 2nd, 3rd, 4th, 5th and 6th. Such is the enthusiasm for this SIG that there is a queue of willing organisers. The next will be held at Syngenta Jealott's Hill on 22nd September 2010, and the one after that is likely to be at SCRI Dundee. It wouldn't really be fair to mention the two well known aphidologists who arrived 24 hours late, but it was great to be able to spend quality time with them. The Aphid SIG also provided an opportunity for the President to present an Honorary Fellowship of the Society to Professor Jenny Mordue from the University of Aberdeen, in recognition of her contribution to both entomological science and the RES.

Myzus persicae. Stacked image. Rob Lind. © Syngenta 2009.

Biodiversity and conservation of insects in gardens

Wednesday 30th September at Wisley

Delegates inspect the 'Plants for Bugs' trial.

Gardening must surely rank as one of the most popular hobbies in the UK, with the added bonuses that it is a healthy activity and can provide eatable rewards. A satellite view of almost any suburban area of the UK shows typically the neatly arranged rows of houses each with at least a small back garden, which according to the 'BUGLIFE' website adds up to about 270,000 hectares, an area greater than the total of our National Nature Reserves. So, not surprisingly, when a joint meeting between the Royal Horticultural Society and the Royal Entomological Society was mooted, reviewing the rather limited research about the effect of our gardens' flora and design on insect diversity seemed a worthwhile topic.

The RHS kindly offered to host the meeting at Wisley, which provided us with a very attractive venue and the opportunity to look around the gardens. We were lucky in managing to get speakers to cover a wide range of aspects of the interactions between insects and the design features and flora found in gardens.

After a welcome to Wisley by Dr Roger Williams, Pippa Greenwood (who pointed out that our meeting room had been a potting shed when she had been at Wisley!) started our morning session by reminding us of the popularity of gardening, even among the young, and the need to persuade people that insects in the garden were not all trying to destroy the plants. Gardens were an excellent starting point for children to encounter insects and we should try to promote a good image of insects, so that people did not flinch as soon as they were presented with something of six or even more legs.

One of the key features of our gardens is the presence of a wide diversity of flowering plants, which Juliet Osborne, in her talk, illustrated were a valuable source of nectar and pollen for a range of flower-visiting hymenopterans. Even the compost heap in the corner of the garden could give a safe nesting site for our threatened bumble bee species and individuals from a nest would forage over an area the size of a large village. Another feature usually present is a lawn, which at first sight looks relatively insect free, but Bob Clements showed that it did in fact hide a wide range of insects, of which emerging dipterans become the most obvious, especially during the Autumn. Most garden lawns remain as undisturbed grassland for years and this allows insects like wireworms and chafers to complete their longer life-

Emperor dragonfly ovipositing. Photograph by Pam Taylor

cycles. Several gardens also contain a pond and these provide refuges for Odonata amongst the urban sprawl. Claire Install from the British Dragonfly Society illustrated that anything from a bucket of water to a lake can act as a valuable resource for water-dwelling insects, and a little thought concerning construction of a pond helps greatly to increase its biodiversity.

Within gardens, parks and even along roads, trees are an important part of the urban landscape. Alvin Helden considered the value of native and non-native species of tree for our endemic arboreal phytophagous insects. Unfortunately there seems to be a move towards planting more non-native trees both in our streets and gardens, which does not help increase insect biodiversity. The morning was rounded-off with a report on the 'Sheffield BUGS Project' by Ken Thompson, which is one of the few pieces of research actually looking at insect biodiversity in gardens of different size. His team had found that neither garden size nor native versus non-native flowers appeared to have any large influence on insect biodiversity, but the altitude of the gardens had an effect. Over lunch the discussions continued and a number of posters were on display.

The afternoon was started by David Brooks reporting on the decline in common moths, many of which may be found in UK gardens, and some of the possible causes for their decline. Many of the moths have far wider ranges than just an area in suburban gardens, but the gardens do offer food sources for adults and sometimes for larval stages. This was followed by Andrew Halstead who changed the direction of the meeting by considering some recent additions to garden insect biodiversity that were far less acceptable to gardeners. The introduction of many exotic floral species to gardens and the general warming of the climate increased the likelihood for the appearance of new insect pests. Wisley was in the forefront of recording these new arrivals, as many RHS members would contact the gardens for advice on the 'new found' species. The afternoon papers concluded with some thought-provoking facts from Phil Bolton about the need for an ecological survey in order to gain planning consent for say the development of gardens. One of the key factors considered by the assessor was the need to maintain insects in the changed environment, as they played such a major role in the food webs of many other animals, especially protected species like bats. Maintaining a wide diversity of flora provided food supplies for the insects and thus helped stabilise the higher food chains.

Having refreshed ourselves with tea, we were guided through the gardens to see the new 'Plants for Bugs' trial Wisley has set up to investigate the effect of garden flora on insect diversity. Replicated 3m square plots have been constructed containing either typical UK garden flora, or flora from Europe or a range of flora representing exotics now commonly found in garden centres. The plots have been set out on two Wisley trial grounds and the diversity of the insects visiting them will be recorded over the next few years. There was plenty of opportunity to offer suggestions on the nature of this trial and it made a fitting end to a very good meeting between the societies.

Emperor dragonfly ovipositing. Photograph by Pam Taylor

Bombus lucorum visiting *Centaurea montana*

Council Report

– RES Strategy –

The Council of the RES have recently set up a 'working group' to look into the 'strategy and workings' of the Society. The group has produced the document below which sets out the current strategy. We now invite all members and fellows to let us know their views on what we are currently doing and what other activities you would like us to consider. Furthermore, please let us know if you have any suggestions for ways in which we could improve the workings of the Society.

Ideas can be sent by e-mail to any member of the working group: Bill Blakemore (Bill Blakemore (bill@royensoc.co.uk), Lin Field (lin.field@bbsrc.ac.uk), Archie Murchie (archie.murchie@afbini.gov.uk) and Gordon Port (gordon.port@newcastle.ac.uk). If you do not have access to e-mail please send written comments to any of the above c/o The Royal Entomological Society, The Mansion House, Chiswell Green Lane, St. Albans, Herts. AL2 3NS.

The stated aim of the RES is *"the improvement and diffusion of entomological Science".*

At a 'Finance Committee' meeting held in October 2006 the two items that were identified for enhancement as a deliberate strategy by the Society were 'Publishing' and 'Meetings' (which were considered to be the main strengths of the Society). This was endorsed by Council and presented in the subsequent Annual Report. Council has also pursued a policy of improving the provision of entomology to the wider public, expanding support for grants and awards and continuing the development of its world-renowned entomological library.

This strategy currently involves the following:

Publications

1) The Society publishes handbooks for the identification of British insects. Details are available on request from the RES and the Field Studies Council also carries a full range of the handbooks. Recent new publications include British Scraptiidae, True Weevils (Part II), Psocids Psocoptera, British Lonchaeidae, The Carabidae of Britain and Ireland and Fleas.

2) The Society publishes Proceedings volumes from its International Symposium meetings.

3) The Society, in partnership with Wiley-Blackwells, publishes seven Journals of peer-reviewed papers in a range of entomological topics. The Journals are:

   Ecological Entomology

   Insect Conservation and Diversity

   Physiological Entomology

   Systematic Entomology

   Medical and Veterinary Entomology

   Insect Molecular Biology

   Agricultural and Forest Entomology

4) The Society publishes an 'in-house' journal for its members (*Antenna*).

5) The Society has commissioned a book on the Insects of the British Isles.

Item 1 is priced to 'break even', items 2 and 3 make a surplus for the Society with item 3 being the main source of RES income, item 4 is a net cost and item 5 is currently a cost but in the long run is expected to make a profit.

Meetings

1) Annual meetings for the Societies Fellows and Members and other entomologists are held at locations around the UK, the Meetings Committee is responsible for determining the location and setting up a 'scientific organising committee' and the RES Staff are responsible (in conjunction with the local organisers) for the practical organisation.

2) Every other year the Annual Meeting is accompanied by an International Symposium, again the responsibility for deciding the topic is with the Meetings Committee.

   National Meetings and International Symposia are underwritten by the Society and although delegates are charged to cover accommodation etc. Council accepts that the RES will make a substantial financial contribution.

3) Special Interest Group meetings. These are, in most cases, held annually and currently include Aphids, Aquatic Insects, Climate Change and Insects, Infection and Immunity, Evolution and Mechanism, Insect Behaviour, Insect Conservation, Insect Ecology, Insect Endosymbionts, Insect Parasitoids, Insect Pollination, Insects and Sustainable Agriculture, Medical and Veterinary, Orthoptera and Post Harvest Entomology.

4) Regional meetings, usually organised by the Regional Officers.

   The SIGs, Regional and National meetings are free to anyone wishing to attend (although there may be a cost for refreshments and accommodation where appropriate).

This is seen as part of the RES 'outreach activities' (see below).

Overall the Society seeks to hold day meetings each month, with the exception of January, August and July or September. Some months are allocated to specific events: the first Wednesday in March is the Verrall Lecture, June holds the AGM and President's Speaker/Address and July or September are the Annual National Meeting.

Outreach activities

In order to fulfil the RES 's responsibilities under its Charitable Status the RES organises, and funds, events to take entomology to a wider audience. These currently include:

1) National Insect Week, held every other year (next one 2010), which includes a wide range of entomological activities throughout the UK.
2) Insect Festivals, the first of these was held in York in 2009 and Council has agreed a repeat event in 2011, it is anticipated that this will become a biennial event to be interspersed with NIWs.
3) A contribution to the 'Bug Club' (an AES organisation) which seeks to encourage children to be interested in entomology.

All three events are a substantial net cost to the Society.

Grants and awards

The RES makes a number of awards and travel grants, these are detailed on the Society's website. Some are funded by other organisations and are subject to terms set out by the funders. The Society's own awards are made by Council, its Officers or its Sub-Committees. Briefly they are currently:

Student Awards, Journal Awards, Goodman Award, Marsh Award, Alfred Russel Wallace Award, J.O. Westwood Award, The Wigglesworth Memorial Lecture and Award, the Book Purchase Scheme and Outreach and Conference Participation Grants.

Library

Book purchases continue and the Library Committee decides on appropriate expenditure and this is ratified by the Finance Committee. The reprint collection is currently being made into a database which will be available on the web in due course and we have started the 'digitisation' of our rare volumes.

SCHEDULE OF NEW FELLOWS AND MEMBERS

as at 11th November 2009

New Fellows (1st Announcement)

Professor Robert Meldrum Robertson
Dr Waqas Wakil
Dr Rod James Dillon
Mr Richard James Paton Fox

Upgrade To Fellowship (1st Announcement)

Dr Joanna Staley

New Fellows (2nd Announcement And Election)

None

Upgrade To Fellowship (2nd Announcement And Election)

New Members Admitted

Mr Michael Tait
Mr Yu Kwok Keung
Miss Jennifer Caroline Kaden
Dr Alin Mirel Puinean

New Student Members Admitted

Miss Hayley Catherine Wiswell
Mr Nicholas Golding
Miss Gemma Hough
Ms Sandra Rehan
Miss Lue Cuttiford

Re-Instatements To Fellowship

None

SCHEDULE OF NEW FELLOWS AND MEMBERS

as at 2nd December 2009

New Fellows (1st Announcement)

Mr Torsten Michael Van Der Heyden

Upgrade To Fellowship (1st Announcement)

None

New Fellows (2nd Announcement And Election)

Dr Julian Luke Bayliss
Dr Zakir Husain Husainy
Professor Robert Meldrum Robertson
Dr Waqas Wakil
Dr Rod James Dillon
Mr Richard James Paton Fox

Upgrade To Fellowship (2nd Announcement And Election)

Dr Terence Michael Whitaker
Dr Yamni Nigam
Dr Joanna Staley

New Members Admitted

None

New Student Members Admitted

Miss Tarryn Castle
Miss Francisca Sconce

Re-Instatements To Fellowship

None

Deaths

Dr C Edwards, 1988 Scotland

Hanging by a thread. Forest trail, Frasers Hill, Malaysia.

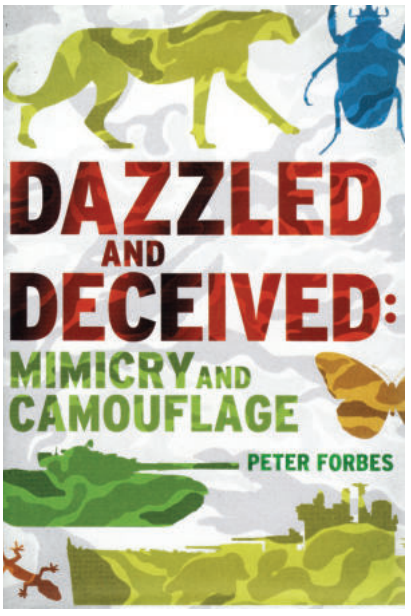
The photographs here show nematoceran diptera resting on silken lines produced by spiders. This looks like walking into the lion's den but they appear to be resting on the web unmolested by the resident spider. I have seen this behaviour several time and wondered how this strange behaviour works. Perhaps the vibrations in the web produced by the mass arrival of the flies triggers a flight response in the spider. Maybe the spider was satiated? Has anyone else observed this phenomena.

Peter Smithers

Book Reviews

Dazzled and Deceived

by Peter Forbes
Yale University Press
ISBN 978-0-300-12539-9 £18.99



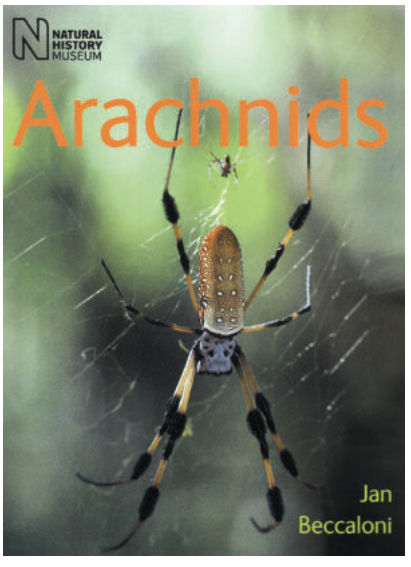
Here is a book with a wide horizon: a history of science and its applications. It begins with Bates and Wallace chasing Heliconid butterflies in the Amazon, charting their fascination with the mimicry exhibited by this genus. It culminates in Mike Majerus triumphantly vindicating the peppered moth as an example of evolution in action. The journey is circuitous but intriguing, leading the reader to Picasso and the cubists via Poulton's early work on animal camouflage. Forbes paints a fascinating history of the transition from the observation of mimicry in butterflies to our current understanding of the genetics that underpin the process. The book charts these early days of biology with great enthusiasm, producing an account that shows great leaps of understanding alongside flawed relationships, intense rivalries and a few blind alleys. It blends biology and military history, bringing artists, biologists and military personnel into the frame to explore how our understanding of mimicry and natural camouflage eventually fused to form the military camouflage core, thus helping to protect our armed forces.

The final section of the book delves into the molecular world and provides a history of the genetics of Heliconid butterflies and an outline of our understanding of the processes involved. 'Dazzled and Deceived' is a fascinating account that provides a window into the biology of camouflage and mimicry along with an insight into the little known interactions between biologists and the military.

Peter Smithers

The Arachnids by Jan Beccaloni

published by the Natural History Museum, London.
ISBN 978-0-565-09220-7 £30.00



The Arachnids is a long awaited text that fills a yawning chasm in the invertebrate literature, as for many years the only publications that covered this group have been out of print and out of date. The Arachnids is written in a friendly, easy to read style which will make it accessible and popular with the widest possible spectra of readers. It will useful to professional biologist and natural historians alike. Each chapter deals with one of the arachnid orders, providing an up to date synthesis of our current knowledge of the group. It deals with the major groups of arachnid such as the spiders, scorpion, mites and harvestmen in great detail and then brings together all that is known of the lesser know groups such as the amblypygi, solifugae, schizomida , uropygi and ricinulei.

Each chapter examines the classification and diversity of the group, internal and external anatomy, distribution and habitats with a final section on general biology and behaviour. It is well illustrated with clear line drawings and a superb collection of colour photographs, it is well researched, peer reviewed and fully referenced. The Arachnids is highly recommended and is destined to be the key reference for this group for many years to come.

Peter Smithers

Diary

Assistant Editor: Craig Macadam (e-mail: craig.macadam@bradan-aquasurveys.co.uk)

Abbreviations

AAB	Association of Applied Biologists.
AES	Amateur Entomologists' Society
BAS	British Arachnological Society.
BC	Butterfly Conservation
BENHS	British Entomological and Natural History Society.
BENHS (IM)	BENHS indoor meetings held at RES.
BENHS (WS)	BENHS workshops held at Dinton Pastures Country Park, Davis Street, Hurst, Reading RG10 0GH. Grid reference SU 784 718. I: Ian McLean, 109 Miller Way, Brampton, Huntingdon, Cambridgeshire PE18 8TZ.
BES	British Ecological Society.
BISG	Bloomsbury Insect Science Group meetings held at Birkbeck College, Department of Biology, Malet Street, London, Room 232.
BMIG	British Myriapod and Isopod Group. I: www.bmig.org.uk
DaNES	Derbyshire and Nottinghamshire Entomological Society.
ECSS	Ecology and Conservation Studies Society. Meetings start at 6:30pm and are held in Room B29, Senate House, Malet Street. London WC1E.
EEC	Edinburgh Entomological Club
ESA	Entomological Society of America.
FBA	Freshwater Biological Association I: www.fba.org.uk
FSC	Field Studies Council. I: http://www.field-studies-council.org
KFC	Kent Field Club
KMBRC	Kent and Medway Biological Records Centre
LCES	Lancashire and Cheshire Entomological Society.
LNHS	London Natural History Society.
LSL	The Linnean Society of London, Burlington House, Piccadilly, London W1V 0LQ.
NFBR	National Federation for Biological Recording
NHM	The Natural History Museum, Cromwell Road, London SW7.
RES	Royal Entomological Society.
RS (CHT)	The Royal Society, 6 Carlton House Terrace, London SW1Y 5AG.
SHNH	Society for the History of Natural History (Hon. Sec.) c/o NHM.
YNU	Yorkshire Naturalists' Union. I: http://www.ynu.org.uk
ZSL	The Zoological Society of London, Regent's Park, London NW1 4RY.
I:	Information from:

Contributions please! Your support is needed to make this diary effective so please send any relevant items to the diary's compiler, **Craig Macadam**, E-mail: craig.macadam@bradan-aquasurveys.co.uk. No charge is made for entries. To ensure that adequate notice of meetings, etc. is given, please **allow at least 6 months' advance notice**.

Meetings of the Society

Recently, Special Interest Group (SIG) meetings have been held at Rothamsted Research, Harpenden or the Mansion House, St. Albans and usually begin with registration and refreshments at 10am for a 10.30am start. Details of the day's programme can be downloaded from the RES website (www.royensoc.co.uk) and include a registration form, which has to be completed in advance so that refreshments can be organised. All meetings finish by 5pm.

Some SIG or monthly meetings may begin after lunch and be held at a different location, so it is best to consult the diary or the RES website for full details. Regional meetings, by definition, will be held locally.

2010

Feb. 3-4 **Postgraduate Forum**
Venue: University of Sheffield
As well as postgraduate presentations and posters, there will be a strong focus at the meeting on exploring a wide range of career opportunities both inside academia and outside. The meeting will also feature a writing and publishing workshop.
If you would like to offer a contribution or, as an established scientist, offer guidance please contact the convenors:

Toby Fountain (t.fountain@sheffield.ac.uk)
Rhiannon Pursall (Sheffield), Email: r.pursall@sheffield.ac.uk
Duncan Allen (Imperial), Email: duncanallen78@yahoo.co.uk
Nina Stanczyk (Rothamsted), Email: nina.stanczyk@bbsrc.ac.uk

March 3 **Verrall Lecture. Professor Chris Thomas (University of York).**
"Insects and climate change: ecological and evolutionary dynamics at shifting range boundaries".
Venue: Sir Neil Chalmer's Seminar Room in Darwin Centre 2, Natural History Museum
Time: Tea will be served at 16:00, followed by the lecture at 16:30, closing sharp at 17.30.
Insect species are, on average, shifting their distributions northwards and uphill in response to recent climate warming. Thermally-driven ecological changes to habitat association and evolutionary changes in dispersal rates produce positive feedbacks, whereby range expansion begets faster range expansion. This appears to generate a dichotomy of winners and losers in response to climate change.

April 7 **Tracking insects: Techniques and Analysis**
Venue: The Mansion House, St Albans.
Time: 10am for coffee; 10:30 start.
The aim of the meeting will be to discuss techniques for marking and tracking adult insects, both in the laboratory and in the field. Factors examined will include technique effectiveness, reliability and data interpretation. Several talks will focus on the use of the latest microchips for monitoring insect movement.
Confirmed speakers include:

Tom Brereton (Butterfly Conservation)
David Chesmore (University of York)
Marion Hall (Open University)
Colin Hawes (Royal Holloway College)
John Muggleton (British Entomological & NH Society)
Mark O'Neill (Tumbling Dice Ltd)
Heather Oaten (Game & Wildlife Conservation Trust)
Elva Robinson (University of Bristol)
Thomas Merckx (University of Oxford)

Convenor: John Badmin (Kent & Medway Biological Records Centre). Email: jbadmin@btinternet.com

May 13 **Electronics and Computing Technology Special Interest Group**
Venue: Rothamsted Research, Harpenden or The Mansion House, St. Albans
Convenor: Dr. Mark O'Neill, Tumbling Dice Ltd. Email: mao@tumblingdice.co.uk

June 2 **Annual General Meeting and President's Address.**
Professor Lin Field - Insecticide Resistance, the Battle against the Pests
Venue: Rothamsted Research, Harpenden.

June 21-27 **National Insect Week 2010**

June 22 **Infection and Immunity Special Interest Group**
Venue: Oxford University
Convenor: Dr. Petros Ligoxygakis. Email: petros.ligoxygakis@bioch.ox.ac.uk

July 26-28 **Ento 10 RES Annual National meeting**
Venue: Swansea University
Specialist sessions to include: biocontrol, immunity and insect microbes, exploiting insects and novel products, monitoring and managing pests, emerging pests and their control. There will also be a special NERC-funded industry/academia Networking Workshop in Applied Entomology: "Ento 1-2-1".
Convenors: Miranda Whitten (m.m.a.whitten@swansea.ac.uk)
Tariq Butt (t.butt@swansea.ac.uk)
Ed Dudley (e.dudley@swansea.ac.uk)
Alyson Bexfield (a.bexfield@swansea.ac.uk)
Norman Ratcliffe (n.a.ratcliffe@swansea.ac.uk)
Ento 1-2-1 enquiries: Phil Eadon (phil.eadon@allancia.com)

Aug. 22-27 **9th European Congress of Entomology**
Venue: Budapest, Hungary.
For information contact RES representative: Dr. Scott Johnson (scott.johnson@scri.ac.uk)

Sept. 22 **Aphid Special Interest Group**
Venue: Syngenta at Jealott's Hill
Convenor: Dr. Rob Lind (rob.lind@syngenta.com)

Oct. 27 **Climate Change Special Interest Group**
Venue: The Food and Environment Research Agency (FERA), York
Convenors: Dr. Howard Bell (howard.bell@fera.gsi.gov.uk)
Dr. Richard Harrington (richard.harrington@bbsrc.ac.uk)

Nov. 26 **Insect Parasitoid Special Interest Group**
Venue: Biology Department, University of York
Convenor: Dr. Peter Mayhew (pjm19@york.ac.uk)

Dec. **Aquatic Insects Special Interest Group**
Date: To be confirmed
Venue: Glasgow
Convenor: Craig Macadam (craig.macadam@buglife.org.uk)

Diary of other Meetings

2010

February

6 **BENHS – Coleopterists' Day**
Venue: Dinton Pastures, Reading
I: www.benhs.org.uk

7 **BENHS joint meeting with Bristol Museum**
I: www.benhs.org.uk

13 **BENHS Workshop: Tachinidae identification workshop – Matt Smith and Chris Raper**
Venue: Dinton Pastures, Reading
I: www.benhs.org.uk

14 **BENHS Open Day**
Venue: Dinton Pastures, Reading
I: www.benhs.org.uk

17 **Edinburgh Entomological Club**
British adult caddisflies – Emma Ross
Venue: Crew Building, King's Building, University of Edinburgh
I: www.edinentclub.org.uk

20 **BENHS Workshop: Ephydridae identification workshop – Martin Drake and Tony Irwin**
Venue: Dinton Pastures, Reading
I: www.benhs.org.uk

27 **BENHS Workshop: Staphylinidae identification workshop – Roger Booth, Peter Hodge and Colin Welch**
Venue: Dinton Pastures, Reading
I: www.benhs.org.uk

28 **BENHS Open Day**
Venue: Dinton Pastures, Reading
I: www.benhs.org.uk

28 **BENHS Open Day**
Venue: Dinton Pastures, Reading
I: www.benhs.org.uk

March

3 **Verrall Supper: Annual meeting of the Verrall Association of Entomologists.**
I: h.f.vanemden@reading.ac.uk

5-7 **Dipterists Forum Identification Workshop**
Beginner's workshop on 'Introduction to Fly Families'.
Venue: Preston Montford Field Studies Centre, Shrewsbury
I: http://www.field-studies-council.org/professional/2010/courseinfo.aspx?id=393

5-7 **Dipterists Forum Identification Workshop**
Advanced workshop on Muscid flies.
Venue: Preston Montford Field Studies Centre, Shrewsbury
I: http://www.field-studies-council.org/professional/2010/courseinfo.aspx?id=394

6 **BENHS Workshop: Introduction to identifying Sphecidae genera – Mike Edwards**
Venue: Dinton Pastures, Reading
I: www.benhs.org.uk

13 **BENHS Annual General Meeting and Presidential Address**
Venue: Oxford University Museum of Natural History
I: www.benhs.org.uk

14 **BENHS Open Day**
Venue: Dinton Pastures, Reading
I: www.benhs.org.uk

17 **Edinburgh Entomological Club**
Ectoparasites of bats – David Dodds
Venue: Crew Building, King's Building, University of Edinburgh
I: www.edinentclub.org.uk

20 **BENHS Workshop: Ground beetle (Carabidae) identification workshop – Mark Telfer and John Walters**
Venue: Dinton Pastures, Reading
I: www.benhs.org.uk

26-28 **Butterfly Conservation's 6th International Symposium: "The 2010 target and beyond for Lepidoptera"**
Venue:Reading University, UK.
I: www.butterfly-conservation.org/symposium
The meeting will address the key target of halting biodiversity loss by 2010 which was set across Europe almost a decade earlier. There will be reviews of progress from the UK, Europe, and countries throughout the world, as well as the latest science on how to reverse declines and conserve habitats. The Symposium will conclude with an analysis of future challenges, including the impact of climate change.

27 **BENHS Workshop: Sawfly identification workshop – Guy Knight and Andrew Halstead**
Venue: Dinton Pastures, Reading
I: www.benhs.org.uk

28 **BENHS Open Day**
Venue: Dinton Pastures, Reading
I: www.benhs.org.uk

April

8-11 **BMIG Annual Field Meeting and AGM**
Venue: St. Deiniol's Library, Hawarden, Flintshire
I: pha@ceh.ac.uk

10 **BENHS Workshop: Identifying nocturnal Ichneumonoidea – Gavin Broad, Mark Shaw and Mike Fitton**
Venue: Dinton Pastures, Reading
I: www.benhs.org.uk

11 **BENHS Open Day**
Venue: Dinton Pastures, Reading
I: www.benhs.org.uk

17 **BENHS Meeting with the University Museum of Zoology, Cambridge**
I: www.benhs.org.uk

21 **Edinburgh Entomological Club**
The Great yellow bumblebee (*Bombus distinguendus*) – Bob Dawson
Venue: Crew Building, King's Building, University of Edinburgh
I: www.edinentclub.org.uk

24 **BENHS Workshop: Weevil identification workshop – Mike Morris**
Venue: Dinton Pastures, Reading
I: www.benhs.org.uk

25 **BENHS Open Day**
Venue: Dinton Pastures, Reading
I: www.benhs.org.uk

May

Dipterists Forum Spring Field Meeting
Venue: Windsor Forest and Great Park.
I: www.dipteristsforum.org.uk
I: Roger Morris. 7 Vine Street, Stamford, Lincolnshire PE9 1QE. Email: roger.morris@dsl.pipex.com

9 **BENHS Open Day**
Venue: Dinton Pastures, Reading
I: www.benhs.org.uk

10 **Edinburgh Entomological Club**
Annual General Meeting
Venue: Crew Building, King's Building, University of Edinburgh
I: www.edinentclub.org.uk

June

4-8 **14th International Sawfly Workshop**
Venue: Kindrogan Field Studies Centre, Pitlochry.
I: Andrew Liston - Email: andrew.liston@senckenberg.de
Address: Senckenberg Deutsches Entomologisches Institut, Eberswalder Str. 90, 15374 Müncheberg, Germany. Tel: ++49 (0)33432 736983734
Guy Knight - Email: guy.knight@liverpoolmuseums.org.uk
Address: World Museum Liverpool, Zoology Department, William Brown Street, Liverpool, L3 8EN. Tel.: 0044 (0)151 478 4369

12-19 **Dipterists Forum Summer Field Meeting**
Venue: Stackpole, Pembrokeshire.
I: Roger Morris. 7 Vine Street, Stamford, Lincolnshire PE9 1QE. Email: roger.morris@dsl.pipex.com

13 **BENHS Open Day**
Venue: Dinton Pastures, Reading
I: www.benhs.org.uk

25-27 **Scottish Entomomologists' Gathering**
Venue: Claonaig, Kintyre
I: Tom Prescott (tprescott@butterflyconservation.org) or Craig Macadam (craig.macadam@buglife.org.uk)

28 – 2 **13th International Auchenorrhyncha Congress and 7th International Workshop on Leafhoppers and Planthoppers of Economic Significance**
Venue: Vaison-la-Romaine, France
I: www.mnhn.fr/colloque/iac13/

July

11 **BENHS Open Day**
Venue: Dinton Pastures, Reading
I: www.benhs.org.uk

22-25 **Dipterists Forum Short Summer Field Meeting**
Venue: Somerset Levels and Mendips - based at Wells Cathedral School.
I: Roger Morris. 7 Vine Street, Stamford, Lincolnshire PE9 1QE. Email: roger.morris@dsl.pipex.com

August

20-23 **Identification of Hoverflies**
Venue: Preston Montford Field Studies Centre, Shrewsbury
I: http://www.field-studies-council.org/professional/2010/courseinfo.aspx?id=401

September

Sept. 7-9 **Soil Entomology and ecology.**
A joint meeting of the RES SW region and the Soil Ecology Society
Venue: University of Plymouth
Details from Peter Smithers email: psmithers@plymouth.ac.uk

19-24 **Aphidophaga: the 11th meeting on the Ecology of Aphidophagous Insects.**
Venue: Perugia, Italy
I: Email jpmi@ksu.edu with "Aphidophaga" in the subject line if you would like to be added to the electronic mailing list for further details.

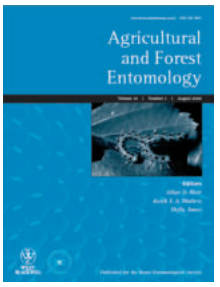
October

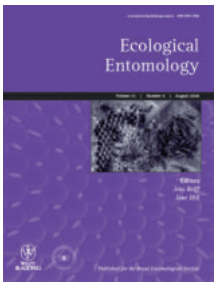
25 **Northern Coleopterists' Meeting**
Venue: The Manchester Museum, Oxford Road, Manchester
Time: 10am to 4:30pm
This meeting is open to anybody interested in beetles and it is aimed at both novice and more experienced Coleopterists, in order to meet and discuss ideas and records. There will be a series of presentations (e.g., by Darren Mann on UK Scarabaeoidea, by Mike Denton on his local patch, Blackmoorfoot Reservoir, etc.), as well as a chance to view and explore the Manchester Museum's extensive collections of beetles. Everyone is welcome!
I: Tom Hubbal (vc63dragonfly@blueyonder.co.uk or 01535 678334) or Dmitri Logunov (dmitri.v.logunov@manchester.ac.uk or 0161 275 2666).

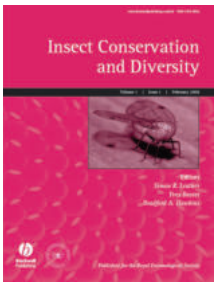
November

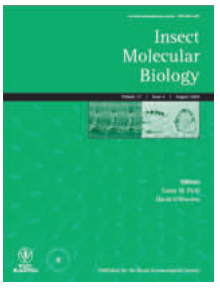
Nov. 19 **Applied Entomology.**
A joint meeting of the RES and the Peninsular Invertebrate Forum
Venue: University of Plymouth at 7.00pm
Details from Peter Smithers email: psmithers@plymouth.ac.uk

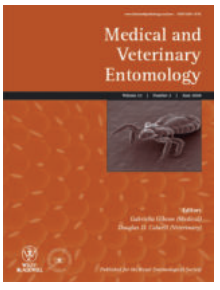
27 **Dipterists' Forum Annual Conference and AGM**
Venue: To be confirmed
I: www.dipteristsforum.org.uk

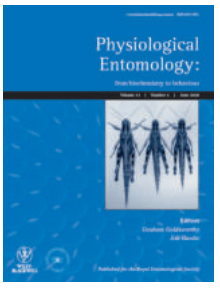


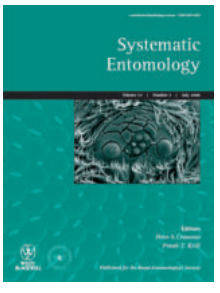












Publications of the Royal Entomological Society

Agricultural and Forest Entomology provides a multi-disciplinary and international forum in which researchers can present their work on all aspects of agricultural and forest entomology to other researchers, policy makers and professionals.
2010 print or online prices: UK £557, Euroland €733, USA $970, Rest of World $1,200
2010 print and online prices: UK £613, Euroland €777, USA $1,132, Rest of World $1,320

Ecological Entomology publishes top-quality original research on the ecology of terrestrial and aquatic insects and related invertebrate taxa. Our aim is to publish papers that will be of considerable interest to the wide community of ecologists.
2010 print or online prices: (with Insect Conservation and Diversity) UK £918, Euroland € 1,166, USA $1,698, Rest of World $1,980
2010 print and online prices: UK £1,011, Euroland € 1,283, USA $1,867, Rest of World $2,178

Insect Conservation and Diversity explicitly associates the two concepts of insect diversity and insect conservation for the benefit of invertebrate conservation. The journal places an emphasis on wild arthropods and specific relations between arthropod conservation and diversity.
2010 print or online prices: UK £557, Euroland €708, USA $1,029, Rest of World $1,200
2010 print and online prices: UK £613, Euroland €777, USA $1,132, Rest of World $1,320

Insect Molecular Biology has been dedicated to providing researchers with the opportunity to publish high quality original research on topics broadly related to insect molecular biology since 1992. *IMB* is particularly interested in publishing research in insect genomics/genes and proteomics/proteins.
2010 print or online prices: UK £928, Euroland € 1,178, USA $1,715, Rest of World $2,000
2010 print and online prices: UK £1,020, Euroland € 1,296, USA $1,885, Rest of World $2,200

Medical and Veterinary Entomology is the leading periodical in its field. The Journal covers all aspects of the biology and control of insects, ticks, mites and other artropods of medical and veterinary importance.
2010 print or online prices: UK £534, Euroland €680, USA $988, Rest of World $1,153
2010 print and online prices: UK £589, Euroland €748, USA $1,087, Rest of World $1,268

Physiological Entomology is designed primarily to serve the interests of experimentalists who work on the behaviour of insects and other arthropods. It thus has a bias towards physiological and experimental approaches, but retains the Royal Entomological Society's traditional interest in the general physiology of arthropods.
2010 print or online prices: UK £492, Euroland €626, USA $910, Rest of World $1,062
2010 print and online prices: UK £542, Euroland €688, USA $1,001, Rest of World $1,168

Systematic Entomology encourages the submission of taxonomic papers that contain information of interest to a wider audience, e.g. papers bearing on the theoretical, genetic, agricultural, medical and biodiversity issues. Emphasis is also placed on the selection of comprehensive, revisionary or integrated systematics studies of broader biological or zoogeographical relevance.
2010 print or online prices: UK £887, Euroland €1,127, USA $1,640, Rest of World $1,914
2010 print and online prices: UK £977, Euroland €1,240, USA $1,804, Rest of World $2,105

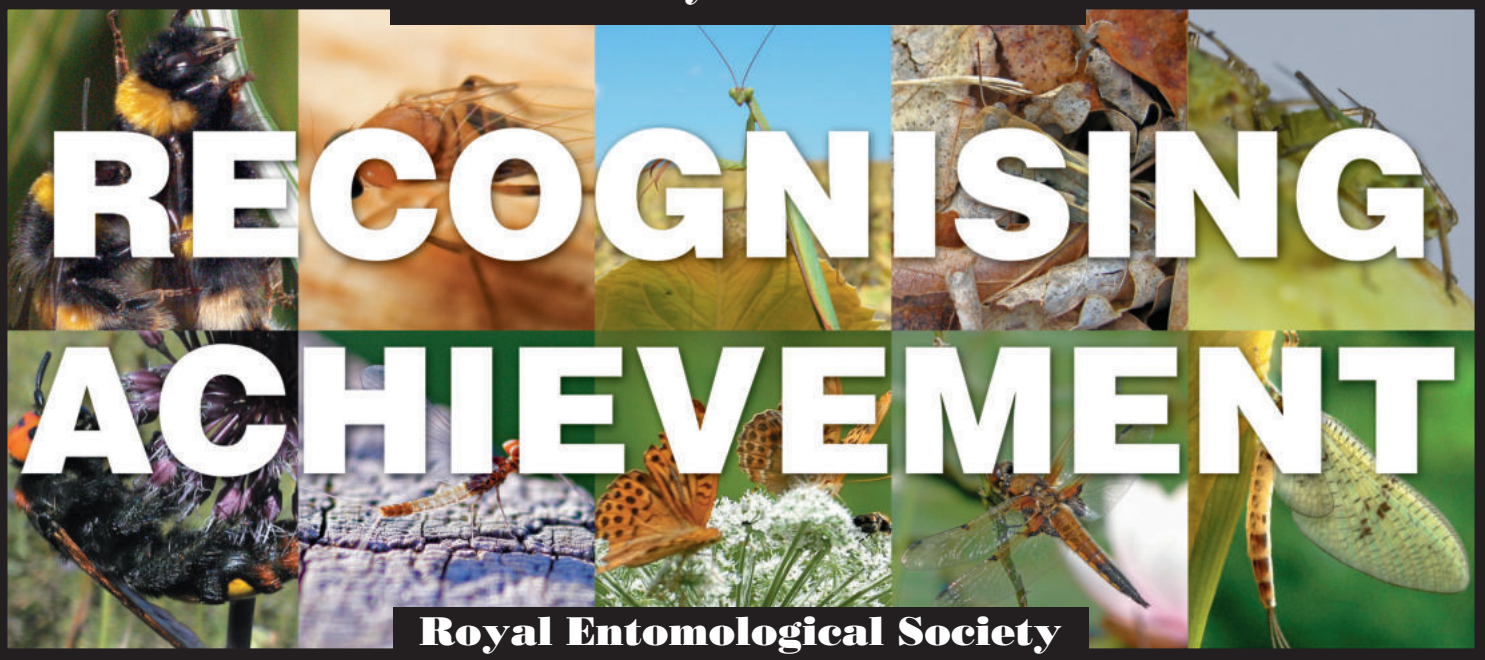
Subscriptions and correspondence concerning back number, off-prints and advertising for the seven principal journals of the Society should be sent to the publishers, Wiley-Blackwell Publishing Ltd, 9600 Garsington Road, Oxford OX4 2DQ. (customerservices@blackwellpublishing.com)

Antenna (Bulletin of the Society). Free to Members/Fellows. Published quarterly at an annual subscription rate of £40 (Europe), £42 (outside Europe), $70 (United States). This journal contains entomological news, comments, reports, reviews and notice of forthcoming meetings and other events. While emphasising the Society's affairs, *Antenna* aims at providing entomologists in general with a forum for their views and news of what is going on in entomology. Subscriptions and advertising enquiries should be sent to the Business Manager at The Mansion House, Chiswell Green Lane, Chiswell Green, St. Albans, Hertfordshire AL2 3NS and any other enquiries to the Editor.

Handbooks for the Identification of British Insects. This series now covers many families of various Orders. Each Handbook includes illustrated keys, together with concise morphological, bionomic and distributional information. A full list of Handbooks with order form is available. See website www.royensoc.co.uk

Symposia. Nos. 1-3 were published by the Society; Nos. 4-10 by Blackwell Scientific Publications: Nos. 11-17 by Academic Press and No. 18 by Chapman & Hall, No. 19 by Kluwer, No. 20, 21, 22 and 23 by CABI.

www.royensoc.co.uk



RECOGNISING ACHIEVEMENT

Royal Entomological Society – Society Awards –

THE ROYAL ENTOMOLOGICAL SOCIETY STUDENT AWARDS

Award Criteria: Any article about an Entomological topic that would be of interest to the general public. The article to be easy to read, in a popular style and no longer than 800 words.

Prize: Winner £300, runner up £200, third place £100, all three articles published in *Antenna*.

RES JOURNAL AWARDS SCHEME

Award Criteria: The best paper published in each Society Journal over a two year period. Each of the Society Journals participate biennially.

Prize: £500 and Certificate for each participating Journal.

THE LJ GOODMAN AWARD FOR INSECT BIOLOGY

Award Criteria: For advancing the education of the public in the knowledge, understanding and appreciation of all aspects of Insect Physiology, thereby promoting the control and conservation of insect species.

Prize: £1,000, also additional awards may be given.

THE MARSH AWARD FOR INSECT CONSERVATION

Award Criteria: For an outstanding contribution to Insect Conservation; on the basis of 'Lifetime Achievement', or 'Considerable and Exemplary Contribution' to a significant project or undertakings. In exceptional circumstances two prizes may be awarded to reflect each criterion.

Prize: £1000 and Certificate.

POSTGRADUATE AWARD: THE ALFRED RUSSEL WALLACE AWARD

Award Criteria: For post-graduates who have been awarded a PhD, whose work is considered by their Head of Department to be outstanding. The research involved should be a major contribution to the Science of Entomology.

Prize: £750 plus Certificate, plus one year's free Membership. The winner will also be invited to present their work at a Society Meeting.

JO WESTWOOD MEDAL – AWARD FOR INSECT TAXONOMY

Award Criteria: The best comprehensive taxonomic work on a group of Insects, or, related Arthropods (including terrestrial and freshwater Hexapods, Myriapods, Arachnids and their relatives). Typically, this will be a taxonomic revision or monograph.

Prize: A specially struck silver gilt medal inscribed with the winners name. Also costs incurred in attending the International Congress of Entomology, European Congress of Entomology, or other major meeting (specified by the Adjudicators) to present his/her work.

THE WIGGLESWORTH MEMORIAL LECTURE AND AWARD

Award criteria: The outstanding services to the science of Entomology. The award will be made to a researcher who has contributed outstanding work to the science and who best reflects Sir Vincent Wigglesworth's standards of personal involvement in every aspect of his/her research.

Prize: A specially struck gilt medal inscribed with the winners name. Also the costs of attending the International Congress of Entomology to give the Wigglesworth Lecture.

BOOK PURCHASE SCHEME FOR FELLOWS AND MEMBERS IN DEVELOPING COUNTRIES

Award Criteria: To provide assistance in purchasing specialist Taxonomic books, that will assist in the identification of Insect groups being studied in developing countries and their regions. Applicants will be required to demonstrate need and specify particular texts.

Prize: Any one applicant may be awarded up to £200 in a three year period. The Society will purchase the texts awarded and send them to the applicant. The applicants may, themselves, provide any additional funds in excess of the amount awarded.

OUTREACH AND CONFERENCE PARTICIPATION FUNDS

Award Criteria: ORF: Grants to support activities which further the Society's aims. This may range from, help to purchase equipment, to help in funding expeditions/meetings. CPF: Grants to assist applicants who are participating in a meeting or conference in some way, e.g. presenting a paper/poster.

Prize: ORF: Monetary grant. CPF: Monetary grant.

For more details on these Society Awards please see www.royensoc.co.uk

Royal Entomological Society
www.royensoc.co.uk

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