The LINNEAN SOCIETY of London

The Linnean

NEWSLETTER AND PROCEEDINGS OF THE LINNEAN SOCIETY OF LONDON

Volume 30 Number 1 April 2014

The Mosquito: Defending Linnaeus

Charles Darwin: Diagnosing his illness

Alfred R Wallace: Well known in his own time

AND MORE...

A forum for natural history

The Linnean Society of London

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Articles should be emailed to the Editor in MS Word format, or sent on disc. Images should be sent as JPEGs or TIFFs at no less than 300dpi. Correct copyright information for images should accompany the article.

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The Linnean

Newsletter and Proceedings of the Linnean Society of London

Contents

Editorial

Welcome to 2014 and a slightly different look to *The Linnean Newsletter and Proceedings*. The slightly smaller format helps us to reduce postage costs, with some supplementary material to be made available online; for example, extended bibliographic information or supplementary tables. Should you not be able to access this material, please contact the Society and a printed version can be made available.

Moving back to the past, on 9 November 2013 the Society welcomed Professor Brian Gardiner, the outgoing Editor of *The Linnean*, members of his family, former colleagues and *FLS* associated with the founding of *The Linnean*, as well as those who had contributed significantly to its success. A celebratory drink in recognition of Brian's achievements as Editor provided an opportunity to see some of the recent changes in the Society's Rooms. Everyone enjoyed the occasion, remembering past times. Brian was thanked for developing *The Linnean* from a duplicated newssheet to a journal with an International Standard Serial Number (ISSN). Thanks were also expressed to Mary Morris for her supporting work, as well as to Pat Morris for cover images.

The members of the new Steering Group are listed on the inside cover and have helped in reviewing and selecting content for this issue. Although we have not yet had an opportunity to all meet in person, thanks to email we are now discussing future issues of *The Linnean*. Their comments and recommendations have been most helpful in sorting through and selecting those articles published in this issue.

Gina Douglas, *Editor*
gina@linnean.org

Alas we have become Sam-less! Samantha Taylor, our Project Conservator, has completed her one-year contract on the Smith Correspondence Conservation Project, and Samantha Murphy, our Events and Communications Manager (E&CM), has also left to take up a regional manager role with the Royal Society of Chemistry, based in her home county of Dorset—we wish both Sams well for the future. However, we say hello to our third Tom, Tom Simpson, who took up the E&CM reins in March, after successfully hosting the Natural History Museum's 'Nature Live' programme for the past two years. The Society has upgraded its audio-visual equipment so you can now enjoy video-podcasts of our meetings on the website, starting with the rewilding debate with George Monbiot and the Founder's Day lecture on the notorious Sir John Hill. Please do let us know what you think of these innovations.

George Monbiot at the rewilding debate (held jointly with the Systematics Association)

The Wallace Centenary celebrations in 2013 culminated in Theatr na nÓg's brilliant production at the Society in December, but if you want a recap on Wallace's life, do have a look at the audio-slideshow, voiced by Sir David Attenborough, and for which the Society contributed several images (www.bbc.co.uk/science/0/24837130). There is also a link to the Society's ten Wallace notebooks which are now online. While on the subject of the BBC, listen out for a feature on Radio 4 in July on the origins of botany, which will include discussion on Linnaeus and the history of classification and taxonomy. The President has been organising a hugely successful public lecture series in Wales, with high-profile speakers on Wallace and his legacy, as well as a schools programme that has reached over 850 sixth-formers there, with all secondary schools in Wales receiving a specially designed (by Leonie Berwick) Wallace poster, printed in Welsh and English.

The education team has just taken part in the 2014 Association of Science Education (ASE) Conference in Birmingham, showcasing the new primary loan kits and posters and handing out secondary education packs, branded travel pass holders and rulers, all designed by Leonie. Hazel Leeper and Leonie are now gearing up for their Darwin interactive workshop as part of Super Scientists at Westminster Abbey in March. The 2013 student lectures in October and November were sell-outs and, in view of their success, the series is being increased to three exciting speakers in 2014 and beyond. The education team will be expanded with the addition of a new education post, to

work on a joint project with the Charles Darwin Trust, producing three online post-16 biology modules: Funky Pigeons, Brilliant Barnacles and Murderous Plants, as well as creating more of our very successful loan kits for schools.


Appleyard Fund in Madagascar—the sifaka

There have been three scientific day meetings on topics ranging from mycology and palaeobotany to Willi Hennig (cladistics), while the Taxonomy & Systematics (T&S) Plenary session provided a collaborative opportunity to address the issues facing natural history collections and T&S training in the UK. The Society continues to provide grant funding from its Special funds: the Dennis Stanfield Fund award has gone to John Mbaluka Kimeu to study the grasses of the unique Laikipia - Samburu - Isiolo ecosystem in East Africa, while Vanessa Winchester has received Appleyard funding for assessing regeneration in a threatened gallery forest, home to the ring-tailed lemur and sifaka, in Madagascar.

Do not miss the forthcoming evening lecture on the Asian elephant (1 May) and of course the Anniversary Meeting on 23 May; please register at **www.linnean.org** to attend the Anniversary Dinner. The Conversazione at Burlington House (3 July) will be your opportunity to find out what goes on behind the scenes with the Society team—please come to meet and greet staff and Fellows alike, and enjoy refreshments throughout the afternoon. If you cannot make that date, why not join one of our new 'Treasures Tours' initiated by Deputy Librarian Elaine Charwat, and look out for library introduction tours that are being planned for researchers. The Society's new jute bags with the Linnaean design are proving popular with visitors and you can also order them from the Linnean Shop on the website—please let us know if you would like to see more Linnean Society merchandise.


Linnean Society Treasures Tours

Finally, thanks to the constant efforts of Tom Helps and Victoria Smith, room hire is really taking off post-building works. If you or a colleague are in need of a competitively -priced meeting room in London, then please contact Tom Helps (tom@linnean.org).

Elizabeth Rollinson, *Executive Secretary*
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There have been several significant acquisitions during the past few months. The family of Professor William T Stearn, President of the Linnean Society 1979–82, contacted the Society concerning his papers. Professor Stearn's study was being cleared following the death of his widow, Ruth. Our Honorary Archivist, Gina Douglas, carried out an initial sort to set aside personal and family papers. The remaining working papers were brought back to the Society and are in the process of being sorted by our volunteer, Dr Alan Brafield. We were also offered the opportunity to make a selection from Professor Stearn's library and about 80 titles were chosen.

Sadly, Professor John Cloudsley-Thompson died in October. He had already presented a large number of natural history books to the Library but, at that time, he had decided to keep his copies of his own publications with him. He left instructions that, upon his death, these, too, were to come to the Society. They were collected from his son in November, together with several boxes of manuscripts, papers and drawings.

Nepalese Maps at the Society

A set of three manuscript survey maps of Nepal, executed by Major Charles Crawford and relating to the British Mission to Nepal in 1802–03, were purchased by the Society in 2013. The maps once belonged to Scottish surgeon-naturalist Dr Francis Buchanan-Hamilton, and relate closely to the botanical materials he collected during the year he spent in Nepal as Surgeon to the Mission. They record the routes and camps used by the mission when travelling to and from Kathmandu, and the excursions undertaken and base camps within the Valley of Nepal. In 1806, Buchanan-Hamilton gave his entire collection of manuscript records (notes and a draft *Flora Nepalensis*), coloured drawings and herbarium specimens to James Edward Smith, and these are all now in the Linnean Society archives. These collections are of great significance as they form the basis of several hundred scientific names of Himalayan plants, and are the foundation of scientific botanical knowledge in Nepal. The Buchanan-Hamilton botanical drawings have already been digitised and are available to view on the Society's website in the Online Collections. An exhibition of a selection of high-quality prints taken from the original drawings has recently been held at the Nepalese Embassy.

JE Smith Correspondence Project Complete

The Smith Correspondence Project has now been completed. All 3,635 letters have been catalogued, removed from unstable bindings, conserved, digitised (13,439 images) and re-mounted in acid-free fascicules. The newly-housed fascicules have

been returned to the Society's Archive Room. The conservation and digitisation elements of this project were funded by a generous grant from the Andrew W Mellon Foundation and, under the terms of that grant, the images have been sent to JSTOR where they should now be available for viewing. We are working with the team at the University of London Computer Centre, which hosts all the Society's digitised images, to work out a schedule for loading the images of the letters into the Online Collections on the Linnean website. Congratulations go to everyone involved for an excellent job well done.

A New Project Begins

And so on to the next project! The Linnaean manuscript collection will be sorted, catalogued, conserved, digitised and re-housed. The work got under way in December and will, again, be funded by the Mellon Foundation. Dr Isabelle Charmantier has joined the project team and she will be creating the catalogue of the manuscripts. Andrea Deneau and Helen Cowdy will be reprising their digitisation and conservation roles and Naomi Mitamura and Tony Bish will be contributing their box-making and binding skills respectively, under Janet Ashdown's supervision.

Treasures Tours

As Elizabeth mentioned in Society News, Deputy Librarian Elaine Charwat is running a successful new programme of 'Treasures Tours'. Each tour begins in the Meeting Room, where visitors learn something of the Society's history and its current activities. They then visit the Collections Store and the Library Reading Room. The first two tours proved very popular: feedback received so far has been most encouraging. The tour dates are advertised on the Society website at **www.linnean.org/events**.

> "Illustrates the passion and endeavour that these early scientists were a part of— very stimulating tour."

Friends of the Hagströmer Medico-Historical Library

A recent noteworthy group visit was that of the Board of the Friends of the Hagströmer Medico-Historical Library in Stockholm, led by the Chairman, Sven Hagströmer. In addition to their interest in the Society's Linnaean material, the members were particularly keen to hear about the conservation and digitisation projects that we have been undertaking and the practical and technical issues involved in getting the material up online.

And finally…

The Pearls exhibition at the Victoria & Albert Museum closed in mid-January and the Linnaean pearls have been returned safely to the Society. The exhibition was a great success, drawing in over 170,000 visitors.

Lynda Brooks, *Librarian*
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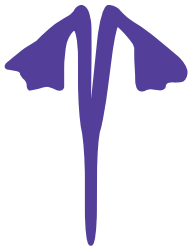
Donations

The following people have made book donations to the Library of the Linnean Society of London. These books will now be in the process of being added to the Society's online catalogue, accompanied by the appropriate donor information. Thank you to all those who have donated to the Society.



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The full list of donations is also accessible as a PDF with the online version of this issue of *The Linnean* at **www.linnean.org/thelinnean**.

A printed copy of the list can be sent upon request—please contact the Library staff at **library@linnean.org**.

Not induction

Fryer (2012) discussed the observations of the Yorkshire naturalist George Porritt relating to the origins of industrial melanism in moths in the 19th century. He then argued that selective predation on moths does not occur and that melanism comes about in the absence of any selection because pollutants in the environment induce heritable change in the genotype. Everyone would agree that the observations of early observers are of great value. However, there is plenty of evidence for selective predation and none for gene induction as a cause for melanism. I pointed this out in a subsequent letter (Cook 2013). Fryer (2013) has now returned to the subject with a long piece covering the same ground as before and ignoring or misunderstanding all the contrary evidence. There is no point in further response except that (1) *The Linnean* is now on open access so that anyone can read it (www.linnean.org/thelinnean), and (2) the induction issue has been with us for a century and deserves to be put at rest. It is therefore important to list the evidence again.

One reason for rejecting induction of melanic mutants by pollutants is that no one ever found induced melanics in the progeny of typical x typical crosses when the environment was polluted, whereas on Fryer's assumption we would expect several per cent. This is not a new observation (Haldane 1924). Since Haldane's time and until the end of the polluted industrial period such crosses were made repeatedly in the course of experimentation. Numbers were not published since they provided no new information, although Bowater (1914) lists a case of over 200 progeny in two families with no melanic exceptions. In the progeny of 41 published families mined from the literature by Creed *et al* (1980) which involved typical homozygotes crossed to typical/carbonaria or typical/insularia heterozygotes there were 3,375 typical and 3,275 non-typical progeny. Hundreds fewer typicals would be expected on the basis of the substantial melanic induction proposed by Fryer.

The most important reason to reject induction is that genetic analysis of haplotypes carrying the carbonaria controlling sequence obtained from different parts of the country carry the same combination of associated sequences, distinguishing them from typical haplotypes and showing that this melanic form has arisen only once (Van't Hof *et al* 2011), at least within Britain. The melanics therefore cannot have been continually induced by environmental pollutants. If only one mutation was induced how could it have increased in frequency and spread rapidly except by selection of some kind? Fryer cites a case of polyphenism in larvae of a moth as supporting his induction theory. Polyphenism is an interesting phenomenon but it is not induction of mutations (see Nijhout 2003; Noor *et al* 2008).

Fryer has no explanation for the post-industrial decline of melanic frequency in peppered moths and claims that melanics have spread throughout the country. That is simply wrong. While frequencies were dropping dramatically where they were high the region of high frequency shrank in extent (Cook *et al* 1990; Cook 2003); this is most completely recorded on the cline from Leeds to north Wales (Saccheri

et al 2008). Finally, Fryer cannot explain the fact that in several places the insularia morph increased in frequency while carbonaria was declining, a result to be expected if insularia was intermediate in fitness to the other two morphs (Cook & Grant 2000) but not if there were gene induction and no selection.

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Laurence Cook FLS
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Western gorse in the eastern hemisphere

After reading the report by our Executive Secretary on the Field Trip to Wales earlier this year (Rollinson 2013), I was sorry not to have attended it myself. I am sure she will have done much not only to encourage existing Fellows to become more actively involved in Linnean Society events but also to promote new membership of this Society. At a time when we often read or hear so much about the loss of species and their habitats, I am pleased to be able to comment on the wider geographical range of one of the plants she mentioned.

Image: *Ulex* (Wikimedia — Richard NF)

Dr Rollinson described the visit to South Stack on the Isle of Anglesey in NW Wales (*ca* 4º40' W) to investigate its interesting coastal flora, birdlife and geology. She reports "...we observed the maritime dwarf shrub heath, dominated by *Ulex gallii* (western gorse or dwarf furze) which is only found in the extreme west of Britain...". Dwarf furze or dwarf gorse is *Ulex minor* Roth and it has a shorter calyx than western gorse, *U. gallii* Planchon. Ingrouille (1995) commented that the distributions of these two short species of gorse scarcely overlap except around Poole Harbour in Dorset, with *U. gallii* extending west from there along the south coast of England to the Lizard peninsular in Cornwall (*ca* 5º10' W). Perring and Walters (1962) gave more detailed maps of the distributions of these two species of *Ulex*, with at least 16 records of *U. gallii* occurring in Kent and East Anglia between 1930 and 1962, east of the Greenwich meridian. Lawson and Sanford (1999) reported on its presence in Suffolk, with Sanford and Fisk (2010) showing *U. gallii* as growing just north of Great Britain's eastern extremity in Lowestoft (*ca* 1º45' E).

In a wider European context, Polunin (1969) stated that *Ulex gallii* ranges from Portugal to Great Britain. Therefore its presence at Lowestoft might well represent the eastern limit of its recorded worldwide distribution. It is known that viable seeds of common gorse (*U. europaeus* L.) have been found in the crops of wood pigeons, *Columba palumbus* L. (Ridley 1930). These birds have a broad diet and they can easily cross a gradually warming North Sea. So, might it not be reasonable to suggest that botanists on the coasts of Belgium and Holland could keep an eye open for the possible arrival of the congeneric western gorse even further into the eastern hemisphere?

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Extras

Upcoming Lecture

Type specimen of Asian elephant, lost and found

1 May 2014, 18.00–19.00 Linnean Society

Speakers: *Prof Adrian Lister, Natural History Museum, London and Prof Tom Gilbert, Statens Naturhistoriske Museum, Copenhagen.*

An elephant foetus preserved in a museum jar formed the starting point for a remarkable story of taxonomic sleuthing. Listed by Linnaeus in 1758 as a type specimen of *Elephas maximus*—the name that became associated with the Asian elephant—its large ears were always a concern, and cutting-edge research using protein and DNA sequencing has shown that the specimen is in fact an African elephant. This research was published in the *Zoological Journal of the Linnean Society* in November 2013, two key contributors of this research will tell us more about the lost and found type specimen for the Asian elephant. Don't miss what will be an exciting lecture!

Burlington House:
Arts and Sciences in the Heart of London

At our Burlington House site we are developing strong links with our courtyard neighbours; the Geological Society, the Royal Astronomical Society, the Society of Antiquaries, the Royal Academy of Arts and the Royal Society of Chemistry.

Details of all the Societies' meetings will be posted on a shared website (burlingtonhouse.org) and we hope to be working together on collaborative projects like the Open House London event on 20 September 2014, and beyond.

Corrigendum

The Linnean 29.2: The *Pterocarya* pictured with Sylvia Phillips on p 8 of this issue is not *Pterocarya* x *rehderiana* but the newly introduced *P. macroptera*, probably one of the first introduced to the UK. We apologise for this inaccuracy.

The Mosquito: an eloquent defence of Linnaeus

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Introduction

It is well known that Linnaeus' classifications aroused ire and controversy among many of his contemporaries. His use of the sexual system for plants seemed outrageous and offensive, and his inclusion of humans as quadrupeds among the primates put his personal safety at risk by brazenly challenging church and establishment. Though his classificatory scheme had many advocates, Linnaeus' arrogant and peremptory persona provoked jealousy amongst his Swedish colleagues (Lindroth *et al* 1983). As an international figure, Linnaeus earned British admiration, but faced a bristly reception in Europe, especially when he offended such authorities as Albrecht von Haller, the famous Swiss botanist and physician (Hjelt 1870).

Here we present a translation of an article praising Linnaeus, published in Berlin in the mid-1700s, and featuring a delightful poem, 'The Mosquito' (Anon 1757). This article was published in the serial *Physikalische Belustigung*, which translates literally as 'Physical delights'. This serial was one of the earliest publishing ventures in popular science, and illustrates the public's growing interest in science during the Enlightenment. First produced in 1751, by Christlob Mylius (1722–54) and Abraham Kästner (1719–1800), *Physikalische Belustigung* reflected the pair's interests in scientific discoveries, and though published irregularly, the journal's 30 issues included original articles, commentaries and translations. Its final issue contained seven articles, ranging from the commentary on Linnaeus to such diverse pieces as 'A new theory of moonlight', 'Tea in Paraguay', and 'Journey into Space'. We have no information on how widely it was circulated, but no doubt its intriguing and eclectic content made for a successful publication. The article on Linnaeus is unsigned, as are all but one of the articles in this issue. It seems likely, however, that Kästner himself wrote the article; he was well known for poetic fables (Baasner 1991), and Mylius, the other editor and contributor, had died a few years earlier.

We present the translation largely for the poem, 'The Mosquito', but the article itself may be of interest, at least for some of its rather telling metaphors, so we include

it for completeness. The author defends the natural system of classification, and realises (as did Linnaeus himself) that the 'natural' Linnaean system, while necessarily partly 'artificial' out of convenience, was an enormous advance over previous systems. The poem metaphorically challenges the criticisms cast on the Linnaean system by those who did not recognise its value. It recounts the observations of a myopic mosquito who, unable to understand the beauty of a Greek statue, criticises the whole thing for defects it perceives in the details. We have kept the translation of the text fairly literal, but taken some liberty with the poem. We therefore also reproduce the poem in German. The original text is available via the web at Google Books.

Translation

III. On the systematic classification of minerals, plants, and animals into Classes and Orders.

We are fortunate to have progressed sufficiently in the study of natural history to have devised good systems of classification for all sorts of species, and ones that are flexible enough to incorporate further observations. Even people who study natural history merely for pleasure can see how much they owe to Linnaeus who revised the chaos and idiocy in natural history so thoroughly that for this he had to endure a torrent of criticism. Without having a proper system for every realm of nature, it is impossible to acquire knowledge and reach the right goals. The anti-systematists (and there are still many of them, because there have always been plenty of ignoramuses) must rely almost totally on memorisation, and all they acquire is past knowledge, whereas a systematist can undertake the most exact investigation with little effort and insightful confidence. Many people today agree with us on this point. If it were only as easy to convince them which classification is the best and how it can be most usefully achieved. In this respect, most people place too much trust in their own intuition. Does not every reasonable person, who is used to thinking a bit deeper, have to laugh when another botanist still divides plants into trees and herbs and considers that this is a natural division? The older scholars, who had to break the ice, can be excused, although many of these already had progressed further. The gardener is

happy to split them in this way, and perhaps the farmer too. But the herbalist should have better grounds for division. We however, we who can stand on their shoulders must see further than they, or not want to insist on what we see, let alone blame famous men who see further than us, lest we be in the position of the mosquito in the following fable:

The Mosquito

On a marble statue,
which to give the finest sheen
an artist had much care decreed,
once a mosquito crawled about.
And like a philosopher
who deeply thinks in pose,
and places his finger
on his wrinkled nose
to pretend to argue learnedly,
it likewise rubbed
its beak with spindly feet
while entertaining thoughts.

It spoke: I'd like to know indeed
why some wise fool
stands by this image raptured.
Wherever my foot treads,
The ground is rough and coarse.
And as far as my eye can probe,
there is no beauty to behold.
Thus 'tis only fools who praise!
* * *

A small mind that toils in vain
to understand the beauty of the whole,
is satisfied with pointing out the smallest stain
and can but insult him who has the larger view.

Die Mücke

An einer marmoren Statüe,
Um die ein Künstler sich besondre Mühe
Den feinsten Zug zu treffen gab,
Kroch einst die Mücke auf und ab,
Und wie ein Philosoph, der tief zu denken pflegt,
Den Finger, um gelehrt zu zanken,
Auf die gerümpfte Nase legt;
So rieb sie auch zu forschenden Gedanken,
Die Schnauze sich mit dürren Füssen.

Sie sprach: Ich möchte doch wohl wissen,
Warum so mancher weiser Thor
Entzückt bey diesem Bilde steht,
Es fühlt mein Fuß, so weit er geht
Den Boden rauh und holpricht an.
So scharf mein Auge forschen kan,
Will wir sich doch nichts schönes weisen,
Drum Thoren sind es, die es preisen!
* * *

Ein kleiner Geist, der sich umsonst bemüht,
Des Ganzen Schönheit einzusehen,
Begnügt sich im Vorübergehen
Die kleinsten Fehler auszuspähen,
Und schimpft auf den, der weiter sieht.

The Linnaean plant system is this beautiful statue on which many mosquitoes have been crawling. Nevertheless, it is hardly my purpose here to involve myself with stubborn people. I only want to say something regarding a bias to which we are all prone when we look at the classification of the works of nature by others. I have often heard of complaints about the unevenness of Classes. However, nothing is more certain than that in a truly natural system, some Classes would often have high abundances, while others would often consist of only one or a pair of members. Let us see whose fault this is. If one wants the philosopher of natural history to divide things up correctly then it is indisputable that he must do it in the same way that nature has.

Most people, when they consider a natural system, don't realise that nature does not make Classes and Orders, like in a school. These latter are no doubt very similar to each other. However in nature, one should not be beholden to this concept of Class and Order. For example, there are so many kinds of plants that are so similar to each other that even someone who is inexperienced easily sees that they cannot be separated from each other. One of the clearest examples is the Class Papilionaceorum or the Diadelphia of Linnaeus. Conversely there are very many flowers that differ greatly from each other and one can therefore only put them each in a **single**[1] Class, or even a single Order. Thus a single class should be made on the basis of rules and similarity in nature. And this is really the reason why we still don't have a singular natural system for the plant kingdom, because the students of nature appear not to have considered that a whole natural Class (indeed very often) has to consist of relatively few kinds of plants. And it should be expected that some such classes would be more abundant than others. One can consult the Linnaean philosophy of botany to see how many plants remain which do not want to be placed into any natural order. The difference in natural history between a real systematist and a false one is as big a difference as that between a **dissectionist** and a **butcher**. The latter is intent on making attractive and equal pieces out of a body, and does not give a thought to the joints, or accordingly to divide the whole of the body into pieces. The former however, is careful to consider nature in all its smallest parts, and does not care whether his parts are all attractive and of the same size. In this respect, I think, one can find no better analogy. It can also serve as a proof of how nature itself alternates between the large and the small. We can often find the reason why some classes are not as substantial as others. The amphibian Class is considerably smaller than the others, and who does not see in this the wisdom of the Creator who did not want to afflict us with more mostly harmful animals.

"The difference in natural history between a real systematist and a false one is a difference as big as that between a DISSECTIONIST and a BUTCHER."

I cannot explain this better than by using the fifth Order of the Class of quadrupeds in the Linnaean system. The other five Orders clearly suggest a natural division based on the teeth (Footnote in original: I exclude some details which, after the reminder of Mr Kleims, Mr Linnaeus corrected in subsequent editions); thus the characteristics of this fifth Order are described as 'Dentes a reliquis 1.2.3.4.6. diversi, anomali'[2,3]. Here I can say nothing other than that each of these animals should be put into its own Order because nature had wished for nothing else in view of the natural differences between these animals, and their lack of similarity with each other. The **elephant** and the **rhinoceros** and perhaps the **pig** could be put in the same Order, but the **horse** and the **hippopotamus** should each obviously be in their own Orders. Incidentally, Mr Linnaeus seems to have done quite well here by not making several Orders out

of these, so as not to scatter our memory too much, and not to cause trouble for the weak.

If one now considers these small things, one will hopefully be sufficiently convinced how essential it is in natural history to leave aside all that which to us seems otherwise correct and noble in ordinary life. Indeed, one must follow nature exactly in all its aspects, and embellish it with nothing extraneous.

Footnotes to the translation

1. The words in bold are also in bold in the original text.
2. Translated from the Latin this is: Teeth different from other orders 1,2,3,4,6, diverse, anomalous.
3. The author here is referring to one of the earlier (6th to 9th) editions of the *Systema Naturae*, published in 1748–56. In these editions, Linnaeus distinguished the Class Quadrupedia as having six Orders: variously these included Anthropomorpha (man and primates), Ferae (carnivores), Glires (rodents), Jumenta (horses, hippos, elephants and pigs), and Pecora (ungulates). In the 1st to 5th Editions (1735–47) Linnaeus distinguished only five orders of Quadrupedia. In the 10th Edition, published in 1758 after this article, he dropped the name Quadrupedia and substituted Mammalia (Schiebinger 1993).

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Edward Alfred Heath FLS (1839–1907): homoeopath, amateur naturalist and beetle collector

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Edward Alfred Heath was born on 22 June 1839 in Totnes, Devon, and educated as a pharmacist in Taunton (Holmes 1908). In 1864, at the age of 25, he moved to London, where he established a successful homoeopathic pharmacy in fashionable Belgravia, at 114 Ebury Street, Pimlico (now the site of a coffee house). In his spare time, he seems to have pursued an eclectic interest in a wide range of natural history topics, with serious dedication.

On 20 March 1884, at the age of 44, Heath was elected Fellow of the Linnean Society. The Form of Recommendation gave 'Botany and *Materia Medica*' as his main interests, and was signed by four fellow botanists, EM Holmes, HN Ridley, BD Jackson and J Colebrook. Edward Morell Holmes FLS (1843–1930) was Curator of the Materia Medica Museum of the Pharmaceutical Society for 50 years, Fellow of the Linnean Society for 55 years, and member of its Council from 1882 to 1885; he probably knew Heath in a professional capacity as a pharmacist and later came to write his obituary for the *Proceedings of the Linnean Society*. Henry Nicholas Ridley FRS, FLS, FRHS (1855–1956) was the first Scientific Director of the Singapore Botanic Gardens (1888–1911) and Linnean Medal recipient for 1950 (Burkill 1958). Dr Benjamin Daydon Jackson FLS (1846–1927) was curator of the Linnean Collections, served as Secretary, General Secretary, and Council member of the Linnean Society, and was founding editor of the *Index Kewensis* (Anon 1927). Dr John Colebrook FLS, was a former pharmacist and retired surgeon of HM Army in Madras, with wide-ranging interests in natural history, very similar to Heath himself.

Heath rapidly started to make active contributions to the Society's weekly meetings, initially focusing on the larger native fauna. On 18 December 1884, under the auspices of 'Sir John Lubbock, Bart., F.R.S., President, in the chair ... Mr. Edward Alfred Heath exhibited a stuffed adult specimen of a Wild Cat, which had been found dead in a trap (Nov. 1884) in Ben Armin Deer Forest, Sutherlandshire, in which district they are still frequently met with'.[1] On 15 January 1885, 'Mr. E. Alfred Heath exhibited a common Martin from Inverness-shire, and a Stoat in its winter coat from Ross-shire' and later

the same year ‘stuffed specimens of the Hen-Harrier, Common Buzzard, Peregrine Falcon, male and female, and an old Raven’ (7 May), ‘a Golden Eagle in its characteristic plumage of the second year’ (5 November), rounding off this productive year with the display of ‘a fine example of the common Pole-Cat (*Mustela putorius*) from near Caermarthen’ (17 December). On 16 December 1886 ‘Mr. Edward A. Heath exhibited a Stormy Petrel (Mother Carey's Chick), *Procellaria pelagica*, which was picked up alive in Kensington Gardens [during the previous week] the bird evidently having been driven inland during the great storm of the preceding day’. At the same meeting, HRH the Prince of Wales was elected an Honorary Member of the Society, and one wonders if the later Edward VII was present for the occasion and also examined the hapless bird.

After this vertebrate phase, Heath’s attention briefly turned to exotic plant life, orchids and nightshades. This interest was to last a few years. On 15 April 1886 ‘Mr. E. A. Heath showed living examples of *Dendrobium densiflorum* and *D. suavissimum*’, on 3 November he ‘exhibited well-preserved examples of the fruit of two species of *Solanum* (*S. mammosa* and another) from Barbadoes’. Further evidence of his interest in orchids is given by him buying at auction in 1883 an example of *Laelia anceps dawsoni,* which had come from Lord Egerton’s hothouses at Tatton Park, Cheshire. Heath had to pay £26–5–0 (about £2,600 in today’s value) for the privilege (Allingham 1924; p 119). He then moved for a two-year residency to Philadelphia obtaining his Doctor of Medicine at the Hahnemann Homoeopathic College, the first US college of homoeopathy, now part of Drexel University College of Medicine. This was a wise investment contributing to the flourishing of Heath’s practice and made him a well-regarded authority in international homoeopathic circles. In 1898, at the height of public debate on compulsory vaccination, Heath self-published (Heath 1898) a homeopathic view in which he attempts to explain how in an age of ‘perfect sanitation’ increased incidence of various diseases was evidence for the ‘poisoning’ influence of animal vaccines. This anti-vaccination attitude was then widespread and shared, eg by influential fellow Linneans, such as Alexander Milton Ross and Alfred Russel Wallace. The suggested response to the surprisingly increasing incidence statistics and widespread deaths from cholera, influenza and smallpox was to be ‘more healthy’, take homoeopathic preparations and avoid injections. In 1900, Heath received an honorary degree from Hering Medical College, Chicago, probably largely in acknowledgement of this public advocacy work.

“… a momentous change has happened in his life: he has finally caught the ‘beetle bug’.”

When Heath reappears in the printed pages of the Linnean Society *Proceedings* a momentous change has happened in his life: he has finally caught the ‘beetle bug’. On 1 November 1894, ‘a series of that remarkable Beetle *Goliathus giganteus* from West Africa was shown by Dr. E. A. Heath…’. This was the first sign of the intense interest

in tropical Coleoptera that seems to have dominated Heath's later life. His successful medical practice seems to have prevented a large output of entomological publications, but his growing reputation as a collector can be deduced from acknowledgements in the scientific work of well-known Victorian practitioners. He provided specimens of various species from Africa and Asia to the British Museum (Natural History)—now the Natural History Museum, London—for use by Gilbert Arrow (1901), who gratefully named one of the species after him, *Pheropsophus heathi*: 'The type of this fine species has been presented to the Museum by Dr. E. A. Heath, who possesses a second specimen, from Burma, Moulmein [=Mawlamyine]).'[2] Karl Jordan (1903), curator at Walter Rothschild's Museum in Tring, Hertfordshire, and later president of the Entomological Society of London, dedicated another new species, *Cubilia heathi*, 'One male, named in honour of Dr. E. A. Heath, from whom we have received the specimen', from Nengia, British Central Africa [now in D.R. Congo].

In the few years just before and after retirement to Shoreham in Kent in 1904, Heath finally found the time to publish a series of papers on particularly striking specimens of African beetles in his own collection (Heath 1900; 1903a; 1903b; 1904; 1905a; 1905b). These contributed a total of ten new names, mostly of longhorn beetles and flower chafers, six of which are still considered valid taxa (see Supplementary Table at www.linnean.org/thelinnean). Heath died soon after publishing these papers in 1907, aged 68, of an acute attack of jaundice. His obituaries, in the *Proceedings* and various international homoeopathy journals, do not mention any surviving next of kin.

The Heath Collection of Coleoptera

In the relatively brief period that Dr Heath dedicated to the serious acquisition of exotic beetles, he amassed 'one of the largest private collections in the kingdom' (Holmes 1908). After his death the material got scattered widely, a large part of his specimens being sold at the Stevens Auction Rooms in London, the same place where he had acquired his pricey orchid 15 years earlier, and where he probably had bought many of the beetles in his collection (Horn & Kahler 1935–7). Some of the types of his new cetoniid species are now in Naturalis, Leiden, The Netherlands (via Oliver E Janson and then Frans Titus Valck Lucassen), and in the Natural History Museum, London. The majority of the longhorn beetles including all the types of Heath's new cerambycid species (eg Fig 1), found

Fig 1 Type specimen of *Zographus balteatus* from the Heath collection

Images: supplied by the authors

their way to Thomas George Bishop (1846–1922), an affluent collector from Glasgow, Scotland, who regularly bought important large insect collections, in addition to being one of the early collectors of the 'Glasgow Boys' school of painting.

Fig 2 The cabinets containing the majority of Heath's longhorn beetles in their current location in The Hunterian (Zoology Museum)

The Heath collection was originally in eight 20-drawer mahogany cabinets resembling those of the famous London cabinetmaker JT Crockett & Sons. Five of these (ie, 100 drawers), plus about two dozen unsorted boxes, are of longhorn beetles, a total of about 10,000 specimens and almost 1,000 species. Despite the quantity, this represents only about 5% of the current world total of known cerambycids (Fig 2). The other three cabinets contained tenebrionid and meloid beetles and some families within the Adephaga and Hydradephaga. These mainly originated from the collections of Lucien-Francois Lethierry (1830–94). It is not clear if these had been bought originally by Heath and then acquired by Bishop or came directly to the latter, who then incorporated them. The longhorn element is in good shape, with most of the specimens treated by including large sturdy cards under each one to protect the long antennae and legs from accidental damage. Any existing labels were pasted onto the upper surface of the cards. This work was carried out sometime in the 1930s by Robert Staig, entomologist on the staff under the Professor of Zoology at Glasgow, Sir John Graham Kerr FRS (Linnean Medal 1955).

Since its arrival in The Hunterian, University of Glasgow, the collection seems to have been worked on very little, with few specimens being re-identified to species. Some new material has been added by staff, University of Glasgow expeditions, or relatively small donations. Roy Albert Crowson (1914–99), Glasgow's famous evolutionary scientist, used the Coleoptera as exemplars for all basic biological principles (cf Crowson 1981). He was appointed as lecturer in Zoological Taxonomy in 1948 and produced a textbook on classification and biology in addition to his coleopterist research output (Crowson 1970). He had been attracted to the university partly due to the potential of the Bishop collection as a resource for his target group (Crowson 1995). But the Cerambycidae were not problematic enough in their phylogenetic positioning to attract much attention for his work, although the museum collection provided preserved material from more obscure families for his ground-breaking work

Fig 3 *Anoplosthaeta jardinei* White, 1858, specimen bearing Adam White's characteristic handwriting. Probably a syntype.

on beetle families (Crowson 1955). He was honoured in 1980 as a recipient of the Linnean Medal for Zoology.

There is a considerable amount of material of historical interest among the contents of Heath's cabinet. For example, the collection contains a specimen of *Anoplosthaeta jardinei* (Fig 3), a species described in 1858 by Adam White FLS (1817–78); (Hancock 2004), with an original label in White's characteristic handwriting. Alfred Russel Wallace, another notable Fellow of the Linnean Society, is represented by several labelled cerambycids from his travels in Southeast Asia, including *Choeromorpha wallacei* from Borneo (Fig 4), which according to one biographer was such a highly prized species that the sale of specimens contributed substantially to the financial success of Wallace's expedition (Bryant 2006).

Fig 4 Cerambycids from the Heath collection as re-curated in the 1930s. The protective cardboard is visible under the specimens, as with these specimens of *Choeromorpha wallacei* from Borneo.

Recently, following almost 80 years of near neglect, it has been decided to re-sort the Heath material and incorporate it into the general museum collection, curating and documenting specimens of special historical interest, bringing the nomenclature up to date, identifying as many of the specimens as possible, and thus generating an accessible overview of the biodiversity represented. This will be work for several years, given current reliance on voluntary work. The first steps are already providing fascinating glimpses of the discoveries that may be possible (Breitling 2013).

Notes

1. This and the following quotes are from the *Proceedings of the Linnean Society* under the corresponding date.
2. This second example does not seem today to be amongst Heath's material in The Hunterian, Glasgow.

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Charles Darwin's Illness

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Introduction

Charles Darwin suffered from a persistent, debilitating illness for most of his adult life with a wide range of bizarre symptoms (Colp 2008). Attacks of nausea and vomiting were his most distressing complaint but he also experienced headaches, abdominal pains, 'lumbago', palpitations and chest pain, numbness and tingling in the fingers, sweating, abnormal heat and cold sensitivity, flushing and swelling of his face and extremities, eczema, recurrent boils, attacks of acute anxiety, a sensation of dying and hysterical crying. His abdominal symptoms were associated with much flatulence with the noisy expulsion of pungent gas both 'upwards and downwards'. In addition to all of this he also suffered from episodes of severe lethargy when he was virtually confined to his sofa.

In his fifties Darwin developed several, more sinister symptoms. He had several episodes of memory loss and temporary partial paralysis, and probable epileptic fits (Litchfield 1887). These could reasonably be described as 'stroke-like' episodes; 'stroke-like' as, unlike the more common vascular cerebral episodes, the areas of brain damage do not relate to major arterial vessels.

Apart from these major symptoms Darwin also occasionally vomited blood, he developed dental decay and skin pigmentation. The sea-sickness he experienced during the entire five year voyage of *HMS Beagle* was also part of his illness (Darwin 1839).

Darwin's symptoms were certainly unusual but they had several even more unusual features:

- His illness was episodic and attacks were brought on by stressful events, even very minor stresses or pleasurable events such as the visits of friends. Perhaps the first of these attacks was after he attended two concerts in the one day, in Birmingham in 1829, when: 'It knocked me up most dreadfully, & I will never attempt again to go to two things on the one day' (Darwin 1829). Another such event was when he addressed the Linnean Society in April

1862. Darwin went to London to give a short paper on what was then his main interest, the sex life of orchids. Before the meeting he had headaches for several days and afterwards was ill with vomiting: 'I by no means thought that I produced a tremendous effect on the Linn. Soc., but by Jove the Linn. Soc. produced a tremendous effect on me for I vomited all night & could not get out of bed till late next evening, so that I just crawled home. —I fear I must give up trying to read any paper or speak' (Darwin 1862).

- The vomiting occurred several hours after meals (not immediately, like bulimia), so that he vomited bilious fluid, not food. He may certainly have suffered from fluid and electrolyte depletion but not from starvation—he seldom lost much weight (Darwin and Litchfield 1915).

- His major symptoms had a reciprocal relationship to his eczema and to his 'lumbago' or 'rheumatism' (fibromyalgia). He noted that when either of these conditions was bad his other symptoms improved. In a letter to Hooker in January 1864 he described how for five months he 'had done nothing but be sick'. In the same letter he mentions how he 'suddenly had a slight attack of rheumatism in my back & I instantly became almost well & so wonderfully strong that I walked to the Hothouse, which must be more than 100 yards' (Darwin 1864).

- He obtained relief, at least initially, from hydrotherapy, 'the Water-Cure': 'The Water-Cure is assuredly a grand discovery & how sorry I am I did not hear of it, or rather that I was not somehow compelled to try it some five or six years ago' (Darwin 1849).

Previous Diagnoses

More than 40 diagnoses for this illness have been proposed, a list beginning from when Darwin first showed symptoms of his ailment until the present day (Colp 2008). Many of these diagnoses can be dismissed as they were for conditions that are no longer recognised (aggravated dyspepsia, suppressed gout) or for conditions that exist only in the realm of alternate medicine (pyroluria, candida overload). Other suggested diagnoses that relate to his five-year voyage with the Beagle may also be crossed from the list as Darwin had definite symptoms before he sailed. These include exotic infections such as Chagas Disease (Adler 1959), malaria and brucellosis. Psychogenic or psychological diagnoses were once popular. The diagnosis that encompasses most of Darwin's symptoms is that of the Cyclic Vomiting Syndrome (CVS) (Hayman 2009). Patients diagnosed with this disorder frequently experience motion sickness and have relief from water exposure. Attacks of illness may be brought on by pleasurable events, which was one of Darwin's more distressing observations. Even a visit from friends would bring on an attack of his illness.

The symptoms of CVS may overlap with those of other disorders, such as lactose intolerance, irritable bowel syndrome, abdominal migraine, panic disorder, fibromyalgia and chronic fatigue. All of these diagnoses have been proposed as the essential cause of Darwin's illness. None, however, including CVS, explain all of Darwin's symptoms. His wide range of symptoms, affecting several different organ systems, rather than indicating a psychological complaint, suggests he had a mitochondrial disorder.

Mitochondria

Cells contain many mitochondria, varying from several hundred to several thousand, their number depending on the particular cell's energy requirements.

The human ovum contains many thousands of mitochondria arranged concentrically around the nucleus. Sperm, in contrast, contain relatively few mitochondria and these do not survive in the zygote. All of our mitochondria are maternally inherited.

Most of the enzymes present in mitochondria are encoded by nDNA, only relatively few are encoded by mtDNA. As a result, abnormalities of mitochondrial function may be inherited either in a Mendelian fashion, or, if due to a mtDNA abnormality, in a matrilineal pattern. Regardless of the particular enzyme abnormality the end result is much the same—decreased ATP production.

Cells may contain a mixture of normal or abnormal mitochondria, a situation known as heteroplasmy. Mitochondria split during cell division, normal and abnormal mitochondria pass randomly to the daughter cells so that the level of heteroplasmy may vary widely in subsequent cell generations. Different tissues and organs may, as a result, show considerable variation in heteroplasmy levels.

Ova in the one ovary may show considerable variation in heteroplasmy (Taylor and Turnbull 2005). As a result of this, and as a result of variations in the developing zygote, children from the same mother, with the same mtDNA abnormality but with different levels of heteroplasmy may have very different symptoms or may have no apparent symptoms at all.

Darwin's Family History

Darwin's numerous symptoms, rather than being an indication of a psychological illness are more consistent with a mitochondrial disorder. Darwin's family history displays a strong matrilineal pattern of sickness showing that this illness was most likely due to an inherited mtDNA abnormality (Hayman 2013). Darwin's mother and his maternal uncle, Tom Wedgwood, both had strange chronic illnesses.

Darwin's mother, Susannah (1765–1817) died when Charles was eight; as a child she was dipped into the icy Irish Sea 'to cure her pukes and boils'. As an adult she was unable to ride in a carriage without being ill, had hyperemesis with her pregnancies

and died at the relatively early age of 52 years with acute abdominal pain (Healey 2001), pain that may have been due to acute pancreatitis.

Her younger brother Tom Wedgwood (1771–1805), Charles' maternal uncle, suffered severe headaches, abdominal pains and was confined to his cabin with seasickness on his one voyage to the West Indies, a journey taken in an attempt to improve his health (Wedgwood and Wedgwood 1980). He died of an opium overdose at the young age of 34.

The most telling history is that of their youngest sibling, Mary Ann Wedgwood (1778–86) who was of short stature and both physically and mentally retarded. She suffered from recurrent fits followed by episodes of blindness with progressive deterioration, dying at the age of eight. A description of one of these episodes is in a letter written in 1784 by their father, Josiah Wedgwood (1730–95) to his friend and partner Thomas Bentley, describing an episode of what appears to be cortical blindness.

An abbreviated transcript reads:

> After writing to my dear friend yesterday evening I tried various methods to discover what degree of sight our poor child had left, and of what nature the defect might be. Before I went to Lichfield I conjectured that she had lost the faculty of adapting her organs of vision to the distances of objects, which would occasion a confused, and double vision, and I was the more confirmed in my conjecture from her seeming at first sight to (be) frightened at her nurse, or sister, or those of whom she was the most fond before, and Dr (Erasmus) Darwin to whom I mentioned these circumstances was of the same opinion. But when I could not make her perceive any object the last night 'till I touched her with it, I was very much alarmed for both her eyes, … . … my fears are much less for my little girl this morning, as I find she can see by daylight, though not very distinctly, and I apprehend double from her sometimes putting her hand on one side of anything she offers to take at the first effort, when she tries again 'till she gets hold of it. I hope she will get the better of this defect, by practice, if her fits do not return, and I am exceedingly happy now to be assured that she has any sight at all remaining.

Her illness is typical of the MELAS syndrome, an entity first described in 1984 (Pavlakis *et al* 1984) and most frequently associated with the A3243G mitochondrial mutation (Goto *et al* 1990).

Other children in that generation had or developed less specific illnesses—essential tremor, Parkinson's disease and cognitive decline. One child, Richard (1767–68) died in infancy with what may also have been acute pancreatitis.

Conclusion

Charles Darwin's illness, including his seasickness and his 'stroke-like' episodes, the illnesses of his mother and her younger siblings, their mother, and Charles' own siblings, in particular Erasmus, may all be explained by one mitochondrial abnormality,

most likely the relatively common A3243G mtDNA mutation (Finsterer 2007). Their illnesses, collectively, had features of cyclical vomiting, abdominal migraine, lactose intolerance, irritable bowel syndrome, chronic fatigue syndrome, and fibromyalgia. If the hypothesis presented is accepted the detailed Darwin-Wedgwood family histories show how these poorly understood disease entities may be interrelated and may have a common aetiology. Other conditions, such as Parkinson's disease, essential tremor and acute pancreatitis may also, at least in some patients, be linked to the same or to a similar anomaly. It would seem that Darwin is still able to teach us something of our own biology.

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Alfred Russel Wallace notes 5: Just how well known *was* Wallace in his own time?

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Over the past years I have several times expressed the conclusion that the celebrated naturalist Alfred Russel Wallace (1823–1913) was, in his later years, one of most famous scientists in the world (eg Smith 1998; 2004). As these statements have recently been challenged (see p 30), it seems they now must be more substantively defended. I will attempt to do this here in three ways: (1) by providing period quotations to this effect (2) by giving the results of a short content analysis, and (3) by allusion to Wallace's record of success in publishing.

Good evidence of his esteem—and fame—is, simply, what people of his time were saying about him. Following is a list of quotations, taken first from Wallace obituaries, and then from other printed sources.

From Obituaries:

'…one of the most fruitful and richly freighted lives ever devoted to the twin causes of Truth and Humanity.' (*The Daily Chronicle* (London), 8 November 1913, p 1); 'He was one of the greatest and clearest thinkers of his age.' (*The Daily Citizen* (London), 8 November 1913, p 1); '…the greatest of all modern scientists…' (*The Daily Mirror* (London), 8 November 1913, p 4); '…he was a great man in the truest sense of the word.' (*British Medical Journal,* 15 November 1913, p 1338); '…one of the world's greatest scientists…' (*Forest and Stream*, 15 November 1913, p 627); 'The doyen of English scientists…' (*The Dial*, 16 November 1913, p 416); 'We should not know where to look among the world's greatest men for a figure more worthy to be called unique.' (*The Independent* (New York), 20 November 1913, p 329); '…a great and significant career has just been closed, but its full measure will probably never be known to any single man.' (*Science*, 19 December 1913, p 871); '…the last survivor of the illustrious band of pre-eminent English naturalists of the nineteenth century…' (*The Entomologist's Monthly Magazine*, December 1913, p 276); '…one of the greatest naturalists of the nineteenth century' (*School World*, December

1913, p 451); '…standing in the highest rank among ornithologists, entomologists and botanists…' (*The Auk*, January 1914, p 138); 'Only a great ruler could have been accorded by the press of the world any such elaborate obituary recognition as was evoked by the death of Alfred Russel Wallace…' (*Current Opinion*, January 1914, p 32); '…was the acknowledged dean of the world's scientists…' (*ibid.*, p 33); '…the last of the giants of English nineteenth-century science…' (*Journal of Botany*, January 1914, p 15); '…ranks far above all his scientific contemporaries as a pioneer of social progress.' (*Socialist Review*, January 1914, p 15); '…a scientific worker of the highest eminence…' (*The Theosophical Path*, January 1914, p 59); '…un des hommes les plus éminents de notre temps…' (*Journal de la Société des Américanistes de Paris* 11, n.s. (1914–19), p 253).

From Other Sources:

'…England's most eminent living naturalist…' (*The Literary World* (Boston), 13 November 1886, p 392); '…the world's greatest living naturalist…' (*The Daily Whig* (Kingston, Ontario), 7 March 1887, p 8); '…the most eminent of living naturalists…' (*The Weekly University Courier* (Lawrence, Kansas), 6 May 1887, p 2); '…the most eminent living naturalist in the world.' (*Daily Evening Bulletin* (San Francisco), 19 May 1887, p 1); '…the greatest living naturalist in Britain…' (*York Herald*, 8 November 1889, p 3); '…the greatest living authority in his department…' (Andrew Dickson White, *Popular Science Monthly*, July 1890, p 299); '…the greatest living working naturalist…' (*The Arena*, December 1892, p xix); 'Of scientific writers still living [one of the three] most prominent in literature…' (James Logie Robertson, *A History of English Literature for Secondary Schools*, 1894, p 360); '…undoubtedly the foremost naturalist in the English-speaking world…' (*Our Day*, November 1895, p 237); '… England's greatest living naturalist…' (*Human Nature*, August 1896, p 53); '…perhaps the most eminent man of science now living' (*The Sydney Morning Herald*, 6 August 1898, p 4); 'The greatest living English scientist…' (Charles Brodie Patterson, *Mind*, September 1898, p 331); '…the greatest living writer on natural history…' (*The Book Buyer*, November 1898, p 318); '…probably the greatest living naturalist…' (*The Coming Age*, April 1899, p 467); '…foremost naturalist of the age.' (*South Australian Register*, 29 August 1899, p 4); '…the most famous scientific man living on earth to-day.' (Minot Judson Savage, *Life Beyond Death*, 1901, p 279); '…its [evolution] greatest living exponent…' (George Croly, *Tarry Thou Till I Come*, 1902, p xiv); '…the greatest living evolutionist…' (*The World To-Day*, July 1 1903, p 802); '…the greatest living evolutionist…' (Robert J Thompson, *Wilshire's Magazine*, October 1903, p 19);

> **"…[If I were asked] what great man would be regarded as the most important and significant figure of the 19th century, I should hesitate between Walt Whitman and Alfred Russel Wallace."**
>
> **—English Illustrated Magazine, 1904**

'…one of the greatest of living Englishmen.' (*The Garden*, 26 December 1903, p 440); '…the foremost living European naturalist…' (Nellie Beighle, *Book of Knowledge*, 1903, p 138); '…[If I were asked] what great man would be regarded as the most important and significant figure of the 19th century, I should hesitate between Walt Whitman and Alfred Russel Wallace.' (GK Chesterton, *English Illustrated Magazine*, January 1904, p 420); '…the foremost living European naturalist.' (*West Gippsland Gazette*, 5 December 1905, p 7); '…our most eminent Socialist…' (*Review of Reviews* (London), November 1906, p 499); '…the greatest living evolutionary philosopher…' (*Watson's Jeffersonian Magazine*, January 1907, p 150); '…the most eminent living evolutionary philosopher…' (*The Arena*, December 1907, p 752); '…the veteran leader of living scientists…' (*The Western Australian* (Perth), 27 February 1908, p 4); '…one of the greatest thinkers…' (*Barrier Miner* (Broken Hill, New South Wales), 26 February 1909, p 2); '…the greatest scientist of the age…' (*The Register* (Adelaide), 2 April 1909, p 6); '…the greatest living representative of many famous men…' (*The Register* (Adelaide), 10 December 1910, p 12); '…the most distinguished of all our living scientists…' (James Ramsay MacDonald, *The Socialist Movement*, 1911, p 88); '…every Socialist of note, beginning with the peer of them all…Wallace…' (*Railway Carmen's Journal*, March 1912, p 146); 'Of the master minds of the last century… Wallace…stands out in its field preeminent.' (*The Bridgemen's Magazine*, February 1913, p 107); 'Perhaps the most distinguished man of science alive to-day…' (*Harper's Weekly*, 16 August 1913, p 29); 'England's greatest living scientist…' (*The Spectator*, Volume 110, 1913, p 493); '… our greatest living scientist…' (*The Literary Digest*, Volume 47, 1913, p 454); 'The most distinguished scientist of recent years…' (Ernest G Steven, *American Law Review*, May–June 1914, p 436); '…at the time of his death…the greatest living scientist in Great Britain…' (Charles Edward Locke, *A Man's Reach*, 1914, p 38).

These remarks run the gamut, from magazines and scientific journals, to newspapers and books. Many are editorial comments; thus, the absence of personal attributions. Searches through other relevant databases would doubtlessly turn up many more such statements.

The matter can also be approached through content analysis. An online search of 60 of the best-known scientists active between 1900–14, via the HathiTrust Digital Library (www.hathitrust.org, which includes a major portion of the total literature of that period, excluding newspapers), revealed that only two then-living individuals, Lord Kelvin and Max Planck, resulted in substantially more hits than Wallace.

Wallace hits came to over 8,000—equal to, or a little ahead of, Robert Koch, Albert Einstein, Walter Reed and David Starr Jordan. Charles Darwin's name results in over 16,000 hits, but the rest of his circle result in fewer than 5,000 each. Surprisingly, a parallel search on naturalists alone, restricted to the years 1870 through 1895, produced similar results, with Darwin significantly ahead at 19,000+, Wallace at 9,000+, and Lyell, Huxley and Richard Owen trailing, in that order.

These data adequately substantiate my earlier remarks. Yet historian John van Wyhe has recently written '… he never approached anything like the level of fame or respect attributed to Lyell, Richard Owen, William Whewell, Louis Agassiz, T. H. Huxley, Hooker, or Darwin' (Van Wyhe 2013a, p 172). Van Wyhe has continued to make such assertions in various public contexts (eg Van Wyhe 2013b, 2013c), and it seems some exception should be taken.

Clearly, the evidence suggests that, Van Wyhe's statements notwithstanding, Wallace *was* among the pre-eminent names in science in his later years. 'Fame' and 'eminence' are one thing, and 'influence', another. Certainly there were many colleagues of his time who looked upon his varied interests with disdain, but there seems to be little indication that this treatment had any effect on shutting down his literary production, or its overall reception. Using Google's Ngram Viewer, Beccaloni (2013) has traced citations of Wallace's works since his time, and while in the earlier years of Wallace's career, Charles Lyell's (and of course Darwin's) works were much more highly cited, in his later years he had passed Hooker, Huxley and Owen, and was about even with Lyell.

Lastly, there is little if any evidence that any of Wallace's scientific writings encountered resistance to getting into print, from any of those who might have disapproved of his spiritualism or socialism. One should therefore seriously question whether such disapproval had much of an effect on his literary career—and the general level of esteem held for him—at all.

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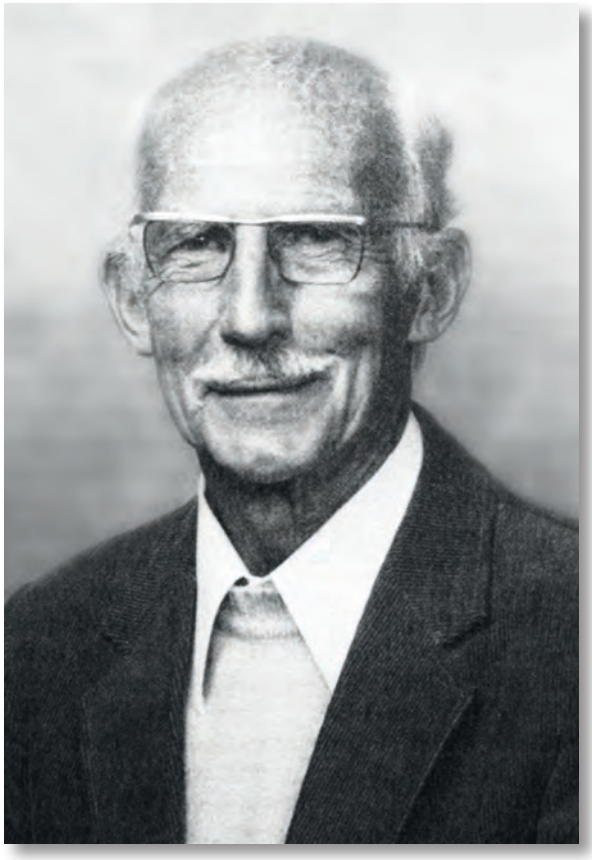
Elis Wyn Knight-Jones, HonFLS (1916–2012)

Wyn Knight-Jones was born in Stone, Staffordshire, on 7 March, 1916, but grew up in North Wales. He was educated at Epsom College, Surrey, and went up in 1933 to the (then) University College of North Wales, Bangor, where he read Zoology, obtaining first class honours in 1939. In December that year he married a fellow student, Luned Mary Morgan-Jones, and together they had three children: Peter (1944), Philip (1948) and Carolyn (1954).



His student days were colourful. Among many extracurricular exploits he is reputed to have released a culture of Cabbage White Butterflies into the projector beam of a city cinema, to the consternation of the audience. During a ladies' garden party at UCNW he staged a fight with a friend, on a roof overlooking the garden, apparently ending by hurling him off the roof. Later it was revealed that this was a borrowed tailor's dummy! Little wonder that his understanding of and care for his own students later in life was so sympathetic. Whilst still an undergraduate he started working on oysters with Dr H A Cole at the Fisheries Experiment Station at Conway. He was awarded a Meyricke Research Scholarship at Jesus College, Oxford, for graduate study with JZ Young, on the enteropneust *Saccoglossus* (Knight-Jones 1952), which he became adept at finding on the shore by its faint but distinctive smell of iodoform. His research was curtailed by the outbreak of the Second World War when he was commissioned in the Royal Artillery. He was promoted to captain, mentioned in dispatches, and wounded in the crossing of the Rhine in 1945. He returned to Oxford gaining his DPhil in 1946, spending the next four years as officer-in-charge of the new shellfish research laboratory at Burnham-on-Crouch. Having resumed his research on oysters, he published the landmark paper with H.A. Cole in which the phenomenon of gregarious settlement was first described (Cole & Knight-Jones 1949). This distinctive behaviour was in time found to occur in several other groups

of marine invertebrates and was the inspiration for a rewarding and productive field of research. Wyn's later laboratory study of gregariousness in barnacle larvae (Knight-Jones 1953) is also regarded a classic work in experimental biology (Toonen 2005).

He returned to the University College of North Wales in December 1949 as a marine zoology lecturer, becoming Acting Director of the new Marine Biology Station (later to become Bangor University's Marine Science Laboratories) in Menai Bridge in June 1950 becoming Deputy Director in July 1951. His location beside the Menai Strait enabled Wyn to explore the faunistically rich shores and shallow waters surrounding the North Wales coast (eg Knight-Jones 1956). His diving exploits became renowned and his leaking dry suit, evidently ill fitting his slender frame, resulted in his getting wet and numbingly cold. Fortunately, the old house occupied by the Marine Biology Station still had a bathroom and hot water! Though later to specialise on tubeworms, Wyn's interests and research projects initiated at Menai Bridge—aided by his first research students—were an eclectic and novel mix, opening leads into several aspects of marine ecology: ciliary action, pressure responses of zooplankton (Knight-Jones & Qasim 1955), protozoans and nanoplankton, marine leeches (Hussain & Knight-Jones 1995), enteropneusts, shore fishes and, above all the settlement behaviour of marine invertebrate larvae. The paper on metachronism and ciliary beat (Knight-Jones 1954) is the clear product of a very original mind. The key discovery was that the direction of the ciliary beat and of the metachronal waves were not necessarily the same. His findings and his terminology for the relationships between effective ciliary beat and metachronal waves soon became part of the wider understanding of cilia in zoology.

In 1956, when a separate Department of Zoology was created at the University College of Swansea, Wyn was appointed its first Professor of Zoology, a post he held until his retirement in 1981. Both the Marine Biology Station in Menai Bridge and the new Natural Sciences Building at Swansea had staircases constructed around a central well three or four stories high. Tall glass tubes erected in the stairwells of both buildings were used for his studies on pressure responses. Various research projects at Menai Bridge formed the basis for his Inaugural Lecture at Swansea (Knight-Jones 1956). As a professor he was never a 'committee man', having to be reminded that he should have been in a particular meeting ten minutes ago. His mode of operation was research- and teaching-based, always leading by example. He regularly collected material for his undergraduate practical classes and unselfishly edited and enhanced the writings of research associates and junior colleagues ahead of submission for publication. His knowledge as a lecturer was broad, his teaching style a little hesitant, but delivered with a droll humour that held his student audience! His commitment to the personal needs of research students was touching and sincere.

An early interest was in the behaviour and substrate selection of settling invertebrate larvae, particularly those of barnacles and Spirorbidae, that family of tiny, coiled tubeworms that occur so abundantly on stones, rock and marine algae. Typically, he

Previous image: Elis Wyn Knight-Jones portrait supplied by the authors

had an original idea that was made available to, and developed by, others. Following the move to Swansea, studies by a sequence of research students revealed an extraordinary diversity of spirorbid species separated in the main not geographically, as Darwin's finches, but by habitat (eg De Silva & Knight-Jones 1962). The seminal review to the Society for Experimental Biology (Knight-Jones & Moyse 1961) drew extensively on research carried out by himself and his students. It immediately became a baseline reference for contemporary studies on interactions in communities of algal and hard substrata. This period was additionally significant as the 1962 paper with his first research student at Swansea (Phillipu Hewa Don Hemasiri De Silva) marked the start of Wyn's career as a polychaete taxonomist.

> **"... in Greece, returning with the 1967 Khios expedition, he had to explain to Greek customs that he was taking only the insignificant little tube worms that were attached to fragments of amphorae in his luggage, not removing marine antiquities from the country!"**

Knight-Jones was a pioneer in adopting the use of SCUBA diving for marine biology, using it as a means of collecting specimens for his research. Anyone acting as his boatman will not forget an instruction that was difficult follow: 'Just follow the bubbles, old boy'! He seemed to breathe so infrequently that finding the bubbles, let alone following them, presented problems. When he took the chair of Zoology at Swansea, provision was made for divers, and many students were able to take up diving, adding direct underwater observation of marine life. His diving and preoccupation with his findings underwater also brought him close to the law on a couple of occasions. In Spain he narrowly avoided arrest when he inadvertently dived near Franco's yacht and in Greece, returning with the 1967 Khios expedition, he had to explain to Greek customs that he was taking only the insignificant little tube worms that were attached to fragments of amphorae in his luggage, not removing marine antiquities from the country!

His knowledge of the intertidal and sublittoral fauna was immense and he could identify almost any marine animal, done with characteristic diffidence. Using this knowledge in conjunction with SCUBA led to papers on the underwater fauna (Knight-Jones 1955; Knight-Jones & Nelson-Smith 1976) and to numerous records in the Dale Fort Marine Fauna (Crothers 1966). It was through SCUBA diving at Dale Fort that Wyn met Phyllis Fisher, who became his second wife in 1969, and with whom he shared his ever developing interest in marine tubeworms (Spirorbidae), becoming the foremost taxonomic experts on this group of polychaetes. On a two-month lecturing and collecting tour of South Africa in 1971, Wyn told the *Cape Times* that these small polychaete worms had become their 'bread and butter'. The birth of their daughter

Gaynor in 1972 did little to slow them down and they made collections from many different places throughout the 1970s. These included a 1976 cruise from Casablanca to Gibraltar—via ports in the Canary Islands, Senegal, Sierra Leone, Cape Verde Islands, Madeira and Spain.

Wyn retired from the Chair of Zoology in 1981. A celebratory symposium was organised at the Linnean Society of London under the title of *Biology of Marine Invertebrates* (Ryland 1984), a broad theme appropriate to the catholicity of his interests. A Fellow of the Linnean Society for many years, he was elected a Fellow *honoris causa* in 2004 (*The Linnean Society of London Annual Report*, 2004, p 15). Retirement did nothing to diminish his zeal for investigations into the Spirorbidae, pursued jointly with Phyllis. At the beginning of his retirement year they embarked on a two-month tour of South America—a trip first planned the year they married. This was soon followed by a three-month visit to Australia in 1983, taking in the *First International Polychaete Conference* in Sydney. Wyn continued participating in collecting trips, conferences and workshops throughout the 1980s and early 1990s. His last trip abroad was to Iceland in 1994, to a polychaete workshop as part of the *Benthic Invertebrates of Icelandic Waters* (BIOICE) programme. He also actively assisted Phyllis in her research work on shores throughout Britain until October 2003; the last being visits to Salcombe and Looe only a few weeks after a hip replacement operation.

Wyn was modest and self-deprecating about his achievements. Many of us recognised them, appreciating the warmth of his friendship and his intellectual stimulation. His contribution to science can only partly be appreciated from his published papers. He was always generous, in passing on his imaginative ideas to his students, his colleagues, and their students. His gentle criticism sounded more like encouragement and often guided others. His shrewdness and firm grasp of fundamentals never overrode his intellectual insight and sense of wonder at the world of nature. Had he not concealed his intellect and versatility in an engaging and humorous modesty, they would undoubtedly have been more widely recognised. His friends and colleagues miss the gleam in his eye and the chance to discuss science with him. Phyllis, who sadly pre-deceased him in 2009 (Mackie *et al* 2011), and then Gaynor both nursed him through his distressing terminal illness. He died on 9 February 2012, a month short of his 96th birthday. His legacy persists in his and his students' writings, and in the memories of all who knew and admired him.

John Ryland / Ernest Naylor
Andy Mackie / Tony Stebbing

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The Linnean Society of London : Programme of Events

May–Oct 2014

1 May [A]
18.00

Type specimen of Asian elephant, lost and found

Prof Adrian Lister, *Natural History Museum, London*
Prof Tom Gilbert, *Statens Naturhistoriske Museum, Copenhagen*

23 May [*A]
16.00–19.00

Anniversary Meeting

Prof Dianne Edwards CBE FRS PLS
Registration for the dinner is essential

19 June [A]
18.00

Shifting baselines: why we so readily accept the progressive decline of the natural world

Prof Callum Roberts, *University of York*

3 July [★]
14.00–17.00

Conversazione

Hosted by the Linnean Society team

18 Sept [A]
18.00

The impact of diseases on wildlife

Dr Becki Lawson, *Institute of Zoology, Zoological Society of London*

20 Sept
10.00–16.30

Open House London

The Society participates in Open House London every year, where we open our doors to the public.

2 Oct [A]
18.00

The Darwin Lecture: Diagnosing Darwin

Prof Anthony Campbell, *University of Cardiff*
Joint event with the Royal Society of Medicine

14 Oct [★]
18.00

Lectures @ the Linn: Student Lecture series

The Viral Graveyard
Dr Ravinder Kanda, *Department of Zoology, University of Oxford*

16 Oct [*A]
18.00

Jacquin's American plants

Dr Santiago Madriñan Restrepo, *Universidad de los Andes*

22–23 Oct [★]
Two-day meeting

New perspectives on climbing plants

Dr Nick Rowe, *University of Montpellier and CNRS*
Prof Dr Thomas Speck, *Botanischen Gartens der Universität Freiburg*

[*] Election of new Fellows • Organiser • [★] Registration required • [A] Admission of Fellows

All meetings are held in the Society's Rooms unless otherwise stated.
A tea reception precedes evening meetings at 17.30.
Evening meetings begin at 18.00 and are followed by a wine reception in the Library.

For more details visit **www.linnean.org/events**