Bulletin of the Royal Entomological Society Volume 40 (1) 2016

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RES, LOOKING BACK

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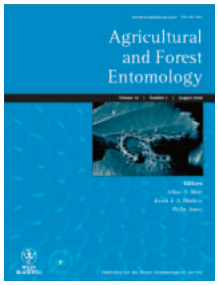

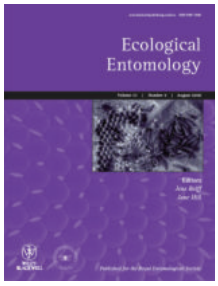

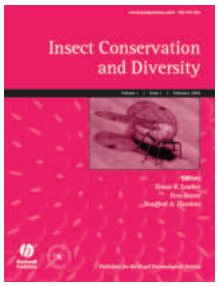

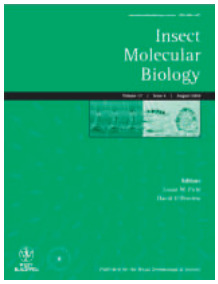

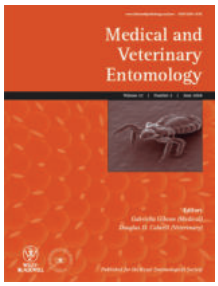

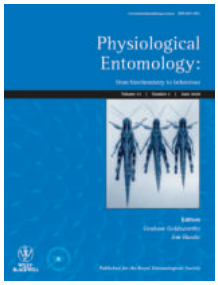

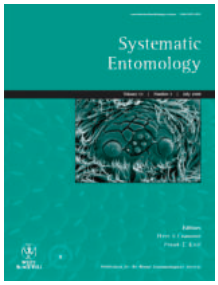

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Agricultural and Forest Entomology provides a multi-disciplinary and international forum in which researchers can present their work on all aspects of agricultural and forest entomology to other researchers, policy makers and professionals. UK RES Members: £78
2016 print or online prices: UK £785, Euroland €999, USA $1,451, Rest of World $1,690
2016 print and online prices: UK £942, Euroland €1,199, USA $1,742, Rest of World $2,028

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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. UK RES Members: £125
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Antenna (Bulletin of the Society). Free to Members/Fellows. Published quarterly at an annual subscription rate of £50 (Europe), £55 (outside Europe), $90 (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 Editors.

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.

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COVER PICTURE

Delegates at Ento 15 tuck into the insect hors d'oeuvres provided by Andy Holcroft of Grub Kitchen. Photograph by Peter Smithers

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Bulletin of the Royal Entomological Society

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The Royal Entomological Society is a scientific society founded in 1833 and incorporated by Royal Charter in 1885 for the improvement and diffusion of entomological science exclusively.

Library: Mrs Valerie McAtear, Librarian (lib@royensoc.co.uk)
The Library is open to Fellows and Members from 9.00am to 4.30pm Monday to Thursday and 9.00am to 3.30pm on Friday. The Library is not open on Saturdays and Sundays or public holidays, and such other times as may be notified in *Antenna.*

Subscription Rates 2016
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EDITORIAL

Welcome to the first *Antenna* of 2016, we hope you have an excellent year and enjoy all of the offerings in this and the following editions. While the new year is often a moment for optimism, a time for positive reflections and plans for the future, 2016 began with a sense of sadness as we learnt of the death of David Bowie. For entomologists of a certain age, Ziggy Stardust the Spider from Mars (Bowie's stage persona) and the subsequent metamorphosis he went through played and important part in our youth; the only rock star with an invertebrate alter ego. His passing means that he will now be confined to the digital realm, a much loved memory which will inspire future generations but stored as a collection of zeros and ones. This thought caused me to reflect on the book reviews that by chance appear in this issue focusing on the recording of our faunas. This activity is a vital one especially at the present time when the threats to our biodiversity are legion. We need to know what we have before we can devise a way to protect it, so biological recording is a vital 21st century pursuit for biologists, but especially for entomologists who have so much more to do. If we don't record and protect our faunas they will go the same way as David Bowie and become digital entities, remembered fondly but existing only in the files we compiled on them.

It is yet another coincidence that the first edition of the year features articles on insects as food and feed, but it is also an indication of the continuing rapid growth of interest in this field. We have a report on the Insects as Food & Feed Workshop that was held in Oxford in early December and an article from ADAS outing their perspective on insects as animal feed.

We also have an account of a project looking at moth diversity in the Himalayas and a fascinating history of the society in the mid to late 20th century from Helmut van Emden.

We feature the first in a series of biographies from Honorary Fellows, and this one is from the last professor of Entomology in the UK, Simon Leather. More are to follow.

As the Verrall supper will have come and gone before the next *Antenna*, can we remind you to apply for your tickets in plenty of time and we are also reminded of the bursaries available to students who may wish to attend.

The book reviews have a biological recording focus with the Linnean Society offering a special edition of their Biological Journal, which evaluates the recent developments in this area. Steven Falk's new field guide to British Bees is sure to stimulate a fresh pulse of apian recording across the UK. Backyard Bees will do a similar thing in the USA, while the Greenland Entomofauna is set to become the definitive identification manual for any one working on Arctic invertebrate faunas. The only outsider is Smith's African Queens, which draws together his life work on this incredibly complex group of butterflies.

We also have a report from Dublin on Ento' 15, the Aphid SIG, recent news from Council and the diary.

The *Antenna* team wish all our readers a prosperous and interesting year.

Peter Smithers

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

CORRESPONDENCE

Lives remembered – Malcolm Cherrett

Dr. William Block's obituary in *Antenna* 39 (2) p 107-8 reminds me of the time I spent at Bangor as an undergraduate and post grad too. Malcolm's charismatic style of lecturing and references (which were well worth tracking down and reading in the library) given on the Applied Zoology blackboard are still in my memory. A far cry from today's PowerPoint and online access encounters with your tutors, kids!

What we got was a humorous, deeply caring and knowledgeable man who saw far ahead of his time. Part of the required course reading was authored by him – "At Home in the World" published in 1968 by Faber and Faber. I gather that this was a re-vamped version of a submission he made for his London University PGCE qualification, for which he earned a distinction. It deserves a wider audience. In it, he described how the demands the human species made on the planet were exceeding its carrying capacity. This was shortly after the publication of Silent Spring (1963) that landmark work, describing the perils posed by persistent pesticide pollution. He politely called it a "well written, rather propagandist account".

Malcolm's book carried further, polite warnings about not only pollution, but also industrial agriculture and the multifarious, unsustainable demands we make on the planet's resources. This has all "hit the press" comparatively lately, and scientists studying, for instance, the effects carbon dioxide increase on the biosphere (a phenomenon not known or at least not mentioned in the above books) have people like Malcolm to thank. Environmental awareness and finding limits to growth has never been more of a "hot topic", if that isn't using an ironic term.

In his book, the final paragraph reads "Undoubtedly the problems of human ecology, the problems of man 'at home in the world' are the most serious biological and social problems of our time". Malcolm dared to discuss the idea that there must be a trade-off between the quantity and quality of life. He chose to use the term 'balanced' as a mature ecological arrangement, rather than 'sustainable' that caught on later.

Is this an epitaph, or a cue for scientists to say more to the public or even become politicians? Or are those who lack the imagination to see that the "business as usual", continuous economic growth "plan" we are pursuing, will lead to a very sticky end. Can it be allowed to carry on? Scientists still have a very inferior place in society, it seems.

Dr. Daniel Hackett, London

Bangor, Applied Zoology Dept. undergrad 1972-75 and PhD 1980

Verrall Supper Bursaries for 2016

From the "Kim Scholarship Fund" and the "van Emden Bursary Fund", the Entomological Club will award up to three bursaries to registered students and other early-career entomologists in connection with the Verrall Supper on Wednesday 2nd March 2016. The aim of the scheme is to introduce to the Verrall Association promising young entomologists who are likely thereafter to wish to continue their membership themselves. A bursary funds a one year membership of the Association and the Supper, as well as up to £40 of any travelling expenses incurred. Perhaps more importantly, the award recognises merit, and can be included on future CVs.

Proposals for bursaries must come from academic supervisors or other relevant managers with some standing in entomology, and proposals should be submitted to entclub@yahoo.co.uk by 10th February 2016.

There is no prescribed format for proposals. One side of A4 may be enough, and the following list gives guidance as to what might be included:

> *Name, date of birth, postal and e-mail address of person proposed.*
>
> *Subject of research study or other entomological work, stage reached, source of funding and achievements so far, evaluation of future promise.*
>
> *Any evidence of interest in entomology at an earlier age and any previous practical involvement in the subject.*

Helmut van Emden
Hon. Treasurer,
Entomological Club (www.entomologicalclub.org)

Nanda Devi Biosphere Reserve.

Mothing in the Himalaya: No mountain too high

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The Himalaya never cease to enthrall us with their beauty, vastness and endemicity. The Western Himalaya covers the Kumaon-Garhwal, North-West Kashmir and North Pakistan. Biogeographically it lies in the transition zone between the Palearctic and Indo-Malayan realms, so species from both the zones overlap. The geological, climatic and altitudinal variations as well as physical structural complexity contribute to the biological diversity of the region. These mountains range from 500m asl (above sea level) to more than 8000m asl giving a range of ecosystems within only a couple of hundred kilometers.

Large parts of this unique ecosystem are under threat due to human impacts. The habitats for many species have a patchy distribution due to human encroachment. The increasing population in the region has led to extensive deforestation and the clearing of grasslands for cultivation. There is a large-scale conversion of lands for agriculture and settlements.

Atlas moth

Erebus sp. (Photo Abesh Sanyal)

Western Himalayan Landscape, Garhwal.

We studied the diversity patterns of moths in Nanda Devi Biosphere Reserve, a Western Himalayan protected area and a World Heritage Site. The area has the typical attributes of the larger Western Himalayan range and promised to provide us with stunning insights into the existing patterns of biodiversity. Our research on the altitudinal distribution of moths took us to many villages within the area of our study. The local tribe is the *Bhotiya* who are mainly agro-pastoralists. There are about 19 villages within the protected area. We stayed with them, spoke with them, and learnt their ways and practically lived their lives. Their hospitality and simplicity was beyond our imagination.

Moths as bio-indicators:

Moths have always lagged behind butterflies, being nocturnal, less attractive and thus less studied. We have very little idea as to how many species are endangered or even how many exist. Moths are important ecologically as pollinators, herbivores, and prey for birds, but most recently as environmental indicators. Many studies have established this group as potent bio-indicators (Summerville et al. 2003, Kitching et al. 2000).

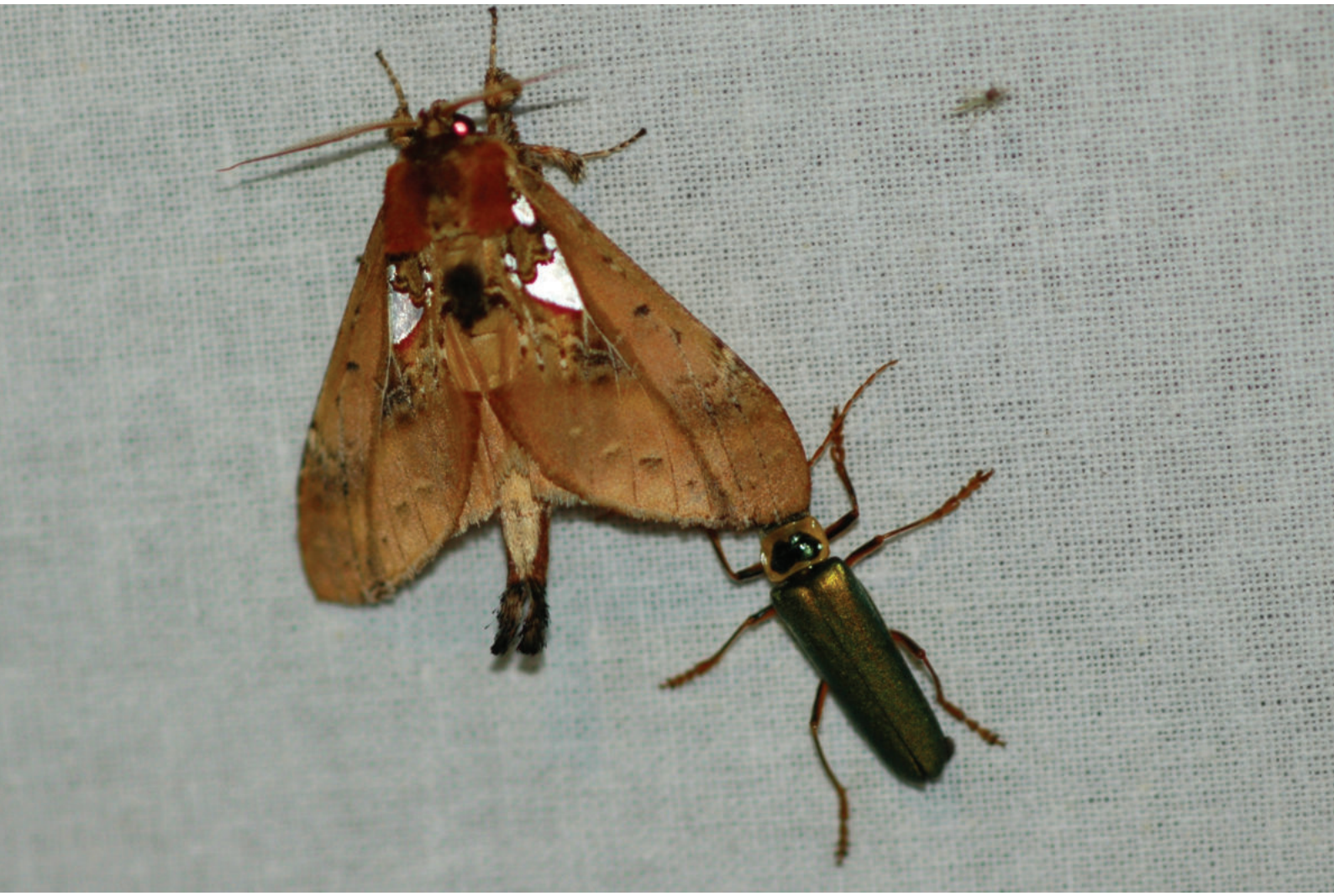
Reading about these less-explored taxa, we were curious to know how they would respond to rapid changes in environmental gradients and human impacts. The Western Himalaya landscape with its uniqueness gave us an array of conditions to study these patterns in moth diversity. We particularly chose one family of moths, the Geometridae family. This family along with Erebidae is the most speciose among the moths. Geometrid moths have shown interesting patterns in other high altitude areas and are more abundant in high altitudes. The study area has four broad divisions of forest types *viz*. Temperate forests (2,000–2,800m), Subalpine forests (2,800–3,500m), Alpine scrublands (3800–4500m), Alpine meadows and moraines (>4,500m) (Champion and Seth 1968).

The study area attracts many tourists as it is home to the highest gurudwara in India, the Hemkund Sahib (4,500m), Valley of Flowers National Park, and the Badrinath shrine. Thousands of pilgrims and general tourists come to Joshimath (the most populated town within the protected area). The area surrounding Joshimath is highly modified by human activities, generated by the economic benefits of tourism, but at higher altitudes other villages are just hamlets nested within forests. This generates a dramatic gradient of anthropogenic pressures within the region, which gives us an opportunity to study and understand the response of moths as a group sensitive to environmental and anthropomorphic change.

Our research:

Studying moths alone at altitude was a challenge as working at night in the mountains is not as easy or adventurous as it might seem. As we stayed in the villages with the local people, they failed to understand why we would want to venture out at night in the forest to study some insect! They would stop us; warn us of evil spirits in the forest as well as the Himalayan Black Bear (*Ursus thibetanus*) which might attack. But nothing stopped us from completing the work and finally our determination impressed them, and few of the villagers even volunteered to come along with us at night to help us out!

Eumelea sp. (Photo Abesh Sanyal)



Ginshachia sp. (Photo Abesh Sanyal)

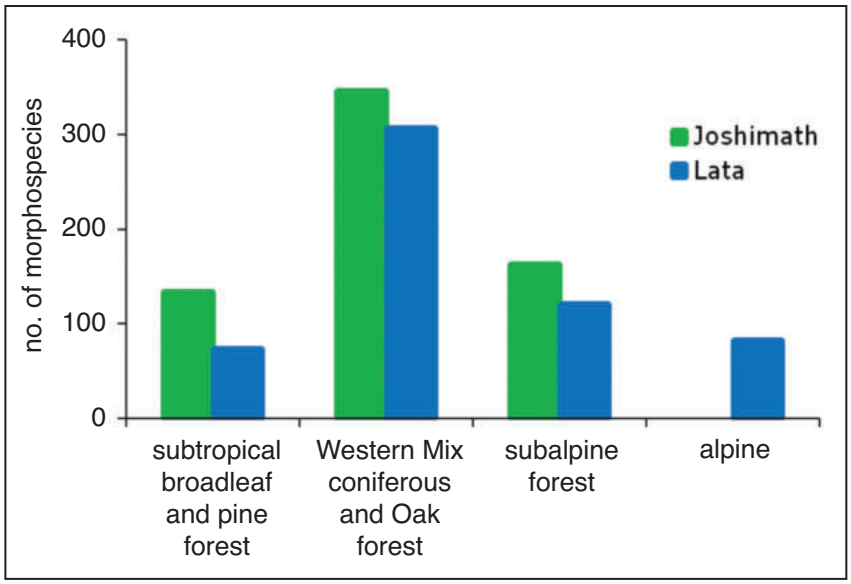


Fig. 1. The western mix coniferous forest showed highest species richness.

We studied two gradients of human disturbance and forest types (Joshimath and Lata) to investigate the relationship between the moths, the environment and the human activity. We sampled moths in the forests at dusk by setting light traps which were operated for 3-4 hours; the moths were collected manually and documented with photographs. We recorded the microhabitat and other variables which might influence the presence or absence of the moths. We sampled across the available forest types at different altitudes in order to determine any patterns in diversity and species composition.

Moths belonging to the five most diverse families (Noctuidae, Geometridae, Arctiidae, Crambidae, Lymantriidae) were identified into morphospecies. The family Geometridae was the most abundant at all the sites with over 700 individuals recorded. The subfamily Ennominae was most abundant at the lower altitudes while the higher altitudes were dominated by the species belonging to the subfamily Larentiinae. The Western mixed coniferous forest (sub forest type under temperate forests) showed the maximum species richness (Fig. 1). The number of morphospecies and individuals at each of the trap sites was negatively correlated with elevation and temperature. The species diversity (alpha diversity) showed a differential response to vegetation structure on the two mountain slopes with a mid-elevation peak (2,300-3,000m) in the more disturbed gradient in Joshimath. Interestingly, the forest types had a greater effect on diversity on the more disturbed mountain slopes.

Our results have shown that the Geometridae are abundant in this area. This group should therefore be well-suited for longer-term studies with a focus on assessing the impacts of environmental change on Himalayan species.

Our results indicate that resource diversity plays an important role in maintaining species diversity. These results predict negative impacts for any ongoing extraction of forest resources on moth diversity and the ecosystem services they deliver. It also highlights the role that moths can play in monitoring climatic and anthropomorphic changes in forest structure.

The study on moths in high altitude landscapes can provide a much-needed insight into their endemic diversity. Monitoring insect populations is often a difficult task for the managers of protected areas. We hope this study will make these managers more aware of the importance of moth species, and also hope it will play a role in shaping future management programmes for the conservation of habitats of the rare species by controlled grazing and limiting resource extraction by local people.

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Website

http://www.eoearth.org/view/article/150643/

The Royal Entomological Society of London – ripping yarns from yesteryear

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The author, not long after joining the Society

When I joined it in 1956, The Royal Entomological Society was very different from what it is today. To begin with, it was the Royal Entomological Society of London, hence the title of this article. This title is still the legal name, though it is now always used in the 'non-location specific' abbreviated form. Perhaps a more substantial difference was that Special Interest Groups (SIGs) had not even been dreamed of, and everything centred around a monthly Fellows' Meeting on the first Wednesday of the month, beginning at 5.30 with tea and tempting cakes in the Library of the Society's premises at 41 Queen's Gate in South Kensington. The Society had purchased the building in 1921 for about £8000, and in the large basement had created a panelled room that could seat about 100 people.

The monthly meetings were very well-attended, often with standing room only. There were then plenty of entomologists working in the immediate vicinity who regarded it as routine to delay their journey home at the end of that first Wednesday in order to attend the meeting. The entomologists employed by the then British Museum (Natural History) were supplemented by colleagues from the Commonwealth Institute of Entomology (later to become part of CABInternational) working both in the Museum and in the Institute's premises in Queen's Gate at number 56. The

Figure 1 and title page: The meeting room with the rows of high benches. By 1955, these had been moved through 90° to face the dais (with clock and the officers behind). On the title page figure, note the flaps on the side wall which could be raised to display exhibits.

Department of Zoology of Imperial College close by also had entomologists who regularly attended the monthly meetings. In those days the Zoology and Hope Departments of Oxford University used to hire a small coach to Queen's Gate and the entomologists at Silwood Park near Ascot would arrive in their own minibus. The minibus was usually driven by Dr Walter Jepson, who managed this while turning round to talk to postgraduate students in seats behind him rather than keeping his eyes on the road.

The dress code at Society meetings was rigidly 'business attire' – no male Fellow would ever have dreamed of turning up without a jacket and tie. On the occasion that a Californian ecologist gave his talk wearing beads and a T-shirt with a palm tree design, the 'tut-tutting' of Fellows probably carried to Gloucester Road Tube Station.

Young entomologists could be assured that, at the monthly meeting, they could rub shoulders with the entomological giants of the day. Exactly at 5.55 p.m., the Librarian would bang the large gong in the Library on the first floor to signal that the meeting was about to start in the lecture room, and the assembled audience would descend the two flights of stairs to the basement. The walls of the staircase and entrance hall were hung with photographs of the Presidents of the Society since its foundation in 1833, with the portrait of the current holder of the office in pride of place within the entrance hall over a table with the book where all signed in on arrival. All the photographs were of men; fifty years ago it would still be a long time before the first woman President (Miriam Rothschild in 1993) would be elected.

The lecture room (now converted to a swimming pool since the house was sold and became a family home) was fully panelled in light oak with a carved dais at one end where the President, Hon. Secretary, Hon. Treasurer, Hon. Editorial Officer and the Registrar sat facing the audience (Figure 1). The Registrar 50 years ago was a Miss Edith Evans, a diminutive figure but with a will of steel. On either side of a central corridor were long benches covered with black leather and with backs so high that shorter entomologists were invisible from behind. One of these, who always sat at the corridor end of the same bench was Baron Charles De Wurms, a microlepidopterist from the Museum. New Fellows soon learnt not to sit next to the Baron because, however riveting the lecture, he would soon fall into a sonorous sleep, obvious to everybody including the speaker. Did one ignore him? Did one wake him up? It was better to sit elsewhere and avoid the decision altogether. No one really knew if 'Baron' was a genuine Hungarian title or an affectation – he was certainly eccentric enough for the latter. His typewriter (a strange mechanical device we once used for writing letters) had lost the lever that reproduced the letter 'A' in either the upper or lower case. The Baron never had it repaired, even though just his address at the top of the page had nine

'A's. He was a bachelor, and a previous Registrar told me that bizarrely the Baron had his guest bedroom rewired so that the light switch was on the other side of the wall in the Baron's own bedroom. When a guest was fumbling about for the light switch before climbing into bed, the Baron would appear and – when the guest admitted the light was bothering him – would calmly pull a revolver from his pocket and shoot out the bulb.

Along the back of the lecture room, and along the right hand wall, were lengths of slightly sloping shelving at a little over waist height. These shelves held any entomological exhibits (and there were nearly always some) that Fellows had brought to the monthly meeting.

At 6 p.m. (or as soon thereafter as the arrival of the audience from upstairs allowed), the President would stand up and bang his gavel on his desk to signify the start of the meeting. Fellows would have received a printed card listing the meetings programme for the whole year; in addition they received monthly (by post) the details of the next meeting, which also included the Minutes of the previous one. Fellows would receive a second set of all these reminders once a year, bound as the *Proceedings of the Royal Entomological Society of London, Series C.*

The monthly meeting would begin with the President calling for a proposer and seconder to approve the Minutes of the last meeting, after which Fellows would be formally admitted to the Society. This procedure would normally occur when a new Fellow attended for the first time after their election. Overseas Fellows would have to wait for their first attendance at a meeting to be admitted, which might be after many years of Fellowship. Admittance involved signing the Obligations Book to signify acceptance of the obligations of Fellowship and then the President would admit them with the formula "..... , in the name and by the authority of the Royal Entomological Society of London, I hereby admit you a Fellow thereof". Many years later, when the late Professor Sir Richard Southwood was President, he forgot the 'Entomological Society' bit, and regularly admitted new Fellows to the Royal Society of London instead.

The byelaws of the Society required that it was the Fellowship that elected new Fellows. Applications for Fellowship would be read out at a meeting, and the election would follow two meetings later to give Fellows the opportunity to raise any objections they had; and there were indeed sometimes objections. Not long before I joined, this election took the form of a box being passed around, and those present would drop either a white (for 'yes') or black (for 'no') ball into it. Not long before I was elected, a Mr Eric Classey was 'blackballed' when he applied for Fellowship. A valuable book had disappeared from the Natural History Museum library, and most Fellows had heard the rumour that Eric Classey, who had metamorphosed his passion for entomology into an antiquarian entomological book business, was the culprit. It was quite a few years later that Eric was elected a Fellow, following the return of the book to the Museum by a rather embarrassed distinguished Professor from the West Country.

After the admissions, the President would move to the next item of the agenda, 'Library Matters'. This invariably referred to the list of books and reprints presented to the Library as circulated to Fellows as part of the monthly reminder. And so at each meeting, Fellows were asked yet again by a show of hands to approve that 'The thanks of the Society be conveyed to the donors'. The President would then move on to 'Communications'. This was an opportunity for Fellows who had given advance notice to address the meeting. Such communications might be to introduce an exhibit which they had brought, a request for specimens or information, an interesting entomological observation or the

Figure 2. Miriam Rothschild's presidential photo! She insisted this image from very much earlier times be displayed.

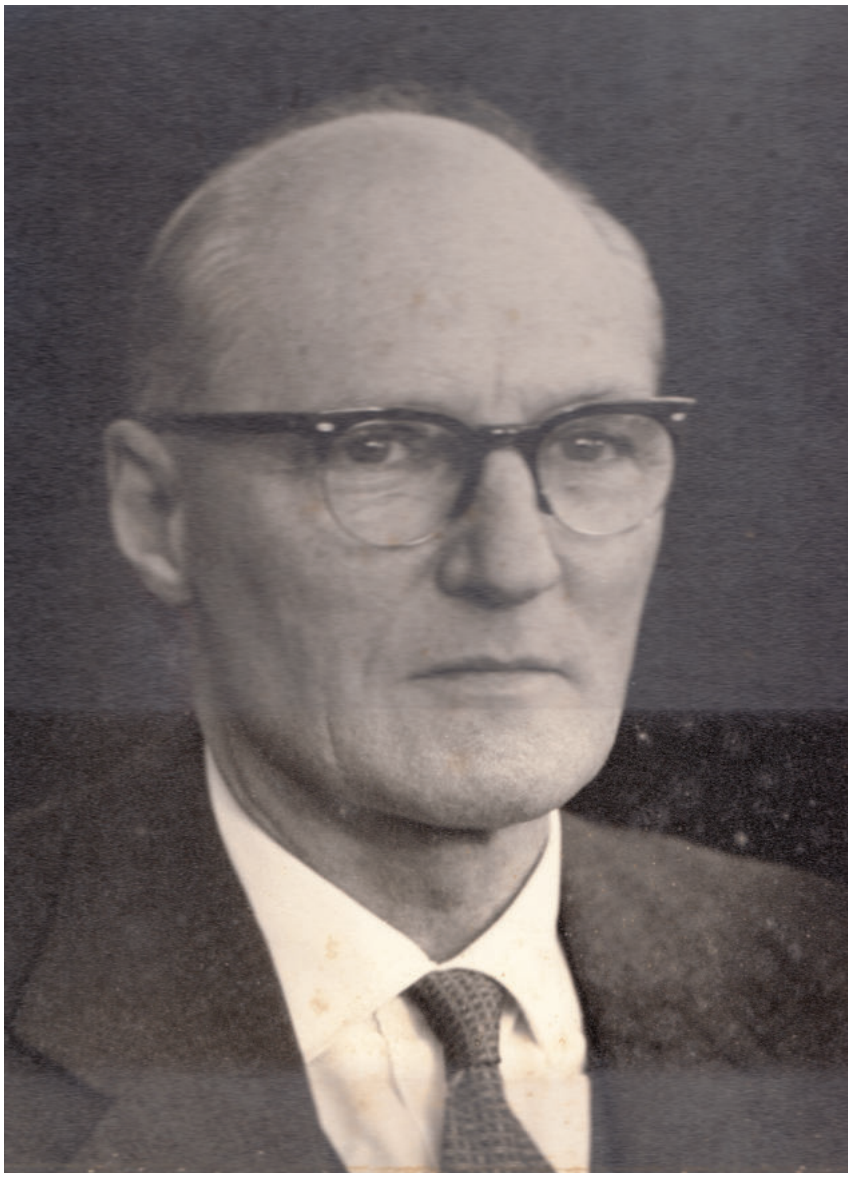

Figure 3. Sir Vincent Wigglesworth.

announcement of a forthcoming conference. On many occasions, Miriam Rothschild (Figure 2) would make a communication concerning her exhibit or an unusual insect or its behaviour she had seen recently. These tended to be mini-lectures, which were known to delay significantly the start of the main speaker. There Miriam would stand in flowing purple Liberty prints and headscarf, often describing entomological phenomena in terms that, if presented less regally, might have been so pornographic as to give offence. These mini-lectures would then of course figure in the Minutes of the meeting and so be published (see earlier) in *Proceedings*, *Series* C. As Miriam had an exhibit most months, these citations then formed quite a sizeable proportion of her list of publications; though in truth the list would have been impressive enough without them!

Then would follow the main speaker, usually using 35mm slides for the illustrations (this was of course long before PowerPoint). The speakers would often load the slides themselves, so that at times unintended mirth was provided either by the slides appearing in reverse order, upside down or reversed left to right – or even any permutation of these three possibilities.

After the talk, the President would open the lecture to discussion. Today discussions tend to be pretty brief, polite and usually a questioner will not pursue the answer received from the speaker. Not so 50 years ago!!! The 'giants' present would frequently indulge in an animated and sometimes even acrimonious exchange of views, which was both impressive and memorable for the younger scientists present, listening open-mouthed in admiration and reverence. One memorable occasion involved a dispute between two 'giants', Professor Howard Hinton from the University of Bristol and Professor O.W. Richards (who never admitted to the names 'Owen Westmacott'). The back and forth cut and thrust was all about the exact moment in development when an adult holometabolous insect became and also when it later ceased to be 'pharate'. Seeing such legendary figures in battle was a major draw of attending the meetings. One could also see and hear Sir Vincent Wigglesworth (Figure 3) of Cambridge University. He had a cutting edge to his comments so sharp that people sought to avoid a thrust in their direction – he was therefore rarely challenged after he had spoken, and accordingly tended to have the last word in any discussion. Other senior entomologists who the younger Fellows had the opportunity to see, if not have the courage to talk to, were Dr Derek Gunn (who never did admit there was anything wrong with DDT), Mr Norman Riley (Keeper of Entomology at the Museum), Dr E. O. Pearson (of cotton entomology fame, and Director of the Commonwealth Institute of Entomology), Dr John S. Kennedy of Cambridge, Sir Boris Uvarov of the Anti-locust Research Centre, Dr Kenneth Mellanby (to become the founding Director at Monk's Wood Research Station) and Dr C. B. Williams of Rothamsted (of diversity index fame). There was also the mildly eccentric Dr A. M. Massee, Head of Entomology at East Malling Research Station. He always had a miniature water-filled vase with a rose or carnation as a buttonhole; his house was called "Acarina" and his daughter was christened "Andrena"!

A particularly famous albeit exceedingly brief 'discussion' followed a lecture by Dr Robert Blackith of Imperial College. Blackith taught statistics in the Department of Pure and Applied Zoology. He had a vast publications list in areas as diverse as statistics, chemistry, entomology, geology, music and English literature, and he picked up languages with

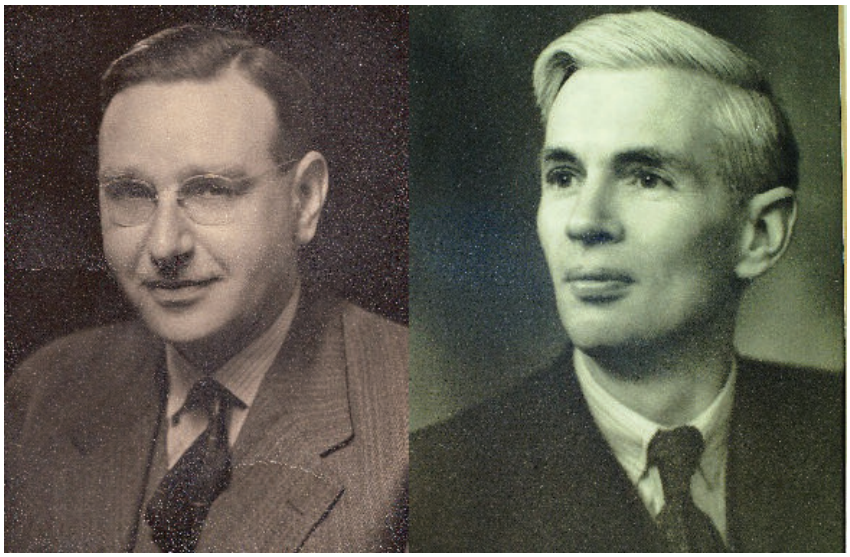

Figure 4. Professors Varley (left) and Richards (right).

extraordinary facility. When invited to give a statistics lecture course in Turkey, he quickly learnt Turkish for the trip. That he then practised it on UK students for his statistics lectures, was not helpful!

Anyway, on one occasion at a Society meeting, Blackith spoke for nearly an hour on the morphometrics of a plant bug on *Artemesia*, with a single slide of coloured knitting needles of various heights inserted in different places on a polystyrene ceiling tile. At the end of the lecture, the President, Professor George Varley of the Hope Department at Oxford, thanked the speaker profusely and said he was sure that the most interesting lecture would have stimulated a lot of questions from the audience. Silence. Varley tried again. Again silence. He tried unsuccessfully a third time. Now the normal expectation is that, in such embarrassing circumstances, the President breaks the ice by asking the first question. However, Varley chose a different solution that he probably later regretted. "Professor Richards", he asked, "as Head of the Department in which this work was carried out, perhaps you would like to make a comment?" Richards stood up slowly, and his words were memorable – "I didn't understand it *either*, Varley" (Figure 4).

At the close of every meeting, in those days around 7.30 p.m., the President would invite the audience to return upstairs to the Library for a glass of sherry "provided by an anonymous donor". The tradition of sherry after the meeting began strangely coincidentally with Miriam Rothschild having vastly over-ordered sherry for a scientific meeting she had held at her home at Ashton Wold, but the sherry inexplicably seemed to continue long after any surplus bottles must have been exhausted. "Anonymous donorship" never seemed to run dry, so nor did we. One really pleasant feature of the teas before, and the sherry after each meeting, was that Fellows really got to know personally the Officers of the day and more importantly perhaps, the staff of the Society.

The building in Queen's Gate had four floors in addition to the basement, and thus more than sufficient space for the Society's needs. Much of the premises was therefore let out to tenants, but it was a legal requirement in our Royal Charter that the Society could only let space to other learned societies, who – almost by definition – could not afford a commercial rent. Until the Registrar was able to persuade the Privy Council to annul this restriction on lettings, the largest area rented out was occupied by the Institute of Biology, with smaller parts of the building occupied by other learned societies such as the Mineralogical and the Archaeological Societies. The Council Room and lecture room were also available for day-hire; the latter was sometimes used for meetings of the Association of Applied Biologists, for example. One regular user of the Council Room was the Astrological Society, and many a smile was raised when the door had a noticed affixed reading "For *unforeseen* reasons, today's meeting of the Astrological Society has been cancelled". Once the then Registrar had succeeded in changing the terms of our Charter and the Institute of Biology had acquired their own premises, we could raise rents dramatically to local commercial levels. Much of the space was then taken by the Army Benevolent Fund, and rents then contributed about one-third of the Society's income.

Fellowship was the only category of membership, and was ridiculously cheap by today's currency. The annual subscription was only £5 a year, for which a Fellow would receive the monthly meetings reminder, the *Proceedings Series* C already referred to and (also free of charge) all the other publications of the Society in parts Figure 5), four times a year. The *Transactions* (in a yellow cover) were usually in the form of single substantial papers. *Proceedings A* (in a grey cover) and *B* (in pink) were collections of perhaps 6-10 shorter papers. Every four years, each Fellow would also receive the *List of Fellows* with their contact details, an extremely useful publication. For about £40, you could become a Life Fellow – i.e. you had fulfilled your subscription commitment for the rest of your life. For obvious reasons, Life Membership was discontinued before long, but many of our long superannuated Fellows (including myself) will regret not having taken up the option while it was still offered!

To maintain a veneer of democracy, the monthly *Proceedings* C posted to Fellows included at the appropriate time a reminder of the deadline for the Registrar to receive nominations for Officers and Council members for the next year. At the AGM, the Fellows then elected Council's nominees in the regular absence of other nominations. In 1963, however, there was a hiccup! Fellows at Rothamsted actually had the nerve to nominate the Head of Entomology there, Dr 'Johnny' Johnson, for the Presidency. Consternation in the Council! Sir Vincent Wigglesworth FRS had already accepted Council's invitation to become the next President. The senior Officers of the Society rushed to Rothamsted and persuaded the staff there to withdraw their bid, with the promise that Dr Johnson would be one

Figure 5. The research journals of the Society in the 1950s.

of Sir Vincent's Vice-Presidents and Council's candidate next time around. The latter, however, never materialised.

In 1981, the 'revolt' came from within Council. The then President, Dr Reg Rainey, was intent on passing his presidential mantle on to a friend in the agrochemical industry, who worked in the tropics and therefore had rarely, if ever, been near 41 Queen's Gate. Two Council members made a counter proposal of a younger entomologist still only in mid career, but who was well known in the Society. He had organised a recent International Symposium, had served on several committees of the Society and was a very regular attendee at the monthly meetings. Faced with inevitable defeat, Dr Rainey withdrew his nomination, and that – folks – is how I became your President!

I am most grateful to the Society's librarian for finding and scanning from the Society's archives all the photos in the text.

Two other President's from this era but not cited in text.
Left: Dr Kenneth Mellanby, director of Monk's Wood Experimental Station;
Right: Mr Norman Riley, keeper of entomology at the NHM.

A new ingredient for poultry feed?

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In Europe the dominant source of protein for poultry feed is from soybean, which is mostly imported from Brazil. As demand for meat and eggs is predicted to rise in line with growing human populations, a key challenge is to secure a reliable and environmentally sustainable source of feed inputs (Macedo *et al.*, 2012; Makkar *et al.*, 2014; Taelman *et al.*, 2015). To achieve this, soybean imports will increasingly be complemented with other sources of protein, and novel sources such as from insects are being considered (Huis, 2013). Insects form a natural part of the poultry diet, and are an excellent source of essential amino acids and a range of micro-nutrients (Makkar *et al.*, 2014). Improvements in insect rearing and processing, and in our understanding of feed nutrition, are fast making this a viable new feed ingredient.

Why are insects a suitable input to poultry feed?

The global consumption of animal products, including poultry and eggs, is expected to increase by 60-70% by 2050. While associated increases in livestock production could lead to habitat loss in vulnerable landscapes, simplification of agricultural landscapes, and increase in greenhouse gas emissions (Machovina *et al.*, 2015; Taelman *et al.*, 2015). Poultry production is generally considered to be more efficient and less environmentally damaging than ruminant livestock farming (e.g. cattle, sheep, goats etc.) (Nijdam *et al.*, 2012; Machovina *et al.*, 2015), however, securing a long-term source of poultry feed in Europe is an increasing challenge. At present, soymeal makes up around 10-20% of poultry feed, based on soybean imported from Latin America (Taelman *et al.*, 2015).

Soymeal is the main source of protein in the feed, and future increases in demand are likely to put more pressure on the agro-ecosystems in South and Central America (Barona *et al.*, 2010; Gerrard *et al.*, 2015). By increasing the diversity of feed inputs, poultry producers can reduce the risks associated with any single supply chain and reduce their ecological footprint. To achieve this, soymeal could be increasingly complemented with other sources of protein, such as insect meal (Huis, 2013).

Inclusion of insects into poultry feed has not been common practice in Europe due to difficulties in rearing and storing suitable insects, and more recently due to legislative restrictions. Poultry with access to outdoor environments will opportunistically consume insects, but this is not actively managed in commercial production. As mass production of insects develops as a growing industry worldwide, and research begins to identify the nutritional quality of insect meal, feed manufacturers are starting to take this option seriously (Sánchez-Muros *et al.*, 2014).

Insects contain between 40 and 60 % suitable crude protein, depending on the species and the growing medium, and they also have a better amino acid profile than vegetable protein sources (Sánchez-Muros *et al.*, 2014). As well as containing a high quality and quantity of protein, insects are a source of additional micro nutrients, such as Riboflavin (Newton *et al.*, 1977; Oyegoke *et al.*, 2006; Makkar *et al.*, 2014), and the chitin from the insect's exoskeleton has been shown to have a positive effect on poultry immune systems, which could reduce antibiotic inputs (Hwangbo *et al.*, 2009; Huis, 2013).

An additional motivation for including insects in animal feed is that suitable insects can be fed on organic waste such as supermarket excess, improving food supply efficiencies and improving the sustainability of food supply chains (Ramos-Elorduy *et al.*, 2002; Rumpold & Schlüter, 2013).

What is the legal status of insect-based feed in the EU?

The ban on animal protein in livestock feed following the BSE crisis in 1996 remains in force, and this extends to insect proteins. A recent European Food Safety Authority (EFSA) opinion paper concluded that any risks associated with insects in human food supply chains are comparable with current mainstream livestock sources (EFSA Scientific Committee, 2015). Following legal changes made by the European Commission in 2013, fishmeal can already be used in mono-gastric livestock feed, such as poultry. The recent EFSA publication suggests that a further amendment, allowing insects to be used as feed, is being considered. Their overall recommendation, however, was that more research is needed to address an overall lack of knowledge in this topic. While there have been numerous studies showing the nutritional benefits of various insects in livestock production, these need to be consolidated to reflect the potential impact insect meal would have if it was widely applied within livestock production systems. The EFSA opinion broadly supports developing insect meal for livestock feed, however the fundamental message remains that more research is needed to ensure it can be produced with no risk to human health (van der Spiegel *et al.*, 2013).

How will the insects be produced?

Once any legal hurdles have been overcome, a key factor in the uptake of insect meal within poultry diets will be the reliability of production. Black soldier flies (*Hermetia illucens*) are one of the most commonly used species in countries where insect meal is already permitted. These flies readily breed in high numbers on a wide range of organic matter, and are not attracted to human habitats or food, so are not considered a nuisance. Mass production of insects is nothing new, but there are a number of challenges associated with intensive animal production systems. Semi-automated systems are already producing tonnes of insect-based products a day for use in pet food, garden bird food, fish and/or poultry feed (where permitted), and for non-feed uses such as for biodiesel, silk or biological control agents. Existing systems are mostly based on feeding organic waste to insect larvae, which are then dried and processed. The use of organic waste needs careful review before it can be used in livestock food chains in Europe (van der Spiegel *et al.*, 2013). Insect meal quality is highly dependent on what the insects themselves have been fed on, and food safety standards will require robust traceability of food chain inputs. In order to be a viable feed input, insect production will need to source organic matter that is both free from contamination, and which is scalable to meet consumer demands.

How will the general public respond to insects in poultry feed?

Initial findings from a consumer perception survey recently reported by PROteINSECT, an EU funded project researching insects as feed, found that 75% of the 700 English language respondents would feel comfortable eating meat from farmed animals fed on insect meal. Similar trends were found in Flanders (Verbeke *et al.*, 2015), and public reception to poultry fed on insect meal is generally thought to be positive as insects are considered to be a natural part of their diet. However, there remain concerns over the true benefits of incorporating the new nutrition source over traditional and other novel poultry feed meal. Further research will be needed to ensure consumer confidence in the quality and safety of changes in production of both eggs and meat, and to demonstrate the claims over improved resource use efficiencies (Belluco *et al.*, 2013).

Will we see insect meal in poultry feed in the UK?

In the future, insect meal could be incorporated into poultry feed as a way of diversifying the feed source inputs and helping to secure our food supply chains. The idea of using insects in poultry feed is still in its early stages. There is a lot of work to be done to ensure ingredients will be safe, legal, publicly accepted, and sustainable. There are challenges ahead, such as the lack of legislative clarity (van der Spiegel *et al.*, 2013), questions over the scalability of insect production (Lundy & Parrella, 2015), and whether consumers will accept such changes in poultry production (Verbeke *et al.*, 2015). The limited research that has been completed so far suggests that insects could make a useful contribution within poultry production as part of the feed supply chain.

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Four images contributed by presenters and inspired by their work: (Clockwise, from top left: A 'bush coconut, by Josh Evans; Children filling out questionnaires, by Hannah Tranter; A 3D-printed insect 'egg', by Susana Soares; Children collecting katydids in Kenya, by Josh Evans. More information and further images can be found at: http://www.libertyruth.com/image-exhibition.html)

Insects as Food and Feed – an interdisciplinary workshop held in Oxford, December 2015

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A 'rapidly increasing interest' from a multitude of disciplines

As Peter Smithers described in a previous issue of *Antenna* (Smithers 2015), there is a 'rapidly increasing interest' in the potential of insects as a food and feed source. Characterised by a spirit of optimism, this interest seems to be growing exponentially among investors, farmers and entrepreneurs, and also within the academy.

However, academic interest in this topic is by no means united under a single discipline. Indeed, nearly every discipline may have something of value to contribute to this emerging field, which touches on issues ranging from the personal (food consumption, health and psychology) to the cultural (taboos, food production and dietary practice) to the global (environmental degradation, climate change and sustainability). Yet 'insects as food and feed' is a topic that has received scant attention in English language discourse to date, even among entomologists.

As part of this growing movement, we – the British Heart Foundation Centre on Population Approaches for Non-Communicable Disease Prevention (BHFCPNP) at the Nuffield


Left: Professor Kenichi Nonaka shares his rich experience of insect collection and consumption based on 30 years of fieldwork, in the first session of the day; Right: Dr Pete Scarborough welcomes a packed lecture theatre to the Oxford Martin School in the first session of the day.

Department of Population Health, Oxford, in collaboration with Kenichi Nonaka from Rikkyo University, Tokyo – had tentatively initiated a very small research project looking into insects as food in 2013. We were very aware of our position as isolated newcomers to a field brimming with possibilities. Yet we were also aware that despite our isolation, we were far from alone. We had heard and read of groups across the UK and Europe also investigating insects as feed and food, in departments and disciplines ranging from Biological Sciences to Psychology and Sociology. We felt that, 18 months on from the highly successful international conference held in Wageningen on Insects as Food and Feed (Vantomme and Münke 2014), and given the success of the new Journal of Insects as Food and Feed launched at the same event (Yen 2014), the time was ripe for a small workshop uniting academics based in the UK and Europe to present and discuss their research. We put in a successful application for funding from the GB Sasakawa Foundation, set a date (December 4th 2015), and put out our first call for papers.

From humble beginnings, to a 'vibrant and packed' event

We envisaged this event as a small gathering of a handful of researchers, mainly UK-based. We would sit around a large table, each give a brief presentation summarising our current research, and end the day with a discussion about the future of the field. However, it soon became clear that the event would have to be on a larger scale to cope with the level of responses that we received! We were fortunate to receive further funding from BioBridge Ltd, enabling us to meet this increased demand.

By the time that December 4th rolled around, we had over 55 registered participants from at least seven different countries spanning three continents, and a packed schedule including five oral presentation sessions, two poster sessions, and two very different hands-on demonstrations of insect foods. As the first session commenced at 10am, 'workshop' suddenly seemed an unnecessarily modest title for such a vibrant and packed lecture theatre, which was decorated with images inspired by the research that would be presented during the day. The themes for each of the formal oral presentation sessions were inspired by the conclusion and recommendations of two landmark FAO publications on edible insects (FAO 2013; Vantomme and Münke 2014).

Opening remarks

The day began with a session entitled 'Opening Remarks'.

Firstly, Pete Scarborough from the BHFCPNP, Oxford, welcomed participants and outlined the findings of the research project that initiated the workshop, in a talk entitled 'Are edible insects healthier than commonly consumed meats?'

The project asked whether the scarce nutritional information available on major food insects can inform us of their potential for combating major public health problems: Overnutrition and undernutrition. As Pete explained, the findings highlighted the heterogeneity of insect nutritional content and the need for more, higher quality data (Payne et al 2015b). The study used two nutrient profiling models to quantitavely compare insects and meats. Yet the results showed that it is not possible to draw conclusions that are based on 'insects' and 'meat' as distinct and/or opposing categories. Rather, the data enables us to see the food insects that may help to tackle certain public health problems – such as palm weevils (*Rhynchophorus phoenicis)*, which may be favourable for combating undernutrition – yet also warns us against seeing insects as 'healthy' without considering their inherent diversity (Payne et al. 2015a).

Our next speaker was Kenichi Nonaka, visiting from Rikkyo University in Tokyo, followed with a talk entitled 'Fieldwork with edible insects: Value and understanding'.

Kenichi, who has been studying traditional insect-eating cultures for over 30 years in three different continents, drew our attention to the diverse ways in which insects are used as food across the world. A geographer by training, he has collaborated with nutritionists, biologists, agricultural scientists and behavioural ecologists, and his experience and publications show the 'value' of insects as food in the world today. He described their place in cultural networks of ecological understanding and in conceptions of taste, and also their role in traditional agriculture. He described how many languages contain words specific to the taste or texture of insects, many communities depend on the cash value of insects as a marketable resource, and in many rural areas, the collection and

consumption of food insects is integral to agricultural production. His talk was a technicolour celebration of food insects as they are used and understood by the two billion people for whom they are an integral part of their diet and lifestyle.

Session 1: Health, growth and nutrition

The first formal session of the day, on 'health, growth and nutrition', comprised a single talk given by Darja Dobermann from the University of Nottingham and Rothamstead Research, on 'Innovating insect processing technology for the enrichment of traditional foods to target malnutrition'.

Darja described the motivations behind her research – the global prevalence of zinc and iron deficiency that is particularly concentrated in the developing world, causing stunting, anaemia and associated health problems. Her group is running a project raising African field crickets (*Gryllus bimaculatus*) on organic waste streams including dried distilled brewers' grains, food scraps and rice bran. She described their current trials, which are ongoing, and some of the potential uses for crickets raised in this way, which include food for human consumption and feed for aquaculture. She discussed the current lack of certainty about the bioavailability of iron from crickets, and also mentioned future directions in which they hope to take this research, which include clinical trials with human subjects receiving fortified foods, and uses for the biowaste (frass) produced by the crickets themselves.

Poster Session A

The meeting adjourned for the first poster session of the day, which was designed to encompass the morning's themes: Health and sustainability. The posters were diverse in both theme and content, and sparked a range of discussions. Two posters outlined the background, objectives and methods for research projects that are currently underway, one of which is looking at minilivestock for food security in Southeast Asia, and another at the potential of feed insects for sustainable salmon farming. Another poster was interactive and warned of the dangers of a 'quick-fix' narrative. Entitled 'Scaling up solutions', this poster likened the current interest in insects as food to the historical rise of soy as a feed source, which is now considered to have led to widespread environmental degradation. To illustrate the remarkable parallels between the two, tabs on either side of the poster could be pulled to substitute 'insects' for 'soy'. Another poster entitled 'Entomophagy and Power' highlighted similar concerns, drawing on a combination of data from companies, academic literature and fieldwork in Southeast Asia to show that the 'insects as food' movement may be perpetrating the power imbalances that are the root of many of the problems within our global food system. Finally, Kenichi Nonaka, in a continuation of his presentation, contributed a poster that showcased the 'Vitality, Speciality, Originality and Priorities' (V.S.O.P) of people who used insects as food worldwide.

Session 2: Sustainability and environmental impact

The second session, on 'sustainability and environmental impact', opened with a talk from Richard Quilliam of the University of Stirling, on 'Insect larvae and waste management: Adding value to sustainable insect production'.

Richard's group, 'ENTO-PRISE', works in Ghana and aims to identify waste streams that can be converted into edible biomass using black soldier flies (*Hermetia illucens*). They hope that the resulting larvae can be used by small scale poultry and aquaculture farmers, and the waste byproduct (frass) can be sold as fertilizer for smallholder farmers. Currently, they see 'green waste' (vegetable waste) as the waste stream with the greatest potential, although this carries additional risks of microbial contamination. Initial trials suggest that some waste streams are safe to use, and the biofertilizer produced is effective for common vegetable crops. Richard then gave us a brief description of a second exciting initiative currently underway at Stirling, named 'Aquafly'. The Aquafly team is investigating the use of kelp on a commercial scale as feed for farmed kelp fly (*Coelopa frigida*), which produces larvae that could potentially be used as feed for aquaculture. This project may have exciting prospects for the future of salmonoid fish farming in the Northern Atlantic.

The second presentation of the session, 'Insects au Gratin' by Susana Soares and Andrew Forkes from Brunel University and London South Bank University, provided a contrast that exemplifies the diversity of this field.

Susana and Andrew suggested that 3D printing technology could provide a means to overcome the 'yuck' factor that is said to play a role in the acceptance of insects as food. Their technology plays with the aesthetics of homogenized insect 'paste' to create designs and textures that may be more palatable than whole insects, although some of their designs are based on the shapes and textures of insects themselves. For example, they can print products that are based on the bee waggle dance, or on the shape of caterpillars and butterfly eggs. They discussed the nature of their technology, which is open source and suitable for small production quantities, and therefore may be a sustainable option in a technology-driven future.

3D printing demonstration, insect sushi, and a sustainable lunch break

After hearing Susana and Andrew's talk, participants flocked to the table at the back of the room where the 3D printer was set up and ready to go. After a few technological hiccups, the printer was running smoothly and decorating cheese crackers with a pink insect 'paste'. The paste itself was made from wild grasshoppers (*Sphenarium purpurascens*) harvested from pesticide-free crops in Oaxaca, Mexico.

Meanwhile, Kenichi Nonaka was preparing a DIY 'temaki sushi' (literally 'hand-rolled sushi') spread to accompany lunch, using an original recipe from the 'Hebo café' in Nagoya, Japan. The processs for making the sushi involved taking a square of nori seaweed paper, coating this with spiced rice, and adding a choice of Japanese insects. The insects on offer were silkworm (*Bombyx mori*), grasshoppers (*Oxya* spp.) and wasp brood (*Vespula*

Susana Soares and Andrew Forkes demonstrate their 3D printing technology to a captivated crowd. The paste was made using grasshoppers collected from pesticide-free crops in Oaxaca, Mexico.

flaviceps), all prepared in a traditional manner using soy sauce and mirin (sweet rice wine), and supplied by Tsukahara Chinmi, a family business based in central Japan.

Accompanying these treats, participants were also invited to help themselves to an array of sandwiches and salads provided by the Organic Deli Company, a catering business that is local to Oxford and sources its vegetables from the surrounding area.

Session 3: Psychology, well-being and marketing

The third session, on 'psychology, well-being and marketing', began with a presentation from Jenny Josephs from the University of Southampton, on 'Capability, Opportunity and Motivation: Factors determining insect eating behaviour'.

Jenny began with a summary of the motivation behind her research – insects are a protein source with a low environmental footprint, which evade animal welfare issues, and do not require antibiotics. Her research looks at reactions to insects as food, both in order to promote increased insect consumption in the developed world and also to maintain insect eating where it is already a common dietary practice. Jenny's preliminary results show a strong aversion to insect eating in the UK, with 51% of respondents refusing to try insect foods. She intends to develop her research through interviewing insect consumers in Southeast Asia.

Jonas House followed with a presentation on 'Social and cultural factors affecting acceptance of insects as food in the Netherlands'.

Jonas introduced his presentation with slides that showed insects on supermarket shelves, advertised as culturally acceptable 'schnitzel' and 'nuggets'. He explained how, when insects are homogenised into culturally acceptable foods such as burgers and nuggets, issues of 'acceptance' are ultimately conflated with acceptance of similar foods. Consumers, he maintained, are often more interested in insects as unique ingredients in themselves, although fresh insects are not currently commonly available in the West.

Poster session B

The second poster session of the day comprised seven presentations, all of which were united in their objective to understand the mechanisms contributing to an acceptance of insects in the Western diet. Four posters used primary data derived from cohorts of consumers to identify factors that accompany the acceptance or rejection of insects as food. Consumer acceptance of insect food products was not high – Sogari et al. ('Intention to eat edible insects: Preliminary results of a TPB study'), for example, found that only 52 of 231 participants were willing to try foods containing insects. Josephs et al ('Perceptions of animals and choices of meat to eat: A cohort study') found that a willingness to try insect foods increased with education about the potential benefits of entomophagy, a finding replicated in Tranter's ('Insects creeping into English diets: Introducing entomophagy to school children in a provincial English town') study. Both Tranter and Carvallo and Materia ('Insects as food: A study with a choice model aimed at identifying drivers for European consumers' acceptance') also found that food insects were more likely to be accepted if they were 'invisible' in foods, e.g. homogenised into insect 'flour'. The three remaining posters described some of the ways that insect foods are reaching consumers today. Schleunitz ('Communicating science and raising public awareness by a scientific comic') described the use of an educational comic to inform consumers of some of the benefits of insect foods, Kamimura and Nonaka ('Welcome to Hebo café: Reframing Japanese insect cuisine") described how the 'Hebo café' in Japan is working to

Above: The lunch spread: Hand-rolled sushi with silkworm (*Bombyx mori*), grasshoppers (*Oxya* spp.) and wasp brood (*Vespula flaviceps*), contributed by Hebo Café and Tsukahara Chimi, Japan, and accompanied by a range of sandwiches and salads made by the Organic Deli, Oxford, using organic and locally sourced ingredients; Below: Peter Smithers partaking...

rediscover traditional insect cuisine using a combination of pre-war recipes and recent culinary innovation, and Stott ('The differing challenges which edible insect businesses face and how collaboration with research and social projects can make positive change') gave a systematic overview of the challenges facing insect start-ups in the UK today, and some of the ways in which the company Bug Boys are working to overcome them.

Session 4: Welfare, ethics and legislation

The final formal session of the day, on 'welfare, ethic and legislation', had only a single presentation – a talk on 'entomophagy and power' led by Andrew Müller.

Andrew described the background to this collaborative project, and discussed his experiences of fieldwork in Southeast Asia. He had hoped to find that the entomophagy movement was indeed helping to empower those who worked with edible insects, but found instead that workers had to endure low wages and poor conditions, and that to meet increasing demand even the insects themselves were being exploited in ways that are unlikely to

be sustainable. His co-authors, Rebecca Roberts, Charlotte Payne and Josh Evans, joined him to describe how their systematic review of academic literature, and of companies selling edible insect products, also supported the observation that the 'entomophagy movement' is already reproducing the unequal power relations that we know are so detrimental to progress in attaining global food security.

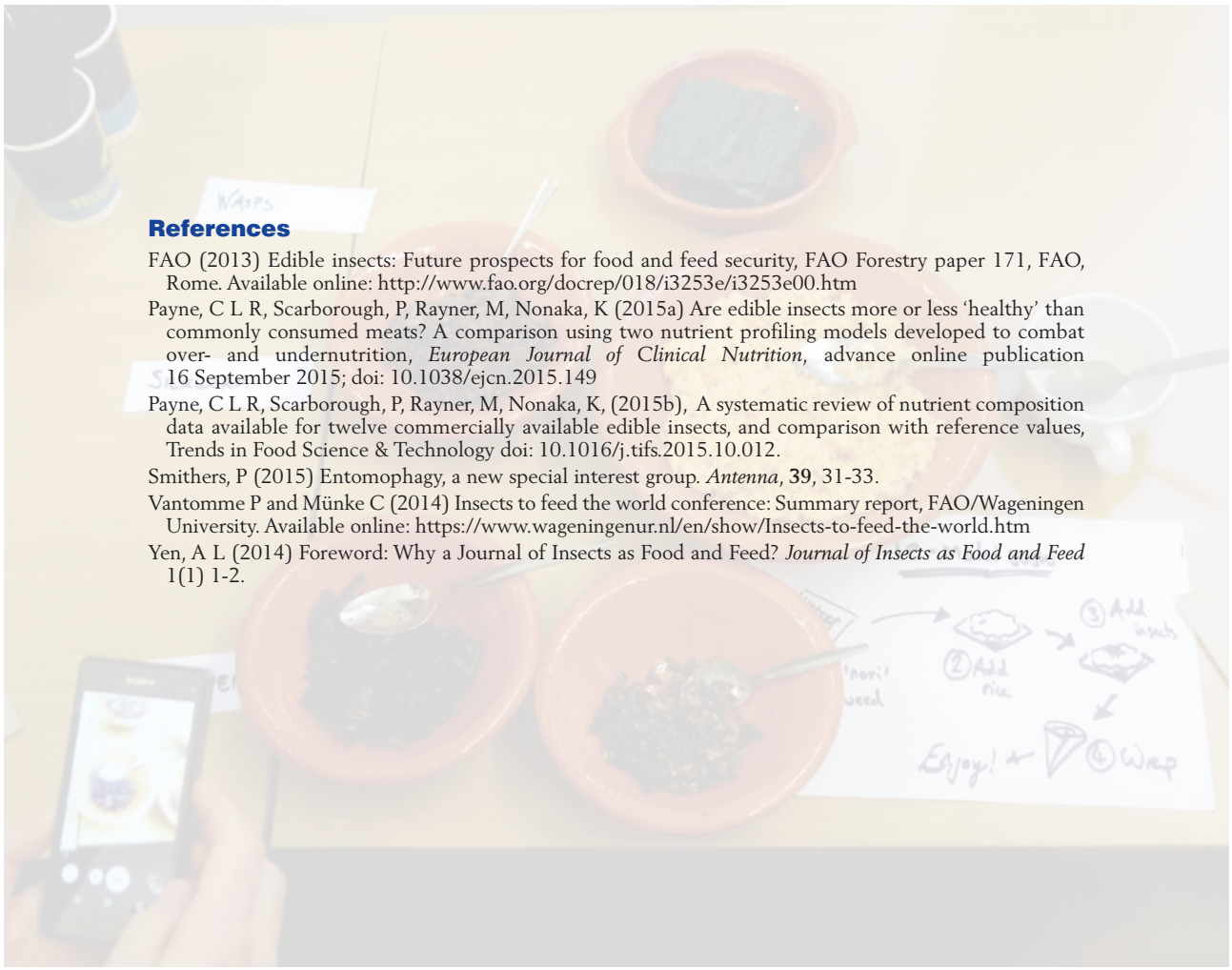
Panel discussion: Identifying future priorities in edible insect research

All of the above gave us plenty of 'food for thought' for the final panel discussion on identifying future priorities for insect research. There was some discussion of the role that edible insects could play in open, mixed agricultural systems in warmer climates – for example, the systematic exploitation of crop pests as a source of food. It was agreed that further research to understand the environmental impacts of different kinds of insect production – particularly in terms of carbon footprint and energy costs – is vital, as is an increased understanding of the health and safety issues raised by the large scale production and consumption of food insects.

Proceed with caution, with optimism ... and with enthusiasm

Overall, the day ended on a note of informed optimism, and the intention to proceed with caution, but also with enthusiasm. We are all 'young' researchers treading on ancient ground, yet it is clear that there is still a great deal to be learnt and discovered in the new and exciting field of insects as food and feed. Technological advances and agricultural innovation will be an essential part of the future of food insects, but such developments will only be effective if they incorporate the appreciation and understanding of insects that remain integral to a multitude of cultures worldwide. As academic researchers who have each one of us barely dipped our toes into the water at this stage - English-language researchers in this field are after all, almost without exception, newcomers by definition - we have a shared responsibility to move forward with integrity.

For more information about the event, including a full programme and slides from all presentations, please visit www.libertyruth.com/iff-workshop-uk-2015.html



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Society News

Council Matters

As the President was overseas, the October Council meeting was chaired by the Honorary Secretary, Dr Archie Murchie. Dr Murchie welcomed the new Trustees, Dr Sarah Beynon, Dr Mary Cameron and Ms Francisca Sconce and invited everybody to introduce themselves, which they duly did. On behalf of the President, the Honorary Secretary confirmed that Mr Peter Smithers and Dr David George had agreed to serve as Vice Presidents for the forthcoming session.

Council were presented with an overview of the Society's co-purchase of Daneway Banks (Site of Special Scientific Interest) with Gloucestershire Wildlife Trust. Mr Clive Farrell, who along with Prof. Jeremy Thomas has represented the Society in negotiations, outlined progress to date. He referred to a satisfactory market evaluation provided to the Registrar by a registered chartered surveyor and that subsequently matters will be passed to our solicitor, Mr Willans, for completion.

Dr Murchie gave an update on the feasibility of the Society bidding to host the International Congress of Entomology in 2020. Whilst all involved were enthusiastic about the Congress, a suitable funding mechanism had not yet been identified that would prevent the Society from being exposed to indeterminate risk. He advised Council that the President and Registrar were meeting with ExCel London representatives to determine whether a financial solution could be identified.

Dr Tilley reported on the Insect Festival 2015, which had been held in the grounds of the York Hospitium on 5th July. The Festival attracted 34 exhibitors and an estimated 1,700 members of the public. A wide range of activities provided entertainment and education to the families attending. These included Bug Hunts and Insect ID led by Dr Roger Key, as well as the childrens art competition, which attracted over 850 entries. Council agreed that this was very successful outreach event in the North of England and thanked Dr Tilley and his team.

The Honorary Secretary gave a verbal report on Ento'15, which had been held in Dublin in September 2015. Dr Murchie felt that the meeting had been a success with a diverse range of high quality talks and poster presentations. The availability of the plenary talks as open access papers in *Ecological Entomology* was an added bonus. Other Council members commented on the setting of Trinity College right at the heart of Dublin, the welcome given by the University's Provost, the conference dinner, ceilidh and the excellent insect hors d'oeuvres served during the President's wine reception. All of which had contributed to a convivial and enjoyable meeting. The Registrar endorsed Dr Murchie's comments and thanked him and the other convenors (Dr Jane Stout, Dr Olaf Schmidt, Dr Brian Nelson, Ms Catherine Bertrand and Dr Stephen Jess) for their hard work. He circulated a statement of income and expenditure and pointed out that the underwriting was less than in previous Ento meetings, achieved by setting fees at full economic cost.

Dr Murchie advised Council that following a special meeting at Ento'15 in Dublin, the proposed revisions to the Bye-Laws had been adopted. The Registrar reminded Council of some of the more significant changes, including the only new section, which is a provision to exclude a Fellow or Member from the Society following due process. The Registrar also explained that since the revised Bye-Laws were acceptable to the Privy Council, future reasonable adjustments were permitted provided these did not contravene our Royal Charter.

Several delegates from the Entomological Society of America (ESA) attended Ento'15 and a meeting was arranged to discuss an initiative that the ESA have launched called '*Grand Challenges of Entomology to Improve the Human Condition*'. This is ostensibly about developing a joined-up international strategy to tackle some of the problems in entomology, in the first instance this will address vector-borne diseases. Council agreed to support the *Grand Challenges* in principle and to sign a memorandum of understanding with the ESA to that effect, subject to some slight amendments in the wording.

SCHEDULE OF NEW FELLOWS AND MEMBERS

as at 2nd December 2015

New Honorary Fellows
None

New Fellows (1st Announcement)
Dr Gajanan Tryambak Behere
Mr Christopher Cathrine
Dr Peter Alexander Maddison

Upgrade to Fellowship (1st Announcement)
None

New Fellows (2nd Announcement and Election)
Dr Margaret C Hardy
Dr Vasuki Belavadi
Professor Frank G Zalom (as at 7-10-15)
Dr Anil Kumar Dubey (as at 7-10-15)
Dr Roy Arthur Sanderson (as at 7-10-15)

Upgrade to Fellowship (2nd Announcement and Election)
None

New Members Admitted
Dr Kimberley Davies
Mr Caleb Seth Jones
Dr Christopher James Rogers

New Student Members Admitted
Miss Elizabeth Finch (as at 7-10-15)
Mr Nicholas James Balfour
Mr Scott Dwyer
Mr Dylan James Hodgkiss
Mr Leslie Choi
Miss Katie Bott

Re-Instatements to Fellowship
Dr Duncan Reavey
Mr Robert Ian Forrest

Re-Instatements to Membership
Dr Grace Twiston-Davies

Re-Instatements to Student Membership
None

Deaths
Dr P D Cox, 1977, York
Mr T W Harman, 1981, Henley-On-Thames

New Honorary Fellows

Simon Leather

Professor of Entomology at Harper Adams University

Simon Leather is an applied entomologist, focusing mainly on problems in agricultural, horticultural and forest crops. He was born in Harrogate, Yorkshire in 1955 although the first 13 years of his life were spent abroad (Ghana, Jamaica and Hong-Kong), as his father was a tropical plant pathologist. He once had a Jamaican accent but rapidly lost it when he was sent to Ripon Grammar School as a boarder in 1968. He graduated from Leeds University with a First Class Honours degree in Agricultural Zoology in 1977 and did his PhD at the University of East Anglia under the supervision of Professor Tony Dixon on the ecology of the bird cherry-oat aphid. He has worked on aphids since 1977 with a particular interest in forecasting and monitoring. He was responsible for the development of an early warning system for the bird cherry aphid in during the early 1980s which is still used to this day.

He joined the Forestry Commission in 1982 based at their Research Station just outside Edinburgh where he was responsible for improving the forecasting and control of a major forest pest, the pine beauty moth. He spent the next ten years working on forest pests all over the north, developing control strategies and advising landowners, foresters and the general public about their pest problems. His main strategy was to develop environmentally-friendly ways of managing pests by changing planting practice and encouraging biodiversity within commercial plantations. After 'solving' the pine beauty moth problem, with help from his long-time friend and colleague, Allan Watt, he was

... A better option than having your head in the sand?

moved on to the large pine weevil (*Hylobius abietis)* project. This proved to be a more intractable pest on which he is still working.

From 1992 until 2012 he worked for Imperial College London, based at their Silwood Park campus near Ascot, continuing his interests in agricultural and forest entomology and beginning a twenty-year study on the biodiversity associated with sycamore trees. In 1998 he developed an interest in urban ecology and began investigating the biodiversity of Bracknell roundabouts in relation to how urban green spaces can aid conservation. As well as being the Postgraduate Tutor at Silwood Park, he ran the MSc courses in Entomology, Integrated Pest Management and Conservation & Forest Protection.

In September 2012 he moved to Harper Adams University to become Professor of Entomology in the Department of Crop & Environment Sciences and to head up the newly-launched Centre for Integrated Pest Management. He teaches at undergraduate but mainly at MSc level, and runs the only Entomology degree in the UK (which moved with him from Imperial College). He currently supervises six PhD students and has successfully supervised 46 through to completion. Thanks to their efforts he has been able to publish more than 200 refereed papers and write and edit eight books.

He has had a long association with the Royal Entomological Society which he joined in 1977. He began his Editorial career with the Royal Entomological Society when he joined Robert Angus as Co-Editor of *Antenna* in 1992, which in those days actually involved real cutting and pasting! He relinquished this role in 1995 to take up the role of Editor-in-Chief of *Ecological Entomology*, a position he held until 2003. He was Editor-in-Chief for *Insect Conservation & Diversity* from its launch in 2006 until 2015 and is now one of their Senior Editors. He has been an Associate Editor of *Ecological Entomology* and *Agricultural & Forest Entomology* since 2004 and is the longest serving member of the Royal Entomological Society Publications Committee which he joined in 1992.

He is also a member of the RES Wallace Award Committee and the Handbooks Committee. He has served on Council twice, 1994-1996 and 2011-2013 and was part of the first National Insect Week organising committee. He does have interests outside the Royal Entomological Society, he was Chair of the British Ecological Society's Publications Committee from 2002-2006 and an Associate Editor of the *Journal of Animal Ecology* from 2004-2014. He also served on the Editorial Board of the *Bulletin of Entomological Research* from 1993-2006. He has been a Senior Editor of the *Annals of Applied Biology* since 2005. He was also a member of the BBSRC's Training and Awards Committee from 2008-2011. He was a member of the Tree Health & Plant Biosecurity Expert Taskforce and chaired the UK Plant Science Federation's Training & Skills Working Group in 2014. He has been a Trustee of the Scottish Forestry Trust since 2014. He is a member of the Entomological Club and has been the Verrall Supper Organiser since 2013.

He believes passionately in outreach and regularly speaks at schools as well as to local Natural History Societies, the WI, U3A and others. He blogs at *Don't Forget the Roundabouts* and can be found on Twitter as *@Entoprof*.

Insects. Perceived.

A report from the RES Annual National Science Meeting & International Symposium – Ento '15 – 2-4 September 2015

Eugenie Regan

United Nations Environment Programme World Conservation Monitoring Centre, Cambridge, UK

Why go to a conference? Why is it important for us to come together with our entomological colleagues to discuss, debate, eat, drink, and dance? And why Ento' 2015 in Dublin? These are some of the questions most of us had to answer in order to get permission or finances to congregate in Dublin at the beginning of September. Stepping off the plane on the Tuesday evening and being warmly greeted by an old entomologist friend immediately reminded me of why it is so important to attend these conferences. Firstly, it's about reconnecting with friends and colleagues. These are the people that support and inspire us to toil onwards with our insect initiatives – which can, admittedly, be a long, lonely road at times. Secondly, it's about exchanging new research and science. There are many reasons to present your own work, including giving us a deadline that incentivises us to pull our information together and make sure that it gets disseminated. But, just as importantly, it's about keeping up-to-date with the new science that is coming out. This is key for our own work; giving us new ideas, potential new collaborations, and informing our decision-making.

Ecosystem Services was the theme of the Ento' 2015, an important area that has got a lot of traction within international circles and brings another perspective to the argument for nature conservation. There was a diverse range of talks on this theme and many different opinions represented. Indeed, some presenters argued for valuing these services and other arguing against. These differing opinions make for a great conference – encouraging debate at the end of talks, over coffee, and indeed over drinks in the evening. Talks that stimulated these debates included Dave Goulson's talk *Global threats to insect pollination services* which touched on a number of controversial and high profile issues affecting pollinators, Jan Bengtsson's talk *Biological control in a landscape perspective* and Michael Ulyshen's talk *Wood decomposition and nutrient cycling as influenced by insects*.

Another much discussed issue was the worrying trend presented by a number of presenters around the misinterpretation of entomological science. Dave Goulson showed how government departments have misinterpreted results of an experiment to better understand the impact of neonicotinoids on bumblebees. Keith Alexander explained how conclusions of paleoecologists have missed the ecology of the species – and thereby misinterpreting the results. Lynn Dicks also touched on this in a very stimulating talk (one of my favourites) where she discussed evidence-based decision-making and how it can be improved even with incomplete knowledge, but how some decision-making completely skips important steps thereby often missing important information.

In terms of my personal highlights, a talk on the Caribbean, chocolate and midges is definitely on top of my list. Once Sarah Arnold mentioned the Caribbean and chocolate in the same sentence she had my immediate attention. I had to resist running up to her afterwards and volunteering as a research assistant! To bring midges into the mix was enlightening and I now have newfound respect for midges – a much maligned insect. They were previously one of my least favourite insects and so it was fascinating to learn their importance for the pollination of cocoa plants and the work that Sarah and her colleagues have been undertaking. You can visit Cocoapop.eu for further information – worth a visit for chocolate addicts!

Another ecosystem service that came up a number of times by presenters was entomophagy (another insect ecosystem service). This was further explored at the wine reception on the Wednesday evening where we got the chance to engage in entomophagy ourselves thanks to Andrew Holcroft of Grub Kitchen. We were universally surprised at how palatable the hors d'oeuvres were! On offer were Mealworm humous, goats' cheese with black ants, chocolate cookies made with insect flour and Andy's signature orthopteran burger; a veritable feast that was initially viewed with extreme caution by the assembled entomologists. The President of the RES, John Picket, and Patrick Predergast, the Provost of Trinity College, showed the way by taking the first bite. Then following their example the company took a tentative nibble. Caution then turned to delight and enthusiasm, and the voracious crowd swept the table clean. The proof of the pudding is in the eating.

The conference dinner was held in the magnificent College Dining Hall, a grand high-ceilinged room lined with the portraits of past associates of the university who oversaw the evening, adding a keen sense of history to the already heady atmosphere. There was much animated discussion over a very fine meal (which this time lacked any entomological dressings). Fellows who had not signed the Obligations book were invited to come forward and do so. Walter Leal was presented with a celebratory plaque in recognition of his contribution to entomology. David George and David Shepard, received the Marsh award for Early Career Entomologist and the Marsh Award for Insect Conservation, respectively. The winner of the Student Essay

From left to right: Prof Walter Leal FRES (ICE Co-chair); Prof Grayson Brown (ESA / Former President ESA); C. David Gammel (Executive Director ESA); Dr Archie Murchie FRES (Honorary Secretary RES); Prof Alvin Simmons (ICE Co-Chair); Dr Luke Tilley (Director of Outreach & Development RES); Prof Phil Mulder (ESA President); Bill Blakemore (Registrar & CEO RES); Prof John Pickett FRES CBE FRS (RES President); Prof Lin Field FRES (RES Editorial Officer / Former President RES); Prof Frank Zalom (ESA / Former President ESA); Prof Hugh Loxdale FRES MBE (RES Treasurer / Former President RES).

competition, Jasmin Parkinson, was also present and received her prize from the president. Once the meal was concluded the tables were swept to one side to create a dance floor and the band Haste to the Wedding struck up the first dance that had everyone on their feet. The evening became a blur of lively music and whirling bodies as the dances became increasingly energetic. As the last notes of the final dance faded away, more senior entomologists adjourned to their beds while younger ones moved onto the local bars to continue their celebrations.

The student talks and posters were very high quality. A new generation of confident, well-spoken entomologists presented their work and it was clear that we have new entomological colleagues that are ready to take on the world! Chloe Hardman from Reading University won first prize for her talk '*Floral resources associated with organic farming enhance pollination services*' on her work evaluating the benefits of "wildlife-friendly" farming schemes while Jessica Scriven from University of Stirling came a close second for her talk '*Niche partitioning in a sympatric cryptic species complex*' which summarised her work on three cryptic bumblebee species. Rachel McDonald won first prize for her poster '*The European earwig* Forficula auricula *L. in apple orchards: the influence of landscape complexity and farm management and the potential implications for pest control*'. Runners-up in the poster prizes were Saorla Kennedy from Dublin City University for her poster '*Honey chemistry and landscape structure*' and Andrew Lucas from Swansea University for his poster '*DNA metabarcoding reveals pollen transport by hoverflies in grassland habitats*'. Well done to all of the students who presented their work at the conference – your confidence, skills, knowledge, and enthusiasm were really impressive.

The final afternoon of any conference is the graveyard shift and everybody's attention is starting to wander to travel logistics and up-coming family commitments. However, we were treated to a stimulating, attention-grabbing set of talks. Sarah Beynon gave an inspiring talk titled *Ecosystem Services provided by dung beetles*. It was an energetic, amusing, and fascinating introduction to these beetles and it was really interesting to hear her novel approach to a career in entomology – and a very successful one at that. Her talk was followed by Irish entomologist, Tom Bolger, who introduced us to the world of acrobatic Collembola! These talks ended the conference on a high and reminded us again of why we have chosen an entomological career path.

Overall an exciting suite of talks, and an inspiration to go back to work with. Without a doubt attending Ento'15 has re-invigorated our passion and energy for entomology, and has armed us with a new set of information, new friends and colleagues, rekindled friendships, and new ideas to go once more unto the breach!

Thank you to all on the organising committee for a well-run and immensely enjoyable Symposium meeting. Thank you also to all the speakers and poster presenters for informing, inspiring, and re-energising us.

David Shepard receives The Marsh Award for Insect Conservation.

David George receives The Marsh Award for Early Career Entolomologist.

Walter Leal receives a celebratory plaque in recognition of his contribution to Entomology.

Walter Leal sings the Obligations book.

Walter Leal and family.

Dancing to the band is enjoyed by everyone.

Dave Goulson and Lyn Dicks relax at the conference dinner.

The Provost and the President take the first bite.

Andy Holcroft from Grub Kitchen prepares the insect hors d'oeuvres.

Ants on cream cheese with cellery.

Caution is abandoned.

Delegates enjoy the entomology section of the Dublin Museum.

The conference dinner in the Grand College Dinning Hall.

The grand victorian main hall of the Dublin museum.

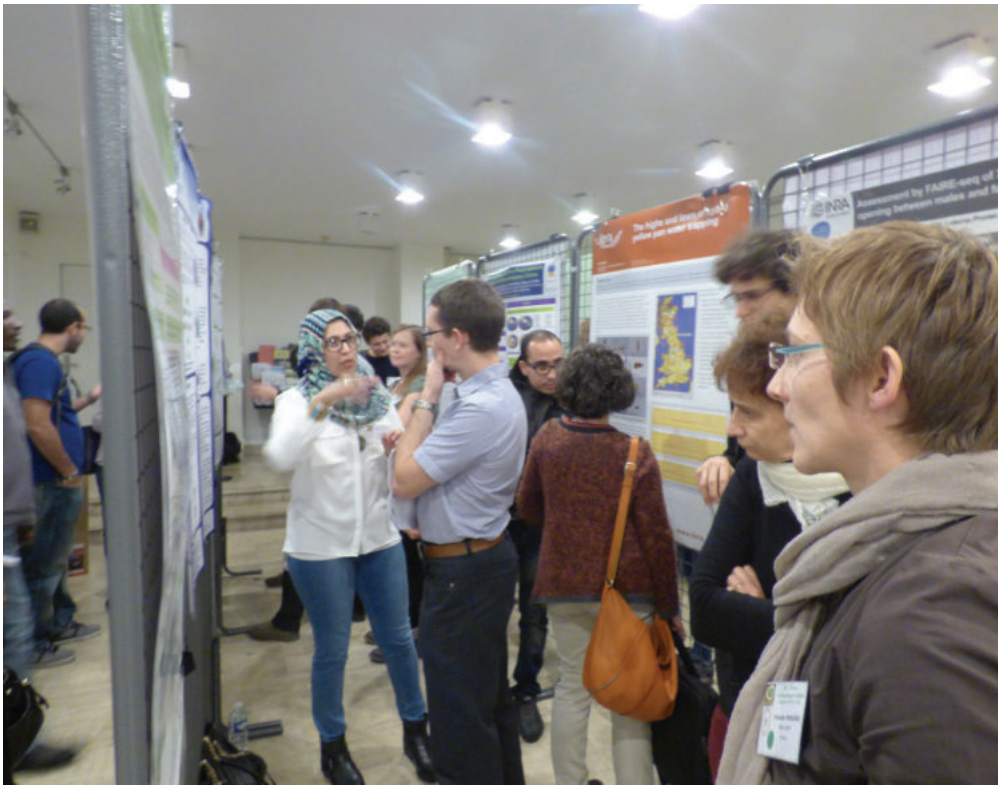
The dinner is eagerly anticipated.

APHID SIG – French Aphid Research Network joint meeting

Paris, 5th – 6th November 2015

More than 100 aphidologists from eight countries gathered in central Paris for a two day joint meeting of the Aphid SIG and our French equivalent (BAPOA). Forty talks and 24 posters were presented. There was a strong emphasis on aphid interactions with their host plants and natural enemies, especially the role of symbionts in these interactions, and the molecular mechanisms involved. This rapidly developing field is hugely exciting, revealing ever more sophisticated interrelationships between trophic levels. It is important to move towards linking it to ecology and population dynamics, and to ensure that morphotaxonomy is not entirely displaced. Not so long ago these subjects would have dominated such meetings. Abstracts are available on the website (http://www.royensoc.co.uk/sig/aphids.htm). Many thanks to Jean-Christophe Simon (INRA Le Rheu) and colleagues for hosting a meeting of scientific, social and gastronomic excellence. Here's to more Anglo-French symbiosis.

Richard Harrington



Jean-Christophe Simon and Charles Dedryer (INRA Le Rheu) being excellent hosts.

Book Reviews

African Queens and their Kin

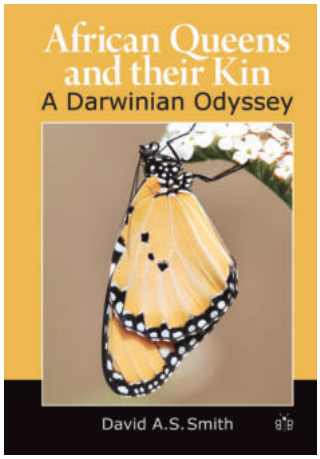
A Darwinian Odyssey

David A S Smith

Brambly Books

ISBN: 9781908241153

£90.00



When we biologists achieve extreme old age, many of us lack the combination of knowledge, mental acuity and organization to make useful coherent comment on topics of interest, whether that interest be current or historic. However, there are wonderful exceptions. Back in the 1940's, Ronald Fisher and Sewall Wright disagreed acrimoniously about the relative roles of natural selection and genetic drift in evolution, and Fisher roundly denounced a role of drift that he named "the Sewall Wright Effect" in order to render his denunciation personal. Although Wright and Fisher were born two months apart, Fisher died in 1962 and Wright in 1988, so Wright had ample opportunity for the last jibe. I attended a three-hour seminar that he gave at the age of 92, at which he expounded with splendid eloquence on his contributions to population genetics. In the course of doing so he vigorously denied ownership of the "so-called Sewall Wright effect" and dismissed it as a straw man invented by Fisher solely to fuel his personal vendetta.

In the 1960's, J. Hadzi published a book about coelenterate biology and reported in the preface that he had received a message from a fellow-researcher asking if he were, perhaps, the grandson of the Hadzi who had written about coelenterates in 1909. And he had been proud to reply: "Indeed not, I am he!"

In like vein, David A. S. Smith takes evident pleasure in having survived into his ninth decade in good enough mental shape to produce eight hundred and twelve pages of very readable prose devoted to the Danaine butterflies that he has studied since 1967. In *"African Queens and their Kin"* (Brambleby books 2014) he expounds on the contributions that students of these insects have made in the fields of mimicry, sexual selection, ecological chemistry, speciation and exploiter-victim interactions. The book begins with intimate details of the life cycle and natural history of the insects. Examples are discussions of the defensive chemistry of the brightly-coloured eggs; the complex behaviour of the females in choosing how to place those eggs; the behaviours used by larvae to manipulate latex flow in their host plants; the evidence that adults are distasteful to predators and the sources of their distastefulness from feeding by both larvae and adults; the diversity of colour pattern of larvae, pupae and adults both within populations and among them.

Subsequently, there are two chapters devoted to phylogeny of the Danaines and speciation; two on inheritance of wing patterns; two on sex ratios and parasitism and two on mimicry, but only single chapters on mating/sexual selection and on defensive chemistry, though the last is a long one.

The book is bursting with observations of caterpillars and butterflies doing what they do in nature, and with interpretations of those observations. I don't always agree with the interpretations: for example, I don't accept that "long isolation" is implied by the refusal of a population to accept hosts that the same species uses elsewhere (page 26) but it's not necessary or to agree with all the book's conclusions, to enjoy it. Nor is it necessary to read it from cover to cover, since each section is sufficiently self-contained that readers can dip into the book here and there as the subjects interest them.

In the course of its biological peregrinations, the book is also an autobiography, recording the changing opinions of the author across the decades, including a frank confession of publishing a paper in Nature prematurely and later realizing it was wrong (p. 532). Smith brings back to life, with remembered conversations, researchers who are no longer with us. He reminded me (page 227) of the old dispute between Fisher and Wright and I enjoyed his accounts of Philip Sheppard, E.B. Ford and Miriam Rothschild, which brought back my own mostly-happy interactions with these luminaries long ago. He reports (page 16) that Miriam had no use for statistical analysis and that when he inserted a Fisher's Exact test into a MS of which she was an author, "it was excised without explanation or apology." Smith also quotes (page 55) examples of her "exquisitely purple prose," in describing butterfly mating behaviour. Readers in possession of archived issues of *Antenna* may be reminded of a Rothschild editorial complaining about the formulaic nature of scientific papers, entitled "MUST we be such unconscionable bores?" In this book, David Smith has heeded her call.

Michael Singer

Plymouth University

The Bees in your Backyard: A Guide to North America's Bees

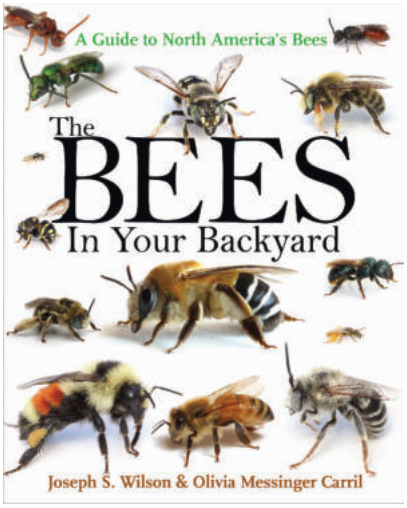
By Joseph S. Wilson & Olivia Messinger Carril 2015

288 pages. Paperback. 926 colour photographs. 1 table. 99 maps

Published by Princeton University Press, Woodstock UK

ISBN 9781400874156.

Price £19.95



This book is part of the exciting new wave of bee publications helping to raise the profile of bees as important pollinators of our food, as insects that are widely threatened by the way we manage land, and as creatures of great fascination and often striking beauty.

This book provides an introduction to the bees of the United States and Canada, a fauna of over 4,000 species. Within the wide-ranging Introduction, a section on 'Is this a bee?' describes how bees can be distinguished from wasps and the various other look-alikes such as hoverflies. I would like to have seen a stronger focus on bee-like here, a photo of *Eristalis flavipes* alongside something like *Bombus ternarius* would have nailed it (rather than featuring a wasp like *Helophilus*). I was also a little surprised to see 'roughened integument and lots of tiny pits' being cited as a difference between wasps and bees (page 9), because I don't think this holds any more true in America than in Europe. Bee names, bee lifecycles, bee homes, bee sociality, bee nutrition and bee enemies (including parasitoids and cleptoparasites) all get coverage here too. There is a good section describing the body parts of bees and I was pleased that this was kept user-friendly and visual without the temptation to use the technically correct yet intimidating body part nomenclature that can affect some literature. But I would like to have seen mention of that fact that the propodeum is actually the base of the abdomen and not the rear of the thorax. The basic structure of the male genitalia would also have been useful, given that these can be so important when trying to critically identify a bee or confirming a new species. A photographic example of how the male genitalia (and maybe one or two other microscopic body-parts) can be used to separate some superficially similar North American bumblebees would have worked a treat here i.e. an insight into how you critically identify bees.

The final part of the Introduction describes how to study bees and contains a key that directs you to the various family-specific chapters 3-8. I was a little concerned by the suggestion on page 35 that a hand lens, good magnifying glass or camera with macro could come anywhere close to rivaling a 'pricey' dissecting microscope. Why not tell it as it is - if you want to identify bees properly and appreciate the beauty of a their physical structure, buy a microscope - have a go. Many microscope models are now no more expensive than popular binoculars or birding telescopes.

Chapter 2 covers Promoting Bees In Your Neighbourhood and focuses strongly on what you can do in your garden by providing suitable nesting sites and flowers. I'm sure that this is the approach many readers will want to take and corresponds to the book's title. But how about encouraging readers to manage any nature reserves in a bee-friendly way, or asking farmers and highway's or railway's departments to make concessions for bees? Surely lots of North Americans live in rural settings where farmland becomes their backyard - or does this touch a sensitive issue of compromising agricultural productivity in North America for biodiversity.

Chapters 3-8 are glorious celebrations of the families Andrenidae, Colletidae, Melittidae, Halictidae, Megachilidae and Apidae, with good coverage of many genera and at least a basic mention of others (except the cuckoo genera), though no keys are supplied to allow formal identification of individual genera. The chapters are full of interesting facts and anecdotes that maintain an upbeat and engaging feel to the text. The final Chapter 9 covers 'Pollen Thieves' i.e. the cuckoo bee genera that include representatives of the families Halictidae, Megachilidae and Apidae. There are pros and cons to this approach - it means that certain comparisons between cuckoo genera are possible, but it also means that family chapters 3-8 are compromised by lacking their cuckoo genera/subfamilies. On balance I would have preferred for the cuckoo genera to be retained in the family chapters, as part of the celebration of each family's diversity.

Overall, this is a delightful book, one of the most attractive insect books I have seen for some time, with some superb photography. I hope it succeeds in drawing people into appreciating bees more. But I also hope that further North American literature arrives to allow enthusiasts to then engage with the recording and monitoring of individual bee species. It should also be stated that this book will delight non-American bee enthusiasts as much as American ones, and is superb value.

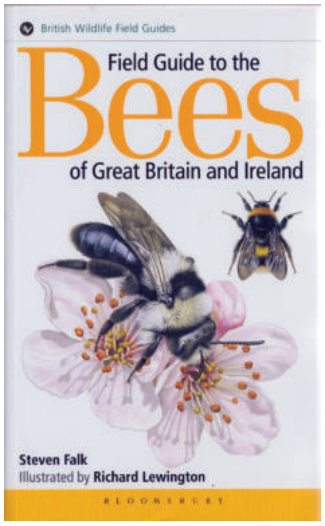
Field Guide to the Bees of Great Britain and Ireland

Steven Falk with illustrations by Richard Lewington.

Published by British Wildlife Field Guides for Bloomsbury

ISBN 978-1-910389-03-4

Hardback: £50.00 • Paperback: £35.00



This new field guide to 'Bees' is another fine example of what modern guides should aspire to.

It is both an excellent introduction for anyone beginning the study of bees as well as an essential tool for experienced entomologists who may need to confirm the identification of a species.

The guide opens with a wide-ranging introduction that covers the classification of bees, life cycles, enemies and associates, an in-depth look at habitats, field techniques, conservation plus societies and recording groups. Also included is an excellent double page spread illustrating the UK genera of bees.

There are five pages of advice on how to use the guide including detailed notes on bee anatomy, followed by a glossary and an illustrated key to the genera of UK bees.

The book then deals with each family in turn, examining the genera that they comprise. Each genera has an introduction followed by keys for males and females to each of the species in the genera. Each of these species are then described in detail, offering distinguishing features, similar species, variation, flight periods, flowers visited, nesting habits, stays and distribution, plus any known parasites. There is also a UK distribution map and at least one, but often two or three, colour photographs of the species.

In the centre of the guide are twenty colour plates illustrating the males, females and any variants of all of the UK species.

The book terminates with a checklist of UK bees and an index.

This is the book that British entomologists have been waiting for. It is a guide that offers both beginners and experts easy access to a confident identification. The keys are lucidly written and copiously illustrated, a combination that make even the trickiest morphological features easily discerned and compared. The two sets of plates offer short cuts to common species or genera or a confirmation of the answer obtained via the keys. This variety of approaches makes this guide both versatile and authoritative. Its publication is timely and it is bound to fuel the growing national interest in British bees. It will enable many more natural historians to access this fascinating group of insects and lead to a greater understanding of both their roles in the British countryside and our interactions with them.

Peter Smithers

Fifty years of the Biological Records Centre

Edited by David Roy, Chris Preston & Helen Roy

A special issue of the Biological Journal of the Linnean Society Vol 115 No 3

Published by Wiley Blackwell

ISSN 0024-4066

Biological recording is one of the great strengths of British natural history. Over the years a vast army of amateur and professional biologist have worked to collect and collate data on our fauna and flora. These recorders range from the gentleman naturalists of previous centuries to the rise of citizen science in the 21st. Aided by the combination of a smallish island and a limited flora and fauna this vast appetite to document them make our knowledge of the UK's fauna and flora unique and possibly the best recorded on the globe.

This 315 page special edition is a synthesis of our current understanding of this field and it appears at a time when this type of data has been shown to be of enormous importance. The editors provide an introduction that offers a brief history of the Biological Records Centre plus an overview of the subsequent chapters. It then explores the role played by BRC in developing the role of citizen science. Garth Foster looks at the way the oldest recording group in the UK, the Balfour-Browne Club has evolved from its origins into a 21st century recording scheme. The subsequent twenty-one papers in this volume go on to explore a wide range of issues related to biological recording. These include the biases contained within these data sets and the range of information that can be extracted, along with the applications that these long-term data sets can be used for. Other papers discuss their use in plotting invasions and extinctions, shifts in geographic range, the response to environmental variables such as pollution and climate change and the change or loss of specific habitats.

Also examined are the roles that biological recording can play in monitoring the effectiveness of protected areas in the face of climate change, how new technologies such as smartphones and online resources contribute to modern recording plus the role that molecular biology can play in future schemes.

This special edition is a wonderful synthesis of the current state of biological recording in the UK. It examines its origins and highlights its achievements while pointing out the many problems and pitfalls encountered. It also indicates a wide range of solutions and proposes new directions that could be taken. This scholarly and comprehensive examination of the subject is a must read for any one involved in biological recording.

Peter Smithers

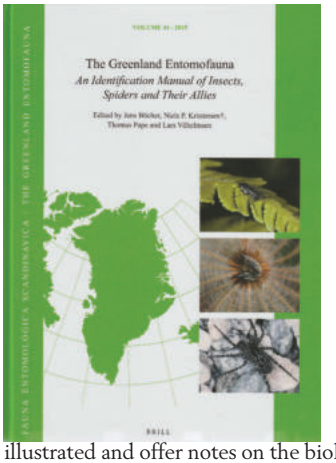
The Greenland Entomofauna
An Identification manual of Insects, Spiders and Their Allies

Edited by Jens Bocher, Niels P. Kristensen, Thomas Pape & Lars Vilhelmsen

Published by Brill

ISBN 9789004256408

€75.00



For most entomologists the identification guides to their local invertebrate fauna forms a small library which comprises books on each insect order and for many a series of such keys to individual families. The idea of a single book that would encompass the entire fauna is a mere fantasy. The popular field guides to insects are useful for common species or higher taxonomic groups but are never comprehensive. Entomologists working in Greenland have the huge advantage that their entire fauna can be encapsulated in a single volume. Despite its 2.8 Kg weight it is still relatively portable when compared to the trunk full of books required in other regions of the world.

The book opens with a brief introduction to arthropod structure and systematics, which includes a key to all the local orders. The following chapter explores the local fauna in relation to the arctic environment, providing a brief overview of the adaptations to arctic life and the limited micro-habitats available. This is followed by a discussion of its zoogeography and the origins of the fauna since the retreat of the ice sheets.

There is also a history of the documentation of this fauna from the initial Fauna Groenlandica written by Otto Fabricus in 1780 to the present publication.

The remainder of the book deals with the 16 orders present in the region. For the larger orders each chapter opens with a key to the families and then provides keys to each family in turn. These are well illustrated and offer notes on the biology and distribution of each of the species. For the smaller groups, some of which contain a single species, descriptions and illustrations are provided plus notes on their biology.

While the text and the keys assume a good working knowledge of the individual groups the expansive glossary and the annotated illustrations will also make this book available to those unfamiliar with particular taxonomic groups. The book is also fully indexed and referenced.

The Greenland Entomofauna is a unique volume in that it offers the kind of comprehensive coverage that is normally associated with extremely focused monographs, and yet it covers an entire fauna in a single volume.

The editors and the legion of contributing authors are to be congratulated on an outstanding contribution to our understanding of arctic biology. This synthesis of their knowledge of the invertebrates of this region will stimulate fresh interest in arctic biology and allow a wider range of scientists to work on invertebrates in the region.

Peter Smithers

Diary

Details of the Meetings programme can be viewed on the Society website (www.royensoc.co.uk/meetings) and include a registration form, which usually must be completed in advance so that refreshments can be organised. Day meetings typically begin with registration and refreshments at 10 am for a 10.30 am start and finish by 5 pm. Every meeting can differ though, so please refer to the details below and also check the website, which is updated regularly.

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

Offers to convene meetings on an entomological topic are very welcome and can be discussed with the Honorary Secretary.

MEETINGS OF THE ROYAL ENTOMOLOGICAL SOCIETY

2016

Mar 2 **Verrall Lecture by Maxwell V. L. Barclay, Curator and Collection Manager, NHM**
"Collections – the Last Great Frontiers of Exploration"
Venue: Ondaatje Theatre, Royal Geographical Society, Kensington Gore, London, SW7 2AR
Convenor: Dr Archie K. Murchie
The Verrall Association Meeting is in the Rembrandt Hotel, 11 Thurloe Place, a five minute walk from the Exhibition Road entrance to the Museum.

Mar 15 **Insect Endosymbiont SIG Meeting**
Venue: Seminar Room D38, Department of Zoology, University of Oxford, South Parks Road, Oxford, OX1 3PS
Convenor: Ailsa McLean (ailsa.mclean@zoo.ox.ac.uk)
Confirmed speaker: Prof Christoph Vorburger, EAWAG Switzerland

Apr 5 **2nd Annual Meeting of the Forest Insects Group**
Venue: Buglife – the Invertebrate Conservation Trust Peterborough
Convenor: Anne Oxbrough (Oxbrougha@edgehill.ac.uk)
Details to follow. For enquiries about submitting and abstract or discussion topic please contact the convenor.

Apr 11 **Entomophagy SIG**
Venue: Sutton Bonington, University of Nottingham
Convenor: Peter Smithers (psmithers@plymouth.ac.uk)
For more information contact convenor.

Apr 15 **South-West Regional Meeting**
Venue: University of Bristol
Speakers: Dr Ulrike Bauer, University of Bristol: "*Friend or Foe? The complicated relationship between insects and carnivorous pitcher plants.*"
Michelle Beales, Buglife: "*An overview of the UK wide project 'Urban Buzz'.*"
Gregory Sutton, University of Bristol: "*Gears and springs, lessons in mechanical design from the insect world.*"
Peter Smithers, Plymouth University: "*Invaders from another hemisphere. The natural History of the land hopper* Arcitalitrus dorrenei*.*"
For more information contact Peter Smithers (psmithers@plymouth.ac.uk).

Apr 20 **Joint meeting of the Insect Pollination and Insects & Sustainable Agriculture SIGs**
"Progress in pollination and pollinator research"
Venue: Madjeski Lecture Theatre, University of Reading
Convenors: Mike Garratt (Insect Pollination SIG) & John Holland (Insects & Sustainable Agriculture SIG)
We are glad to announce a joint meeting of the newly vitalized Insect Pollination SIG and Insects & Sustainable Agriculture SIG. The aims of the meeting are to bring together the latest advances in pollination research and the conservation of pollinators in relation to agricultural crops.
We welcome offers of full and short presentations. Full presentations would be of 20 minutes duration including questions whilst short presentations would be of a rapid-fire type (5 minutes maximum) instead of posters. Please send your talk title and a brief description of the likely contents for consideration to m.p.garratt@reading.ac.uk and jholland@gwct.org.uk by 31 January 2016.

Jun 20 – 26 **National Insect Week**
www.nationalinsectweek.co.uk

Sep 6 – 8 **Ento' 16 Annual Science Meeting**
Venue: Harper Adams University College, Shropshire
Convenor: Prof. Simon Leather

Nov 2 **Climate Change SIG Meeting**
Venue: The Mansion House, Chiswell Green Lane, St Albans, Herts, AL2 3NS
Convenors: Keith Walters (keith.walters@imperial.ac.uk); Richard Harrington (richard.harrington@rothamsted.ac.uk)

Other Meetings

2016

Apr 12 **Aberdeen Entomological Club, Lecture by speaker Craig Macadam (Buglife)**
"More than just fish food: ecosystem services provided by aquatic insects"
Venues: Macaulay B, James Hutton Institute, Craigiebuckler, Aberdeen and screened live to New Seminar Room, James Hutton Institute, Invergowrie, Dundee
Convenor: Jenni Stockan (jenni.stockan@hutton.ac.uk)

Apr 20 **Edinburgh Entomological Club, Lecture by speaker Scott Shanks (Buglife)**
"Buglife's work in Scotland"
Venue: Room 304, Crew Building, King's Buildings, University of Edinburgh, 4pm
For details see www.buglife.org.uk/local/edinburgh-entomological-club

Apr 26 – May 1 **7th International Conference on Fossil Insects, Arthropods and Amber**
Venue: National Museum of Scotland, Edinburgh
Convenor: Dr Andrew Ross
This is the main conference on the scientific study of non-marine fossil arthropods and amber. It is usually held every three years and this is the first time that it will be held in the UK. The conference will comprise of a Reception at the Royal Society of Edinburgh, three days of lectures at the National Museum of Scotland and two optional days of field-work to non-marine fossil arthropod sites. For more information about the meeting and instructions on how to register please e-mail a.ross@nms.ac.uk. Deadline for registration 29th February 2016.

May 18 **Edinburgh Entomological Club AGM, ISI reports and update on conservation strategy**
Venue: Room 304, Crew Building, King's Buildings, University of Edinburgh, 4pm
For details see www.buglife.org.uk/local/edinburgh-entomological-club

Aug 29 – Sep 2 **Aphidophaga 13 (13th International Symposium on the biology and ecology of natural enemies of aphids)**
Venue: Technical University of Munich, Germany
Convenor: Professor Wolfgang Weisser
The 13th of a series of productive and friendly conferences founded in 1965 by Dr Ivo Hodek of the Czech Republic. Four days of plenary and offered papers are interrupted in the middle by an excursion which provides as great networking opportunity.
For further details, google "Aphidophaga 13" or contact h.f.vanemden@reading.ac.uk for an informal word.

Sep 25 – 30 **XXV International Congress of Entomology**
"Entomology without Borders"
Venue: Orange County Convention Centre, Orlando, Florida USA
For further details, please visit: http://ice2016orlando.org/

2018

Jul 2-6 **European Congress of Entomology**
Venue: Expo Convention Centre, Naples, Italy

author guidelines

We are always looking for new material for *Antenna* – please see below if you think you have anything for publication

AIMS AND SCOPE

As the Bulletin of the Royal Entomological Society (RES), *Antenna* publishes a broad range of articles of relevance to its readership. Articles submitted to *Antenna* may be of specific or general interest in any field related to entomology. Submissions are not limited to entomological research and may, for example, include work on the history of entomology, biographies of entomologists, reviews of entomological institutions/methodologies, and the relationship between entomology and other disciplines (e.g. art and/or design).

Antenna also publishes Letters to the Editor, Meeting Reports, Book Reviews, Society News, Obituaries and other items that may be of interest to its Readership (e.g. selected Press Releases). *Antenna* further includes details of upcoming entomological meetings in its Diary Section and features information and reports on RES activities including National Insect Week, Insect Festival and National, Regional and Special Interest Group meetings. Details of RES Awards and recipients are also covered, as is notification of new Members (MemRES), Fellows (FRES) and Honorary Fellows (HonFRES).

READERSHIP

Antenna is distributed quarterly to all Members and Fellows of the RES, as well as other independent subscribers.

INSTRUCTIONS FOR AUTHORS

Standard articles are normally 2,000-6,000 words in length, though shorter/longer submissions may be considered with prior approval from the Editorial Team. The length of other submitted copy (e.g. Letters to the Editor and meeting reports) may be shorter, but should not normally exceed 2,000 words. The use of full colour, high quality images is encouraged with all submissions. As a guide, 4-8 images (including figures) are typically included with a standard article. Image resolution should be at least 300 dpi. It is the responsibility of authors to ensure that any necessary image permissions are obtained.

Authors are not required to conform to any set style when submitting to *Antenna*. Our only requirement is that submissions are consistent within themselves in terms of format and style, including that used in any reference list.

PAGE CHARGES

There is no charge for publication in *Antenna*. All articles, including images, are published free-of-charge in full colour, with publication costs being met by the RES for the benefit of its membership.

REVIEW AND PUBLICATION PROCESS

All submissions are reviewed and, where necessary, edited 'in-house' by the *Antenna* Editorial Board, though specialist external review may be sought in some cases (e.g. for submissions that fall outside the Editorial Boards expertise). Receipt of submissions will be provided by email, with submitting authors of accepted articles being offered the opportunity to approve final pdf proofs prior to publication. Where appropriate, authors will be requested to revise manuscripts to meet publication standards.

SUBMISSION PROCESS

All submissions should be sent electronically to 'antenna@royensoc.co.uk', preferably in MS Word format with images sent as separate files (see above). Image captions and figure headings should be included either with the text, or as a separate file.

EDITORIAL BOARD

ENTO'16

Harper Adams University, Newport, Shropshire

Tuesday 6th to Thursday 8th September 2016

Celebrating 180 years of the R&S journals

Agricultural entomology, behaviour, conservation, detritivores, diseases, diversity, ecology, evolution, forensic science, forestry, molecular biology, pathogens, pest management, physiology, plant-soil-insect interactions, pollinators, urban entomology, vectors, xylophages…

Plenary speakers include:

Peter Witzgall Swedish University of Agricultural Sciences, Uppsala, Sweden
Pathogens, insects and volatiles

Saskia Hogenhout John Innes Centre, Norwich
How virulence proteins modulate plant processes to promote insect colonisation

Helen Roy Centre for Ecology & Hydrology, Wallingford
Citizen science and invasive species

Session speakers include:

Mary Cameron London School of Hygiene & Tropical Medicine
Current and future trends in medical and veterinary entomology

Raphael Didham CSIRO Australia
Emerging issues in insect conservation

Paul Eggleston University of Keele
Insect molecular biology – the way forward?

Jane Hill University of York
Responses of species to climate change – range margin shifts and distribution changes

Rob Weaver FERA, York
Physiological Entomology – celebrating 40 years of behaviour to biochemistry and beyond

Christiane Weirauch University of California, Riverside
Tbc

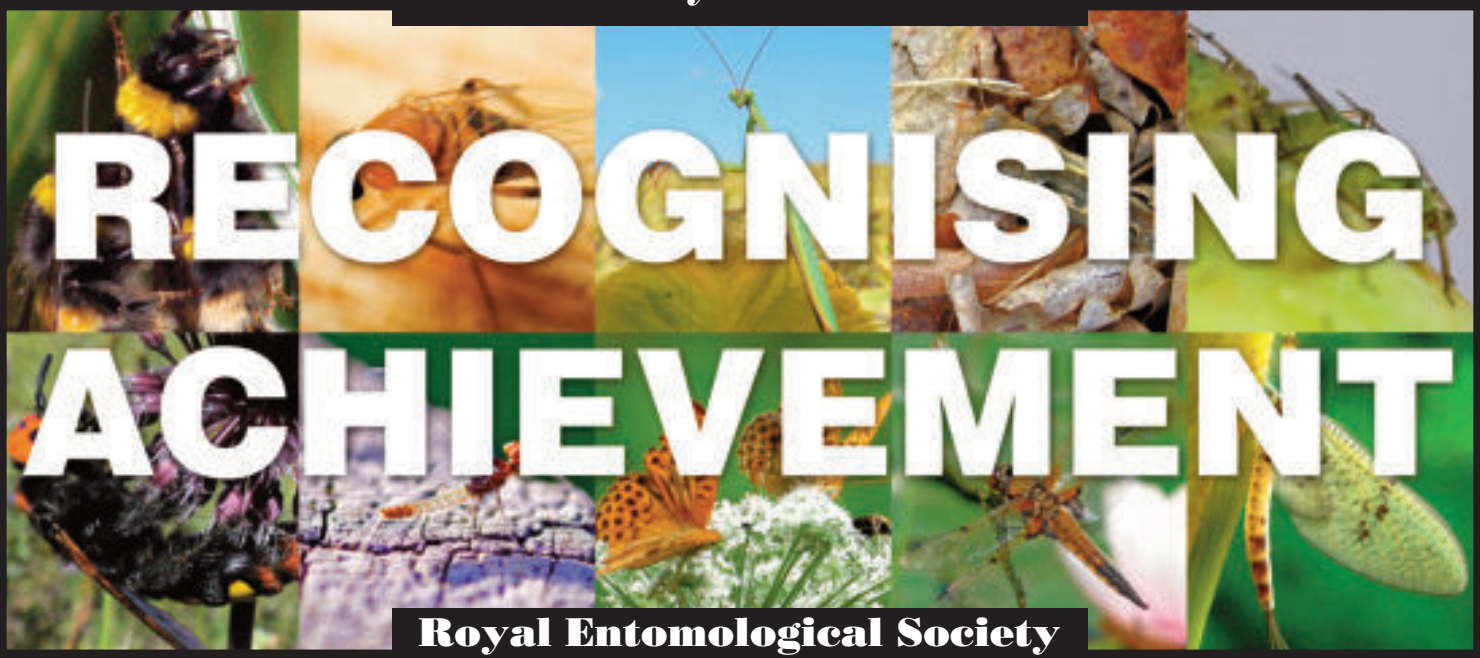
To register visit: **www.royensoc.co.uk/meetings**

ROYAL ENTOMOLOGICAL SOCIETY · FOUNDED 1833 ·

ENTO'16

To submit a talk or poster abstract (< 250 words) or for more information, contact Simon Leather **sleather@harper-adams.ac.uk** by March 31st 2016.

www.royensoc.co.uk



Royal Entomological Society
– Society Awards –

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

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: £600 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: £800 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.

MARSH AWARD FOR EARLY CAREER ENTOMOLOGIST

Award Criteria: For an early career contribution to Entomological Science (up to 30 years of age, or, in the early stage of a research career) that is judged to be outstanding or exemplary with single or ongoing impact on the science. The Award is 'open' and not restricted to any particular discipline or specialised area of entomological science.

Prize: £1000 and Certificate

Royal Entomological Society
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