The Linnean

Communicating nature since 1788

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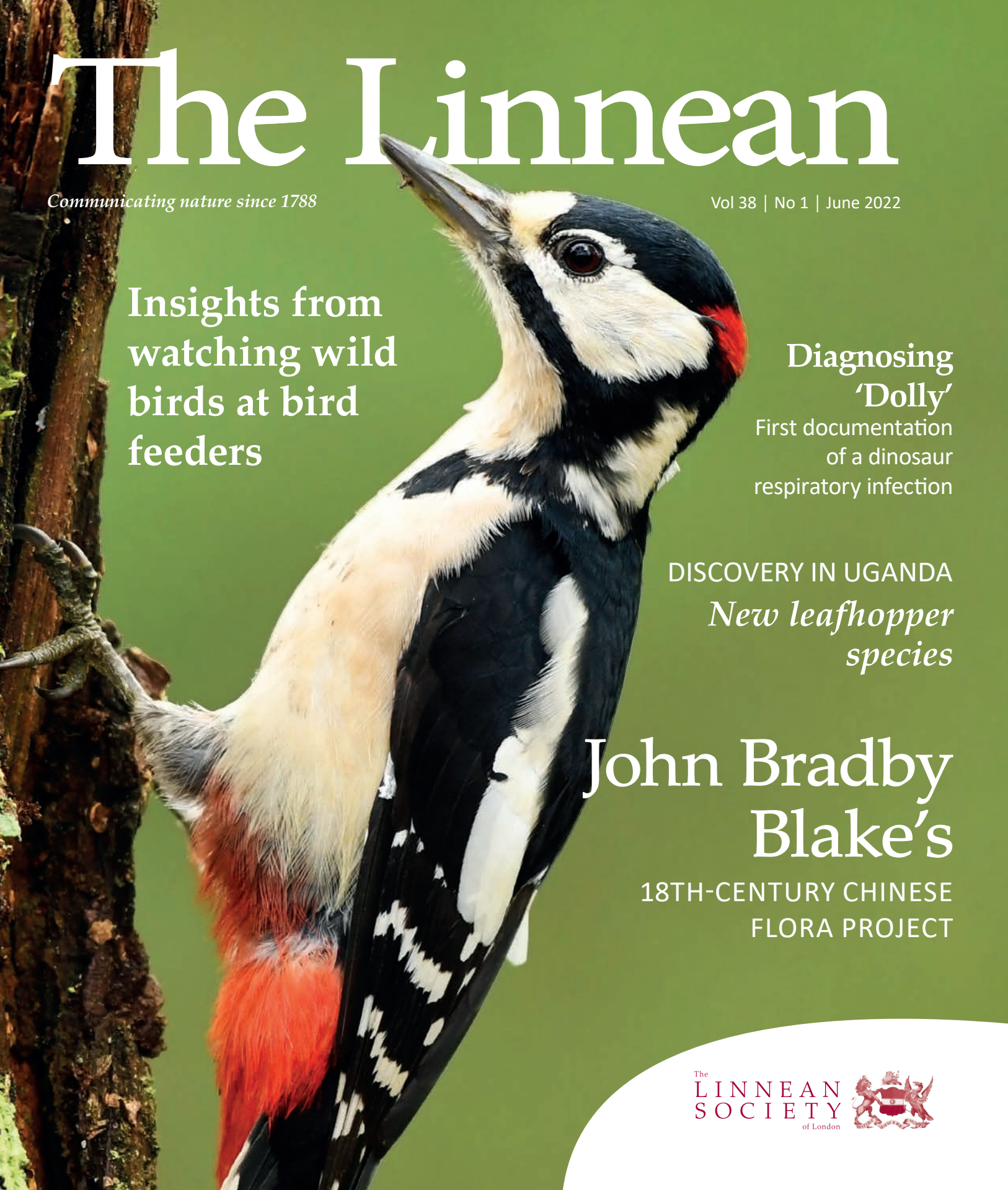

Insights from watching wild birds at bird feeders

Diagnosing 'Dolly'

First documentation of a dinosaur respiratory infection

DISCOVERY IN UGANDA

New leafhopper species

John Bradby Blake's

18TH-CENTURY CHINESE FLORA PROJECT

The LINNEAN SOCIETY of London

About us

The Linnean Society of London is the world's oldest active society devoted to natural history. Founded in 1788 by botanist Sir James Edward Smith (1759–1828), the Society takes its name from the Swedish naturalist Carl Linnaeus (1707–1778), whose botanical, zoological and library collections have been in our keeping since 1829. These collections, awarded Designated status by Arts Council England, are of fundamental importance as a primary reference for the naming of plants and animals. They are enhanced by the Society's own rich library which provides key resources for scientific and cultural research.

Our vision is a world where nature is understood, valued and protected. To do this we aim to inform, involve and inspire people about nature and its significance through our collections, events and publications. Thanks to the wide-ranging expertise of our membership and our unique collections, we are a hub for science communication through interdisciplinary learning and engagement.

Cover image: Piotr Krzeslak / Shutterstock.com; This page: Daniel Brent

The LINNEAN SOCIETY of London

Communicating nature since 1788

Patron: Her Majesty the Queen

Dear Fellows,

welcome to your new-look issue of *The Linnean.* As you will have seen in the last issue and in Linnean News, *The Linnean* and *PuLSe* have now been combined into one publication. Under one title, *The Linnean* will increase to three issues a year, giving us more opportunity to share stories from our collections, and for you to share your research with the wider Fellowship.

You will also have read that Gina Douglas has stepped down as editor, and has taken up the role as President of the Society for the History of Natural History. We know you will join us in thanking her for her dedication to the Society and *The Linnean*.

We hope you enjoy this issue, which includes several new discoveries from within our membership (such as 'Dolly', a dinosaur with a respiratory infection), the Society's connection to John Bradby Blake's 18th-century Chinese Flora project, and a moving tribute to a good friend of the Society, botanist Norman Robson.

You'll also find details on our upcoming events, updates on our activities and book reviews. And please join us in congratulating this year's medal and award winners!

Thank you, as always, for your support and encouragement.

Leonie

Editor, *The Linnean*
& Publications Manager

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Publish

The Linnean is published three times a year, in spring, summer and winter (UK). All contributions are welcome, but please contact the Editor or see the *Guidelines for Contributors* document on our website before writing and submitting articles (www.linnean.org/thelinnean).

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Features

News & Updates

What's on

LINNEAN LENS: CHARLES DARWIN'S VASCULUM

Speakers: Régine Fabri, Glenn Benson

14 June | 14.00

Like many botanists of his time, Charles Darwin owned a vasculum—an oblong tin box in which to put specimens during field work. The Society holds Darwin's vasculum within its collections, the same one he used during his global voyage on the *Beagle*.

In this talk, Régine Fabri of the Meise Botanic Garden will explore the history and use of the vasculum, and why they were all the rage with 18th and 19th-century botanists, and the Society's Curator of Artefacts, Glenn Benson, will focus on Darwin's and why it is one of our 'treasures'.

NEW INSIGHTS INTO THE THIOTRICHALES INCLUDING HYDROTHERMAL VENT SPECIES

Speaker: Dr Rich Boden

16 June | 18.00

The *Thiotrichales* of the class *Gammaproteobacteria* in the phylum *Pseudomonadota* of the *Bacteria* contain a diverse range of chemolithoautotrophic species, obtaining their energy from chemical reactions such as sulfur oxidation, and their carbon from CO_2, much like plants. Rich Boden will discuss some new insights into the lifestyles, habitats and adaptations in key *Thiotrichales* that allow them to thrive in the diverse ecosystems they inhabit.

To book for these and other events not shown, visit www.linnean.org/events

Tea: Nature, Culture, Society, 1650–1850

Organisers: Richard Coulton (QMUL), Jordan Goodman (UCL), and Romita Ray (Syracuse University)

22–24 June | See website for details

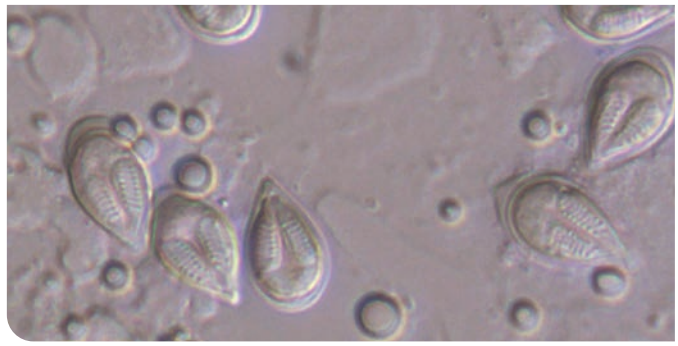
This international three-day meeting will address natural, cultural and social histories of tea between the mid-17th and mid-19th centuries. Arguably the first truly modern globalised commodity, tea's pre-eminence depended not just upon commercial efforts of merchants, but also upon a framework of knowledge and practice constructed primarily in China, Britain, Europe, and India.

The Mind of a Bee

Speaker: Lars Chittka

29 June | 18.00 (Nature Reader event online)

Most of us are aware of the hive mind—the power of bees as an amazing collective. But do we know how uniquely intelligent bees are as individuals? In this lecture I will explore the bees' remarkable cognitive abilities. You will learn that they are profoundly smart, have distinct personalities, can recognise flowers and human faces, exhibit basic emotions, count, use simple tools, solve problems, and learn by observing others.



The Hidden World of Parasites

Speaker: Beth Okamura

7 July | 18.00

Parasites are ubiquitous and diverse. Most, however, are hidden from view, infecting hosts internally as 'endoparasites'. Recognition of many parasites is therefore challenging, and hinders understanding of parasite diversity, life history, distribution, and evolution. Recent confirmation that the enigmatic Myxozoa is a large radiation of parasitic cnidarians greatly expands our appreciation of endoparasite diversity and the tree of life, as explored in this talk.

Birds and Us: Our Relationships with Birds

Speaker: Professor Tim Birkhead

14 July | 18.00 (Nature Reader event at Burlington House)

Since the dawn of human history, birds have inspired and challenged our ideas about science, faith, art and philosophy. We have variously worshipped birds as gods, hunted them for sustenance, adorned ourselves in their feathers, studied their wings to engineer flight and, more recently—thankfully—we have attempted to protect them. The story is one that merges history, science and passion. **(This event is onsite at Burlington House; please book only if you are able to come in person.)**

News

UPDATE ON THE BYE-LAWS REVISION

Mark F. Watson Hon FLS
Chair, Bye-Laws Revision Group

Over the last seven months, the Bye-Laws Revision Group (see *PuLSe* 49, October 2021) has been reviewing the governance documents of 12 similar organisations, looking back at the post-1988 amendments to the Society's Royal Charters and Bye-Laws, and understanding the legal processes for making future changes. Council decisions on the recommendations from the 2019 Governance Review and changes to customary practices of the Society, particularly since the last Bye-Laws update in 2016, have also been considered. These include the necessary adaptations made to our activities over the pandemic years, which have shown the benefits of remote participation in meetings and events and have enabled a greater engagement of Fellows worldwide in the Society's business.

Following current practice in other similar charitable organisations, a three-tier governance structure of Royal Charters (set by the Privy Council), Bye-Laws (set by the Fellowship) and Standing Orders (set by Council) was recommended, and a framework for the new Bye-Laws was drawn up. However, once drafting of the new Bye-Laws and Standing Orders commenced, it soon became evident that Council input was needed in such key areas as the Society's governance structure, Fellowship and Membership, Council and Officers, and general meetings. As a result, two Extraordinary Meetings of Council took place (10 December 2021 and 25 February 2022) to discuss these issues, formulate recommendations and allow the drafting to continue.

Council recommended revisions to how General Meetings are organised and the way members are elected, primarily to reflect current practice and not to disadvantage those unable to attend in person. Society business should usually only be done at the Annual General Meeting, but Fellows should be able to call an Extraordinary General Meeting. Remote attendance, electronic voting and voting ahead of meetings should be permitted, with voting rights decoupled from the ceremony of admittance. More scrutiny should be brought into the process of the election of Fellows, with a group of Fellows tasked with approving applications.

Council also proposed that the three-year term of office, renewable twice (to a maximum of nine years), currently in place for Officers, should be applied to all Council members. This provision would govern the turnover of members on Council rather than the current inflexible method of five people retiring annually to be replaced by five others. Reflecting changes in the role of Secretaries and the Society's new staffing structure, it was agreed that the Officers defined in the Charters should be the President and Treasurer, and these would remain elected by the Fellowship. Other roles within Council would be established and appointed by Council. It was also agreed that a Working Group be set up to review the Society's committees and suggest a new structure that better supports the Council and staff.

The Bye-Laws Revision Group met in person and online in February

The Bye-Laws Revision Group is now tasked with examining the application of these decisions and drafting a new set of Bye-Laws for consideration by Council before they are put forward to the Fellowship for approval. It is anticipated that an Extraordinary General Meeting will be called for this later in 2022. Fellows with a particular interest in the Bye-Laws are encouraged to contact the President (**president@linnean.org**).

Evolutionary Journal of the Linnean Society: A compelling place to publish

Steven Dodsworth, *Editor*

I'm Steven Dodsworth, the Editor in Chief for the *Evolutionary Journal of the Linnean Society* (*EJLS*), the new fully open access journal being launched by the Linnean Society in collaboration with Oxford University Press. I am an evolutionary biologist, with wide-ranging interests that centre on the evolution of plant diversity, the evolution of genomes and traits, and the use of high-throughput DNA sequencing data to transform systematic thinking. In particular I am interested in the role that chromosome and structural genomic variation play in adaptive radiation, ecological divergence and speciation, and the origin of morphological novelties.

The topic of evolution is of course very familiar to our Fellows, as the Society's work is focussed on understanding and conserving the natural world. At the heart of this lies the study of evolution, to investigate both the nature of taxa themselves and the myriad and wondrous biological characteristics they possess. Since the joint papers of Darwin and Wallace were presented in 1858, the Society has continued to publicise important evolutionary studies.

Scope of the new journal

EJLS aims to cover the broad remit of evolutionary biology, from different empirical perspectives as well as the biology of diverse organisms. We hope to receive papers that transgress traditional boundaries and ways of thinking (i.e. multi- and interdisciplinary studies) as well as those that relate to the interactions between organismal groups, or have conclusions that reach beyond organismal boundaries. Recent advances in omics methodologies (e.g. genomics, phenomics), combined with computational advances, are opening new avenues of experimental research that previously would not have been possible, and are most welcome. Examples of this might include high-throughput developments in RNA/DNA sequencing, proteomics, phenotyping, and microcomputed tomography, or the use of large databases of trait data or climate data in order to answer evolutionary questions. Papers that utilise some of these new approaches (including those that are purely methodological), would be welcome additions to the journal, and we hope to receive papers that study both micro- and macroevolutionary processes, or a combination.

Steven Dodsworth interviewed in February for the initial launch

Open access

Perhaps most importantly to note, our new journal is a fully open access publication, which means that all articles published are freely available, immediately at the point of publication. This, we believe, is a great step for the wider dissemination of scientific results and knowledge, ensuring that diverse audiences are able to access the latest published research in evolutionary biology.

Please throw your support behind this new venture, and we encourage all Fellows, as well as their colleagues and collaborators, to consider this as a place for their research to be published. EJLS includes multiple article types, including shorter articles and Letters to the Editor, which is distinct from the existing journals.

We would welcome as many Fellows as possible to get involved: **https://academic.oup.com/evolinnean**

Images: The Linnean Society of London; Oxford University Press

SAURO-THROAT

First evidence of an avian-style respiratory infection in a dinosaur

by Cary Woodruff FLS & Ewan Wolff FLS

During the Late Jurassic Morrison Formation, a remarkable sauropod (the long-necked, herbivorous dinosaurs, like '*Brontosaurus*') nicknamed 'Dolly' died. After death, 'Dolly's' skeleton was then buried in the bottom of a river channel, sealing away the remains to the world and beginning the diagenetic process for 'Dolly's' skeleton to enter the fossil record. Approximately 150-million-years later, 'Dolly's' fossilised skeleton was unearthed in the picturesque mountains outside of Yellowstone National Park in southwest Montana, USA.

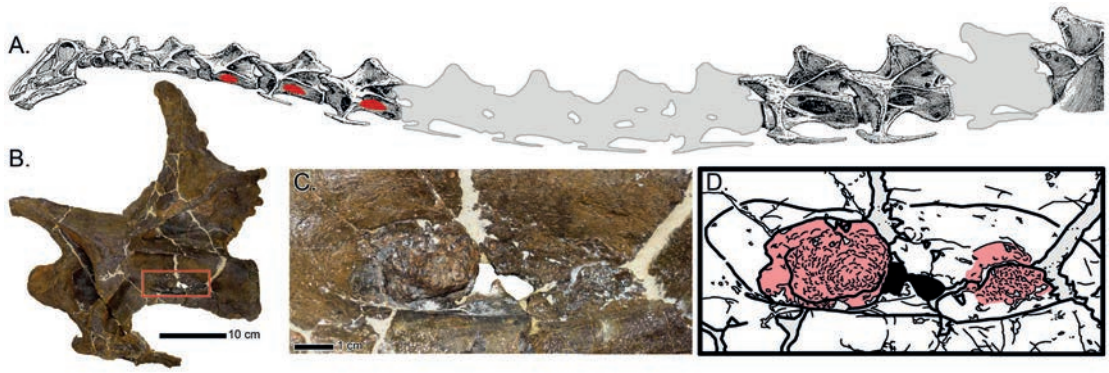
'Dolly' is not a remarkable palaeontological discovery because of size or relative age—'Dolly' was only an ~18-meter teenager at death. 'Dolly' was also not exceptionally preserved like *Archeopteryx* or *Sinosauropteryx* with skin or feathers, nor like *Scipionyx* with preserved organ impressions. Instead, what makes the remains of 'Dolly' so unique is that this represents the first documentation of an avian-style respiratory infection in a dinosaur.

Bone pathology in fossil vertebrates

If the limited fossil record we have of pathology is any evidence, diseases have been tormenting life ever since its origination; even fossil invertebrates were not spared. Palaeopathology studies that document and diagnose lesions in fossil vertebrates are no simple task. The overwhelming majority of the vertebrate fossil record fails to preserve soft parts, so unless a disease has affected a bone, we are left with no evidence of its existence. Our expectation, therefore, is that the knowledge of

Above: Hypothetical life restoration of 'Dolly'. Note that the pulmonary disease infecting this animal would not have been externally evident, but the probable pneumonia-like outward symptoms would have included coughing, laboured breathing, nasal discharge, fever, and weight loss, among others.

Image: Woodruff et al. (2022) and Corbin Rainbolt



RIGHT: Abnormal bony growth in MOR 7029. (A) Schematic map of the neck of Diplodocus, with the abnormal bone growth denoted in red. (B) Neck vertebra of MOR 7029 with a red box highlighting the abnormal structure; close up in (C) with interpretative drawing in (D) (abnormal structure in red).

the breadth of ancient disease will typically be curtailed. Compounding these difficulties in diagnosis is that many diseases have overlapping presentations.

So how, then, were we able to identify the bone pathology seen in 'Dolly'? Making effective inferences requires a brief background on dinosaurian phylogeny and anatomy. Dinosauria is composed of two orders: Ornithischia—which contains the horned dinosaurs like *Triceratops* and its kin (Marginocephalia), the elaborately crested hadrosaurs (Ornithopoda), and the armoured stegosaurs and ankylosaurs (Thyreophoran)—and Saurischia which contains the sauropods (Sauropodomorpha) and all of the carnivorous dinosaurs like *Tyrannosaurus* (Theropoda). While a chicken and a *Velociraptor* may not superficially look much alike, Aves is in fact a clade of theropod dinosaurs (palaeontologists refer to birds as avian theropods). And within Dinosauria, while there are many osteological traits shared by these saurischian clades, of great importance to our study is that they possess a very remarkable pulmonary system. Analogous to a pump bellows, a highly specialised pulmonary system consisting of the trachea, lungs, air sacs, and pneumatic diverticulae produce a unidirectional flow of air through the body. Many of these pneumatic diverticulae even penetrate into the skeleton. In the majority of sauropods, these pneumatic diverticulae laterally pervade into much of the vertebral column. In the case of 'Dolly', the bone lesions were only present at the junction between the pneumatic diverticula and vertebrae.

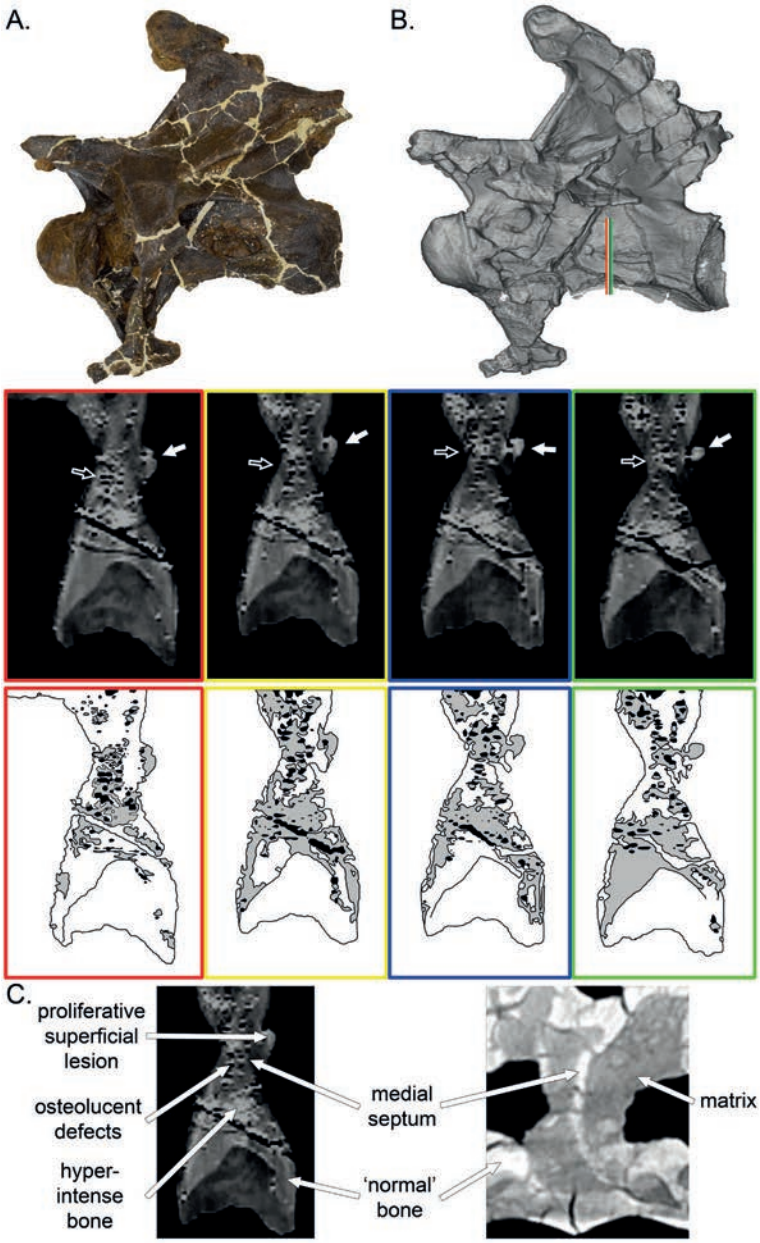
The fact that the bone lesions in 'Dolly' are entirely restricted to the junction between the vertebrae and pulmonary tract was an initial starting point in considering that they were respiratory-related in origin. In examining ancient bone lesions, we start in the same way that a modern pathologist would, by evaluating the gross pathology of the specimen and describing the things that we see in the bone or other preserved structures. Then, if possible, radiographs, CT or micro-CT are performed in order to find out more about the internal structure of the bone. If researchers are really lucky, histology will also be performed to see the remains of the structures that the bone cells left behind. However, much of this still relies on observable comparisons; and as mentioned earlier, numerous, and drastically differing diseases, could produce very similar pathologic changes in the bone.

Evaluating the options

For the bone pathology in 'Dolly', we used a standard differential diagnosis approach for vertebrate palaeopathology. Starting with the possibility of a respiratory-related origin based on location of the lesions, we evolutionarily constrained where we looked for possible diagnoses using the Extant Phylogenetic Bracket (EPB). The EPB is a concept developed by our coworker Dr Lawrence Witmer, to look at reconstructing anatomy and behaviour in extinct animals based on their extant relatives. For dinosaurs, we bracket them between their closest living relative—birds and crocodilians. For example, let's examine egg laying: both birds and crocodilians lay eggs, so consequently dinosaurs

Images: Woodruff *et al.* (2022)

likely did as well. In the mid- to late-2000s, this approach was applied to palaeopathology in order to draw from our knowledge of diseases in extant relatives and called *zoological palaeopathology* (by Dr Ewan Wolff FLS). So, for 'Dolly', we looked at the suite of respiratory-related diseases in birds and crocodilians. Because so much information that a modern veterinarian and veterinary pathologist would use to evaluate disease is missing, we used the same approach developed in previous palaeopathology research to compare to diseases that are known in modern relatives. This naturally makes sense, as you would not call a human doctor when your bearded dragon is sick, you would look to an exotic pet veterinarian. And this is the power of a differential diagnosis approach, as it means that we can begin to develop hypotheses about the bone lesion that align with the problem. Initially, you question where you are 'in the skeleton' and what would be a logical analysis of disease in that area. From there, you compare any issues that can occur because of a local problem in the bone versus a systemic disease process, and list any simple explanations. You can then expand on these possibilities, making sure that you have considered multiple disease categories. This is the same process used in modern day veterinary medicine and veterinary pathology, but we form diagnosis lists from this bracketing perspective using crocodilians and birds. We then go through an additional process of additional anatomical, environmental, and ecological considerations. For example, an aquatic scale parasite from crocodiles doesn't fit as a diagnosis for an animal that was grazing on the open plains—the ecologies are totally different. If the multiple considerations aren't understood, then you may choose possible diagnoses that don't make sense for that animal. And for 'Dolly' the site of infection was key.



LEFT: CT scans of infected vertebra from 'Dolly'. Photograph and scan model of the infected vertebra (A & B respectively). The coloured lines in (B) correspond to the scan slices (and scan interpretative drawings below). White arrows point to the externally visibly abnormal bone growth, while black arrows denote the internal irregularities. (C) Comparison of the abnormal tissue composition of 'Dolly' (left), compared to that of a 'normal' sauropod (right). © Woodruff *et al.* (2022)

As mentioned, saurischian dinosaurs possessed a circuitous pulmonary system that laterally pervaded the vertebrae. And while crocodilians have recently been shown to possess a similar form of unidirectional respiration, they entirely lack the complex pneumatic

Images: Woodruff *et al.* (2022)

Below: The elaborate and circuitous pulmonary complex of the sauropod, with the hypothetical route of infectious pathway in 'Dolly'. Human scale bar is the exemplar of pandemic education and rationalism, Dr Anthony Fauci.

system and structures of saurischians (novelty of hepatic pistons aside, the faveolar lung is less complex). Therefore, we had to narrow our phylogenetic perspective towards an avian emphasis. Then it was just a matter of careful research on modern birds to understand what the possibilities were. That said, we still made sure we ruled out non-airsac diseases before we went ahead with these conclusions. As a veterinarian and as a palaeontologist, the most important thing is to maintain a healthy sense of objectivity.

Diagnosing 'Dolly'

While there were many possible contenders, ranging from inhalation of volcanic ash, tumours, bacterial, and beyond, several of these were easier to rule out. Take ash: there's a famous park called Ashfall Fossil Beds State Historical Park in northeastern Nebraska where, about 12 million-years-ago, a massive supervolcanic eruption buried the landscape and over 200 animals in volcanic ash. After breathing in all of that volcanic ash, many of the bones have spongy outgrowths (like mesothelioma), and these animals ultimately succumbed to this respiratory infection and died in a matter of weeks. This certainly sounds like a good contender for 'Dolly', but sedimentological analysis of the rock in and around the specimen did not reveal any ash; so volcanic eruptions were not a part of 'Dolly's' ancient world, and thus, not a possible agent for the source of the infection. Yet from this EPB/zoological palaeopathology-based approach, a very strong possibility was a fungal infection. Today, a fungal infection called aspergillosis is one of the most common causes of respiratory infections in birds. Aspergillosis causes all sorts of complex systemic pathologies in birds, and without treatment can be fatal; this type of infection causes lesions within the pulmonary system. And the fungal

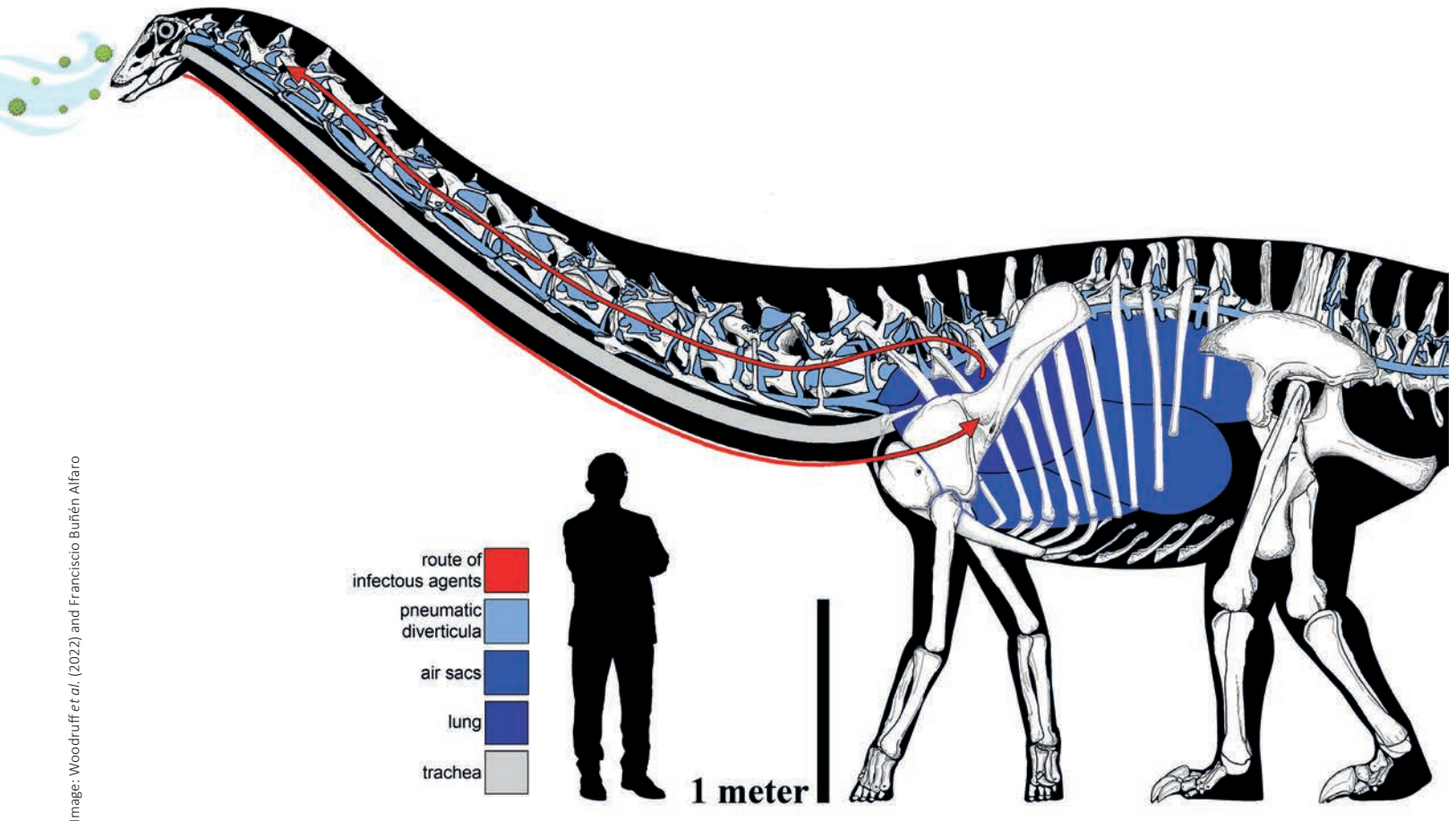


Image: Woodruff *et al.* (2022) and Franciscio Bufién Alfaro

genus that causes aspergillosis has a fossil record. So, one of the most common causes of respiratory infections in extant dinosaurs had to have an earlier evolutionarily origin. Therefore, it is not implausible to think that 'Dolly' may have suffered from an aspergillosis-like infection.

Unfortunately, for all of the reasons mentioned above, we cannot definitively say that the causal agent for the respiratory infection in 'Dolly' was aspergillosis, only that 'Dolly' had airsacculitis with associated osteomyelitis (a respiratory infection of the air sacs that caused a bone infection); but what caused this infection in the first place could have been fungal related.

While palaeontologists have known of the non-avian saurischian respiratory complex for decades, there has been much discussion on 'how avian' the pulmonary system was in these saurischian dinosaurs. This airsacculitis in 'Dolly' not only demonstrates that at least in sauropods, their respiration was very avian-like, and they were also susceptible to the same kinds of respiratory ailments, and through the same infectious routes, as birds today. This may ultimately lead us to contemplate the dinosaurian immune system further, as the immune response in modern birds within the air sacs relies on first-responder immune cells called heterophils that are not present in mammals.

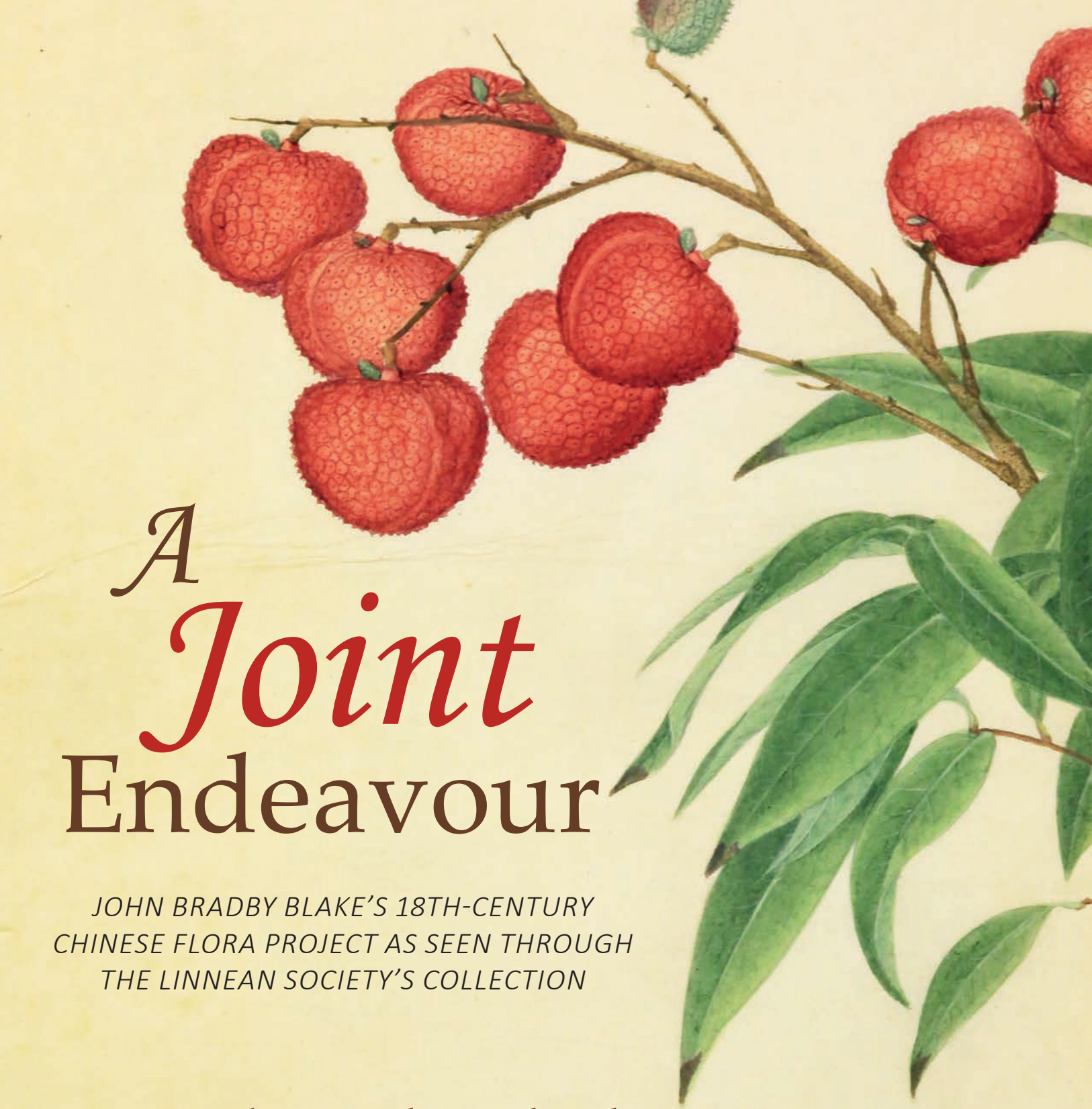
From this ultimately avian-derived differential diagnosis, we can even suggest the symptoms that 'Dolly' experienced. Today, airsacculitis in birds often causes flu- or pneumonia-like outward symptoms that include coughing, sneezing, laboured breathing, fever and weight loss, among others. If 'Dolly' did display such symptoms, it would have been easily evident that this animal was grievously ill. And of course, all of this data begs the question: did 'Dolly' ultimately die from this illness? Like the vast bulk of the fossil record, we can't say with any certainty, but for birds today with untreated airsacculitis, it can often be fatal. Additionally, there's ample evidence that sauropods were gregarious herding animals. In herds today, sick animals often fall behind, or sick animals separate from the herd to recuperate undercover, and in some extreme cases, healthy individuals purposefully distance themselves from the sick. So did 'Dolly' pass away sick and isolated? Or did being on its own and visibly weak paint a 'bullseye' for predators? Either way, we can't say—but we do believe that in one way or another, it ultimately contributed to the death of 'Dolly'.

Reference

Woodruff, D. C., Wolff, E. D., Wedel, M. J., Dennison, S., & Witmer, L. M. (2022). The first occurrence of an avian-style respiratory infection in a non-avian dinosaur. *Scientific Reports* 12(1): 1–12.

Left: The authors, Dr Cary Woodruff FLS (Great Plains Dinosaur Museum, *Above*) and Dr Ewan Wolff FLS (University of New Mexico, *Below*)

Images: courtesy of the authors



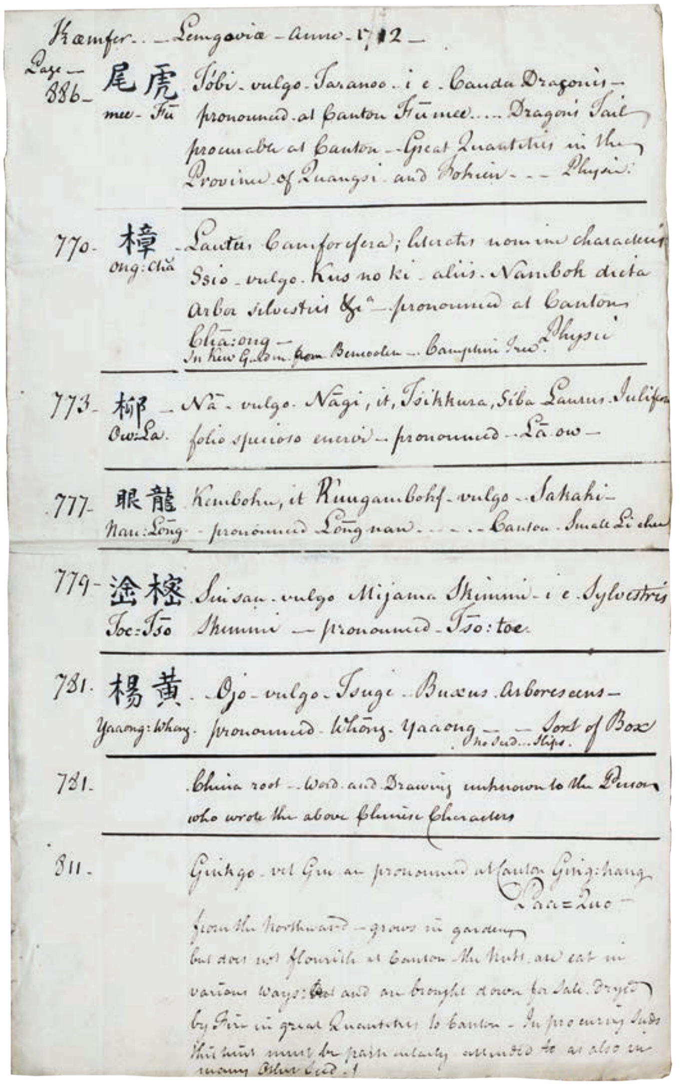
A *Joint* Endeavour

JOHN BRADBY BLAKE'S 18TH-CENTURY CHINESE FLORA PROJECT AS SEEN THROUGH THE LINNEAN SOCIETY'S COLLECTION

by Josepha Richard

As one of the earliest British botanists gathering plants in China, John Bradby Blake (1745–1773) makes for an interesting case study of an amateur naturalist using the Linnaean system. John Bradby Blake was a self-taught botanist before following in the footsteps of his father, Blake senior, a captain for the British East India Company. However, when young Blake applied to become a supercargo, or trader, for the East India Company, his intention was not to become a captain; Blake was instead aiming specifically for an appointment in China, which he obtained in 1766.[1] Soon, he became one of the resident British traders that supervised the tea trade in Canton (Guangzhou). From the start, Blake's goal was to use his spare time to collect any Chinese plants that he could find, especially those that were little or unknown in Europe at that time.

BELOW: Blake's handwritten list of Chinese plants found in Kaempfer's *Amoenitatum exoticarum*, possibly once owned by Carl Linnaeus, his son, or Linnean Society founder James Edward Smith.


Kæmfer — Lemgoviæ — Anno 1712 —

Page 886 — 尾虎 mee-Fū — Tobi vulgo Taranoo i.e. Cauda Draconis — pronounced at Canton Fū mee.... Dragon's Tail procurable at Canton — Great Quantities in the Province of Quangsi and Fokien — Physic.

770 — 樟 ong:Chā — Lautus Camforifera; literatis nomine characteris Ssio vulgo Kus no ki alias Namboh dicta Arbor silvestris &c.ª pronounced at Canton Cha:ong — In Kew Garden from Bencoolen — Camphire Tree. Physic

773 — 柳 Ow:La — Na vulgo Nagi, et Tsikkura, Siba Laurus Julifera folio specioso enervi — pronounced Lā ow —

777 — 眼龍 Nau:Long — Kembohu, et Ruugambokf vulgo Sakaki — pronounced Long nau — Canton Small Li chee

779 — 涂樬 Toe:Tso — Suisan vulgo Mijama Skimmi i.e. Sylvestris Skimmi — pronounced Tso:toe

781 — 楊黃 Yaaong:Whong — Ojo vulgo Tsuge Buxus Arborescens — pronounced Whong Yaaong — Sort of Box

781 — China root — Word and Drawing unknown to the Person who wrote the above Chinese Characters

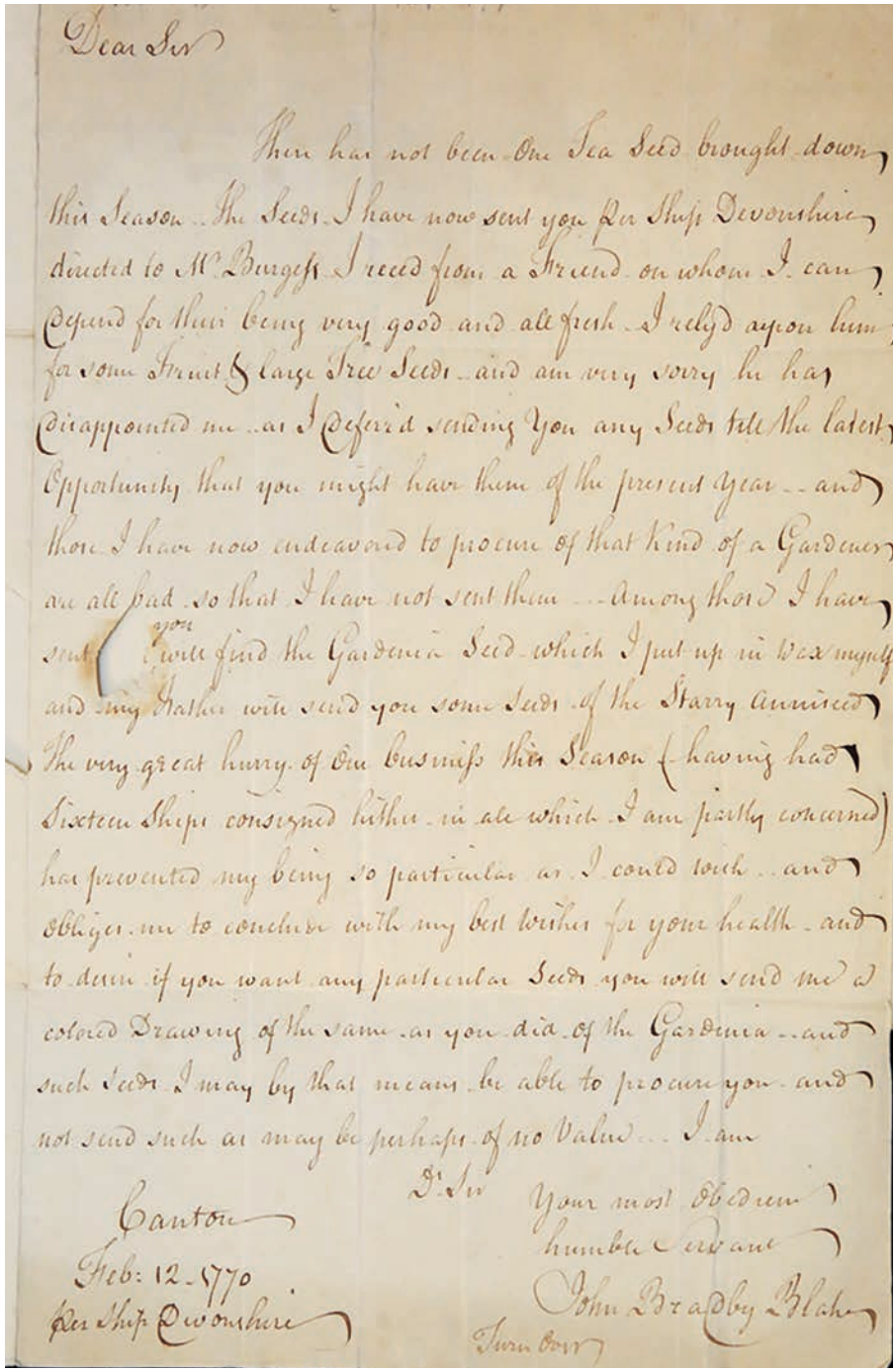
811 — Ginkgo vel Gin an pronounced at Canton Ging:hang ... from the Northward — grows in gardens but does not flourish at Canton the Nuts are eat in various ways: ... and are brought down for Sale Dryed by Fire in great Quantities to Canton — In procuring Seeds this time must be particularly attended to as also in many Other Seed.

Around 1771, Blake started to produce notes for a Chinese Flora, probably the earliest British attempt to systematically document the diversity of Chinese plants. It involved identifying, researching, procuring, and sending seeds back to England, while also commissioning botanically accurate paintings to illustrate Chinese plants of economic or ornamental interest. Similar projects had hitherto been largely pursued by Jesuit missionaries with privileged access to the emperor's court in Beijing in the north. In comparison, Blake's access was restricted to only a few south-eastern locations such as Canton and nearby Macao, as he operated under the Canton System period (1757–1842).[2] Such conditions did not make it easy for Blake to collect plants, and as a result he worked with numerous Chinese go-betweens. Blake's Chinese Flora was never to be finished, as he unexpectedly died in 1773 aged 28, but plenty of his notes remain to document his project. It so happens that the Linnean Society's collection contains four items linked to Blake—one uncovered as recently as 2021—through which the project can be summarised.

1) Letter glued into a copy of Kaempfer's *Amoenitatum exoticarum*

As an amateur naturalist, Blake first had to learn what was already known about Chinese plants. It is likely that he consulted the Sloane collection in the British Museum.[3] His letters include multiple references to buying the most important botanical books available in Europe at the time before leaving for Canton. The first item of interest is a copy of *Amoenitatum exoticarum* by Engelbert Kaempfer, with a letter containing a list of Chinese plants in Blake's handwriting pasted inside the cover. Kaempfer's survey of Japanese plants, although dating from 1712, would have contained some of the most up-to-date information one could obtain about East Asian flora. It would have been

1 Crane, P. & Loehle, Z. (2017). Introduction. *Curtis's Botanical Magazine* 34(4): 217.
2 During that time an imperial edict restricted most Westerners' visits to the city of Canton. Richard, J. (2017). Thoroughly Chinese: Revealing the plants of the Hong merchants' gardens through John Bradby Blake's paintings. *Curtis's Botanical Magazine* 34(2018): 475.
3 Crane, P. & Goodman, J. (2017). The life and work of John Bradby Blake. *Curtis's Botanical Magazine* 34(4): 234.



Dear Sir

Then has not been One Sea Seed brought down this Season. The Seeds I have now sent you Per Ship Devonshire directed to Mr Burgess I recd from a Friend on whom I can depend for their being very good and all fresh. I relyd upon him for some Shrub & large Tree Seeds and am very sorry he has disappointed me as I deferd sending You any Seeds till the latest Opportunity that you might have them of the present year and those I have now endeavord to procure of that kind of a Gardener are all pad so that I have not sent them. Among them I have sent you will find the Gardenia Seed which I put up in Wax myself and my Father will send you some Seeds of the Starry Annised The very great hurry of Our business this Season (having had Sixteen Ships consigned hither in all which I am justly concerned) has prevented my being so particular as I could wish and obliges me to conclude with my best wishes for your health and to desire if you want any particular Seeds you will send me a colored Drawing of the same as you did of the Gardenia and such Seeds I may by that means be able to procure you and not send such as may be perhaps of no Value. I am

Dr Sir

Your most Obedient humble Servant

John Bradby Blake

Canton

Feb: 12 1770

Per Ship Devonshire

Turn Over

helpful for Blake to determine which plants were already known but may not have been successfully naturalised in Britain or its colonies. During this preliminary research, Blake wrote plenty of notes, organised either by reference work or by plant. This letter shows how Blake precisely referenced page numbers, a practice he continued even while documenting new plants in China. While it is possible the Linnean Society's book was his own copy, the letter could also have been sent to someone else in London and kept there for safe keeping. For example, Blake was corresponding with Daniel Solander (1733–1782), one of Linnaeus's apostles.[4]

2) Correspondence between John Ellis and Blake

Indeed, Captain Blake made sure to introduce his son to eminent naturalists in London before he embarked for China, including not only Daniel Solander but also John Ellis (c. 1710–1776), as shown in this extract of their correspondence.[5] The two advised Blake on different but crucial details for his project. Solander focused on helping Blake use the Linnaean system correctly to either identify known plants or classify previously unknown Chinese plants. Ellis had a particular interest in transporting seeds and live plants, which is shown in this specific correspondence listing seeds that Blake sent through ships using different methods of conservation, such as wax or vials. Once arrived in London, the seeds were usually distributed by Blake's father to an impressive array of recipients in Britain and the British Empire, including not only Ellis, but also the Royal Botanic Gardens at Kew, Chelsea Physic Garden and a few nurseries.[6]

This correspondence illustrates the last stage of the process that Blake had put in place: from identifying a plant, to obtaining a live specimen or seeds, to growing the plant and having it illustrated or painted, then finally exporting viable seeds to England. While in Canton,

Above: John Bradby Blake writes to John Ellis from 'Canton' (Guangzhou) in 1770, discussing the seeds already sent, and those to come.

4 Goodman, J. & Jarvis, C. (2017). The John Bradby Blake Drawings in the Natural History Museum, London: Joseph Banks Puts Them to Work. *Curtis's Botanical Magazine* 34(4): 251.

5 Linnean Society, John Ellis correspondence, MS/275.

6 Crane and Goodman (2017): 238.

Blake was restricted in his movements, allowed only in a few locations near the British factories where tea was traded. In his letters he makes it clear that he still managed to grow plants in pots, and observe them through the seasons, experimenting a little with some of their properties (for example with the oil of the tallow tree, *Triadica sebifera*). Some of the seeds were obtained through his acquaintances among Jesuits in Beijing, but most came through his local connections among Chinese merchants involved in the tea trade, as well as local gardeners and plant collectors. Nor were all the plants he gathered native to China: some originated in the broader south and east-Asian area, like cinnamon (*Cinnamomum*), and further, such as chillies (*Capsicum annuum*).

Below: The ornate silk covers of Hu Zhengyan's *Ten Bamboo Studio Manual of Calligraphy and Painting* offer a clue to Blake's possible ownership of the albums.

3) Silk-covered copy of the *Ten Bamboo Studio Manual of Calligraphy and Painting*

Despite his incomplete knowledge in botanical matters, Blake made a point of being thorough in his research. Since he did not speak Mandarin himself, he must have hired a translator to help him go through Chinese botanical works. It is likely that some of the translation was carried out by Whang Ah Tong, who later visited England and stayed with Captain Blake.[7] The third item is a copy of the *Ten Bamboo Studio Manual of Calligraphy and Painting* by Hu Zhengyan, which focuses on painted plants and rocks.[8] The only clue to Blake's ownership of these two volumes lies in their striking yellow silk covers featuring multicoloured patterns, which matches very closely the covers of four albums of Blake's commissioned paintings held in the Oak Spring Garden Foundation, Virginia, USA. Other items containing Blake's handwriting and similar silk covers were also recently found in Canterbury Cathedral Library, which further strengthens this tenuous-but-plausible hypothesis.

While Hu Zhengyan's 17th-century coloured woodblock prints were meant as an introduction to elegant painting, it is possible Blake mistakenly thought it contained Chinese botanical knowledge. Nonetheless, Blake also procured two classics of Chinese *materia medica*: an undetermined edition of the *Bencao Gangmu*《本草綱目》(Compendium of *materia medica*) by Li Shizhen 李时珍 (1518–1593), and its abridgement, the *Bencao Beiyao*《本草备要》(Practical aspects of *materia medica*) edited by Wang Ang 汪昂 (1615–1694). With a translator's help, Blake annotated their illustrated sections as thoroughly as he did with European botanical references. While these two books would have been useful to learn of the properties of Chinese plants, their illustrations were rather too schematic in nature for Blake's purpose. It is thus possible that he acquired the *Ten Bamboo Studio Manual* to get an idea of the skills that Chinese painters could achieve in the style known as 'bird-and-flower painting'.

4) Painting of a Litchi, unknown date and painter

Like many naturalists working outside of a dedicated expedition, Blake decided to commission a local artist to illustrate his Chinese Flora.[9] As a result, the paintings can be seen as a hybrid between Linnaean botanical accuracy and the Chinese tradition of painting florals. Blake subscribed to John Miller's *An Illustration of the Sexual System of Linnaeus*, the latest of which were regularly sent to him

7 See Ching, May-Bo (2017). The 'English experience' among the humblest Chinese in the Canton Trade Era (1700s–1842). *Curtis's Botanical Magazine*, 34(4): 298–313.

8 Linnean Society Website. 'Librarian Will Beharrell introduces a pioneering, genre-straddling masterpiece of 18th-century Chinese printing.' [https://www.linnean.org/news/2021/04/12/the-ten-bamboo-studio-treatise-on-painting-c-1700]

9 Noltie, H. J. (2017). John Bradby Blake and James Kerr: hybrid botanical art, Canton and Bengal, c. 1770. *Curtis's Botanical Magazine* 34(4): 431.

Above: The most 'finished' versions of Blake's commissioned paintings, like this 'Li Chee', are found at the Oak Spring Garden Foundation in Virginia, USA.

Image: Oak Spring Garden Foundation

by his father. There are no indications of Blake himself ever learning how to draw, but he probably took an active role in deciding the composition of the paintings. In a letter to his father, Blake described his long evenings of work alongside Chinese painter Mak Sau and described their work as a 'joint endeavour'.[10] Together they produced hundreds of paintings between 1771 and 1773, many of which were added to over time, when the plant reached a new stage of flowering or seeding. The paintings were sent over to Solander to obtain feedback on their suitability for botanical identification. Solander would advise to fix certain aspects as needed, which then occasioned the production of a new painting. As a result, there are several sets of paintings surviving for any one plant, in different stages of completion. A few copies were also made for safety's sake, as ships transporting goods and materials did sink frequently at the time. Different sets of Blake's commissioned paintings were identified in private collections and in several UK museums, but the most 'finished' versions are undeniably the ones kept in the Oak Spring Garden Foundation, alongside a large amount of his notes and correspondence.

Typically, Blake-commissioned paintings included the Chinese name of the plant in Chinese characters and its Cantonese romanisation, which appeared inside a black frame within which the plant was also represented. Depending on the level of detail, there could be fructifications, or a leaf added at the bottom of the painting. There are several paintings of various species of *Litchi* (lychee) in the different Blake collections: two sets of 'simpler' ones, perhaps those originally sent to Solander, are kept in the Natural History Museum and the Royal College of Physicians in London.[11] While none of the paintings have yet been analysed, it is likely that the technique used was watercolour and gouache on paper.

10 'Extract of letter from John Bradby Blake, Esq…to his father John Blake, Esq...November/ December 1772', Oak Spring Garden Foundation, John Bradby Blake Collection, Plants and Letters, pdf, p. 38.

11 Richard, J. (2020). Collecting Chinese Flora: Eighteenth- to Nineteenth-Century Sino-British Scientific and Cultural Exchanges as Seen Through British Collections of China Trade Botanical Paintings. *Ming Qing Yanjiu* 24: 214.

The *Litchi* painting in the Linnean Society's collection was only uncovered, as such, in 2021. Its composition clearly marks it as a Blake-commissioned painting that might have been separated from a larger set. However, it is unclear if it was really painted by Mak Sau in the 1770s. The blue ribbon surrounding the black inked frame usually accompanies pith paper, a medium which wrinkles easily, and usually dates towards the mid-19th century. There could have been several uses for such a late copy of Mak Sau's paintings, the most likely being to help later British naturalists in China get started on their own search for plants. Although their paths did not seem to have crossed while Blake was alive, Sir Joseph Banks (1743–1820) was aware of Blake's work. There is some evidence that a set of Mak Sau's paintings was lent to a few of Banks's plant collectors to help them commission their own in the late-18th and early-19th century.[12] Alternatively, it is possible that Chinese painters based in Canton, in export painting studios, got hold of Mak Sau's paintings and referenced them to produce multiple copies to sell to Western customers. So far, the Linnean Society painting remains a mystery, along with a few others in private collections.

Above: The Society's image, found in the Linnaean portfolio, certainly looks like a Blake-commissioned painting, but other clues indicate it may be a copy of Mak Sua's work. As of yet, it remains a mystery.

Image: The Linnean Society of London

Conclusion

The collective of scholars informally dubbed 'the Blake Project' has existed for more than a decade, during which time much has been uncovered about this unfinished Chinese Flora.[13] It is an exceptional case study because so many paintings and manuscript notes survive, scattered in different collections across the world. Every so often more of Blake and Mak Sau's paintings appear on the market, or some of Blake's manuscripts are identified in a museum collection. The jigsaw reveals progressively more of this previously forgotten project using the Linnaean method. What's more, it becomes ever clearer that Blake could not have progressed so far in his project without a significant input from a range of Chinese painters, gardeners, and translators.

12 Goodman & Jarvis (2017): 261.

13 The Blake Project is hosted by the Oak Spring Garden Foundation. OSGF website, page about John Bradby Blake archive [https://www.osgf.org/john-bradby-blake]

Linnean Society
Medal & Award Winners

2022

Recognising Excellence in Science

The Linnean Society's awards and medals celebrate natural historians from inside and outside academia for their accomplishments in improving our understanding of the natural world. These extraordinary people have shown, across many branches of natural history, how in-depth study and practice can not only increase knowledge but can address some of our world's pressing environmental problems. All of our winners were celebrated at this year's AGM and Anniversary Meeting on Tues 24 May.

Linnean Medal (Zoology): Mr Rohan Pethiyagoda

For services to science

Mr Rohan Pethiyagoda has been an employee of and advisor to the government of Sri Lanka, serving as Chairman of the Water Board in the 1980s. His 1991 monumental *Freshwater Fishes of Sri Lanka* was hailed as a landmark achievement, treating the island's diverse ichthyofauna more comprehensively and authoritatively than ever before. Over the next decade both Rohan and his Wildlife Heritage Trust (WHT), set up with the profits from the book, became synonymous with the exploration, discovery and documentation of Sri Lanka's biodiversity and the wider application of this to enhance biogeography of the broader region.

Linnean Medal (Botany): Professor Sebsebe Demissew

For services to science

Sebsebe Demissew is one of the most powerful voices for biodiversity conservation today. He has worked over three decades on the documentation of the plant resources (both wild and cultivated) of Ethiopia and Eritrea including the traditional knowledge on the use of plants by indigenous communities. His science has gone beyond taxonomy to encompass study of the vegetation of Ethiopia, including analyses of the effects of climate change on this unique flora. At its heart, his work improves the knowledge of biodiversity and ultimately empowers the people of the global South.

Bicentenary Medal: Dr James Rosindell

Recognising the work of a biologist under 40

James Rosindell pioneered the 'protracted speciation' model that resolved problems with a prominent model of community ecology; recognising that speciation takes time rather than being an instantaneous event. This has now become an established part of macroevolutionary theory. His work with fractal geometry led him to invent the 'OneZoom' tree of life explorer, which makes the complete tree of life accessible as a public good, which has attracted nearly 1.5 million online users.

Darwin-Wallace Medal: Professor David Jablonski

For major advances in evolutionary biology

David Jablonski has been one of the most influential and innovative palaeobiologists: a leader in the use of large-scale data sets to investigate macroevolutionary pattern over diverse temporal scales and levels in taxonomic hierarchy. His contributions cover topics as diverse as the effect of larval ecology on evolution, causes of the latitudinal diversity gradient, determinants and consequences of geographic range size, the origin and fate of evolutionary novelties and, of pressing relevance, the biology and evolutionary impact of mass extinctions.

H. H. Bloomer Award: Mr Geoffrey Kibby

Amateur naturalist's contribution to biological knowledge

Geoffrey Kibby had a career as an entomologist based at the Natural History Museum, London until 1998, but also was an almost entirely self-taught keen amateur mycologist. In retirement he then devoted himself to macrofungi as a true citizen scientist; he has become a leading authority on a variety of mushroom genera, publishing guides for their identification and taxonomic revisions of those especially difficult to identify—invariably illustrated by his own superb coloured drawings, and updating them as new data become available.

Trail-Crisp Award: Dr Frieda Christie

An outstanding contribution to biological microscopy

Frieda Christie has contributed her expertise in microscopy to innumerable projects, including palynology, palaeobotany, cytology, plant anatomy, plant development and ontogeny, taxonomy, and plant evolution, particularly in Gesneriaceae. She has published significant original research with collaborators around the world, where her images are appreciated as not only scientifically novel, but beautiful as well. She has also provided unparalleled technical support to students and postgraduate researchers.

Irene Manton Prize: Dr Bruno Pok Man Ngou

Best doctoral thesis in botany in a UK university

Bruno Ngou's doctoral thesis examined how plants and their diverse pathogens interact in an evolutionary arms race to avoid and cause disease. Two distinct immune-defence mechanisms allow plants to recognise and activate defence against these bacterial, fungal and oomycete pathogens; plants recognise the pathogens, while pathogens detect this and secrete effector molecules, which plants in turn detect, but the interaction between these had not been studied. He found that these two plant immune systems function synergistically to activate robust immunity that thwarts pathogens.

John C. Marsden Medal: Dr Timothy Lamont

Best doctoral thesis in biology in a UK university

Timothy Lamont's doctoral thesis took an unexpected turn after a catastrophic coral bleaching event devastated his field site. He turned this to his advantage, developing innovative ways of documenting the change in the soundscape after biodiversity loss, and conducted two ambitious field experiments to assess impacts of changes in the acoustic landscape on future recruitment of coral reef fish. His results showed the importance of sounds, even underwater, to the eventual recovery of natural reef ecosystems, which have led to the exciting potential of 'acoustic enrichment' to restore fish communities on degraded coral reefs.

Jill Smythies Prize: Dr Andrew Brown

To a botanical artist for outstanding, diagnostically relevant, published illustrations

Andrew Brown developed his skill in botanical illustration through his doctoral work on palynological vegetation history and during a career as an educator in the independent school sector. After retirement, he devoted himself to illustration fulltime. His detailed paintings of Alaskan wildflowers based on drawings done from life, have been exhibited at the Society and elsewhere. Other paintings have been selected for inclusion in limited edition botanical works, such as the *Highgrove Florilegium*.

Do you know someone who deserves to be recognised for their contributions to science? Submit your medal and award winners for 2023!

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Finding *Phlogis*

Discovery of an unusual & very rarely found leafhopper

by Alvin Helden FLS

As an entomologist and all-round natural historian, I have always been fascinated by the natural world. For me, part of that fascination has been a desire to record and name what I see. So in 2015, when I began taking undergraduate field trips to the forest of Kibale National Park in Uganda, I was confronted by the challenge of trying to learn something of the huge diversity of unfamiliar species that I found there. Some things, like many mammals and birds, are easy to identify, but the vast majority of species are of course from other groups. Being an entomologist, I particularly wanted to be able to name some of the insects at Kibale. As part of our field course, we did a butterfly recording exercise, and with the help of expert local Ugandan field assistants, we were able to put a name to many butterflies. By taking photographs, making use of some excellent websites and some published species records, alongside a little expert help, I was also able to make good progress with identifying hawkmoths (Sphingidae) and tortoise beetles (Cassidinae). However, what I really wanted to do was to try and identify some of my specialist group of insects, the Auchenorrhyncha—the leafhoppers, planthoppers and relatives.

Above: Dense vegetation in Kibale National Park, Uganda.

Discovery in Uganda

Although I have expertise in identifying Auchenorrhyncha from the UK and other European countries, I had not worked on the African fauna before. Of course, before I could make a start in this area, I had to get the necessary agreements and permission from the Ugandan Wildlife Authority and the Ugandan National Council for Science and Technology. Once secured, I made a start collecting specimens during our field course in 2017, at the Makerere University Biological Field Station (MUBFS). I used several techniques to collect Auchenorrhyncha: a moth sheet; sweep netting; and tree beating. It was while sweep netting some bushes around the field station in 2018 that I came across a particularly unusual looking leafhopper.

I then photographed the live specimen. In fact, for my work in Uganda I have photographed all the specimens I have collected. What I wanted to avoid with this project was to just collect a set of specimens that would remain relatively inaccessible, except to a specialist. The intention was to create a photographic record, so that anyone, expert or not, could engage with the species I found. My aim is to publish all the morphological information for the specialist, but also in a way that anyone, especially a Ugandan who may visit the field station, can see something more of the wonderful diversity of insects that might otherwise receive little notice. I have already made photographs of the butterflies, hawkmoths and tortoise beetles freely available to anyone, on Figshare (Helden *et al.* 2020; Helden 2021a, 2021b).

Image: Nick Greaves/Shutterstock.com

Above: Male specimen of *Phlogis kibalensis* Helden, 2022, shortly after it was collected in Kibale National Park, Uganda.

Image: Alvin Helden

An unusual specimen

For Auchenorrhyncha, photographs of specimens will certainly be helpful in identifying the different families, tribes and genera, and are also good for the non-expert to become familiar with this group of insects. However, for many species we rely on genital structures, particularly of males. So, back in the UK I have spent a good deal of time dissecting and photographing the genitalia of the specimens, as well as preserving the insects. Once that was done, the final step was to try to identify the species. One of the biggest challenges in identifying African Auchenorrhyncha is to locate the literature needed. Species descriptions, keys and illustrations of features are scattered in a very wide range of sources, with some dating from the 19th century. There are none of the same detailed identification guides with broad taxonomic coverage that have been published for European species, although there are some very good, well-illustrated sources for certain specific groups. As ever, when identifying species, I was relying on the great work of others who had written all of these sources. Amongst the many authors, there were two giants of identification, as it were, on whose shoulders I was standing. The first, Henri Synave, focused on planthoppers, and the second, Rauno Linnavuori, on leafhoppers. Both did a very significant amount of work on African species, and it was one of Linnavuori's papers that led to my discovery of the new species.

When I collected the specimen in Uganda, I knew this leafhopper was unusual, but it was not until I brought it back to the UK that I discovered how rare it was. I was looking through a copy of Linnavuori (1979), when I came across a series of line drawings illustrating the external features of a specimen of *Phlogis mirabilis*, which looked very like the specimen I had collected; in particular, a drawing of the lateral view of the head and thorax, which showed the very distinctive humped profile of the pronotum. I knew straight away that the specimen had to be the same genus, but was it the same species?

Fortunately, there had been some more recent work done on the tribe of leafhoppers to which *Phlogis* belongs (Phlogisini), including a detailed and well-illustrated description of a male specimen of *P. mirabilis* (Takiya *et al.* 2013; Viraktamath & Dietrich 2017). I was able to compare the specimen I had collected and realised that it was different, primarily in terms of the fine structure of the male genitalia, but also with a difference in size and colour of the base of the abdomen (Helden 2022). It was then that I knew when I looked down the microscope that I was the first person ever to see the

internal genital structures of this species. It was an exciting but humbling feeling.

Finding a previously unknown insect is not unusual, as many species are newly described each year. However, what made *P. kibalensis* so interesting was that only two specimens of the same genus have ever been found before. One was the *P. mirabilis* specimen described by Linnavuori in 1979 and the other the male *P. mirabilis*, described first in 2017 but originally collected in 1969. Therefore, there had been no scientific record of this genus alive for over 40 years, and none prior to 52 years ago. Is this because it is genuinely rare, or it is just hard to find? It is impossible to know.

Hope for the species

What we do know is that many species, almost certainly including *P. kibalensis*, are dependent on their tropical forest habitat for survival. Deforestation is undoubtedly leading to extinction in both the short and long term. Fortunately, Kibale National Park, despite being largely isolated by deforestation in the surrounding region (Hartter & Southworth 2009), is well protected. It does have its challenges of human-wildlife conflict and illegal resource extraction, but the forest remains intact and there are great efforts being made to engage with local communities and provide them benefit from the park (MacKenzie *et al.* 2017). In fact, much of the area near where *P. kibalensis* was found was once logged and is now recovering (Chapman *et al.* 2018). Therefore, there is hope that *P. kibalensis* and its forest home will survive.

Due to the disruption of the COVID-19 pandemic, I have not been able to return to Uganda since 2019, but I do hope to continue my work on the Auchenorrhyncha of Kibale. There is still a great deal to discover, especially about their ecology, and maybe one day I will find out something more about the mysterious *Phlogis kibalensis*.

Acknowledgements

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Insights from Watching

Wild Birds at Bird Feeders:

Biodiversity, behaviour & warning colouration

by Hugh Loxdale FLS

In January of this year, my wife and I took part in the RSPB's 'Big Garden Birdwatch' survey, and in the short space of an hour we noted 16 different species arrive at the bird table and feeders or in the garden generally of our home in North Devon. Some months beforehand (starting in late June, 2021), in an effort to determine the avian biodiversity locally, we began to record the species that visited our bird table and feeders as well as those visiting the garden generally or flying over it. The RSPB survey revealed that the 16 species represented a high proportion of the birds we had already recorded (~42% of the total recorded in just over 6 months). Hence, even such a rapid survey can provide an insight into what is living in the immediate surrounding area. In addition, we also noted some interesting aspects of the birds' biology.

An overview of local bird species

For context, our garden (approx. 485 m^2 in area[†]) is surrounded by a diverse landscape comprising mixed woodland, some commercial, and pastures grazed by livestock (sheep, cattle and horses). Even without actually recording the bird species that visited our bird table/feeders and their sexes on an hourly and daily basis, it was soon apparent that you start to get a feel for the demography and dynamics of the birds that visit, and their behaviours. For example, we found that very few nuthatches (*Sitta europea*) appeared, even though the birds are found locally, and few greenfinches (*Chloris chloris*) visited in the autumn and winter, despite these being regular visitors earlier in the summer. The occasional Eurasian siskin, *Spinus spinus w*as also seen visiting the bird table and feeders, especially in the spring, autumn and winter, but never any Eurasian bullfinches, *Pyrrhula pyrrhula*, although these did occur in our garden from time to time throughout the year, usually in pairs (male and female). Such seasonal changes probably reflect the holding of local territories during the breeding season, followed by abandonment of these.

Left: House sparrows, more abundant in number in our count for the 'Big Garden Birdwatch', showing competitive behaviour at bird feeder filled with mixed seeds.

I also realised that bird tables and feeders mainly attract those species that are used to visiting such stations, whilst other species do so rarely, unless they are drawn in by other migratory birds, and are behaviourally-inclined to do so. As with insect light traps (Williams 1948, Robinson & Robinson 1950; Fry & Waring 2001; Bell *et al*. 2019), wild bird feeding stations can provide a rough indication of the species existing locally in the 'attractive radius' of the trap (Williams 1951; Bell *et al*. 2019[‡]) and as such, over time, a species richness curve (SRC) can be constructed (Scheiner *et al*. 2000), as I have done here for both the table/feeders and the birds generally seen in or over the garden (Table 1; Fig. 1a & b—*OVERLEAF*), although different foodstuffs (Niger seeds, sunflower seeds, mixed seeds, fat balls, etc.) may—and often do—attract different bird species (H. D. L. pers. obs.).

Since late June 2021, we have recorded 38 species in our garden and skies in the immediate area, 17 of which were seen at the table or on the feeders themselves (~45% of total). No new species have been recorded since 18 January 2022, suggesting that we have sampled the majority of the species locally that are attracted to the bird tables/feeders (Fig. 1b), although over time, new species may eventually be recorded. This equates to around 6% of the total UK avian fauna (currently 614 spp.; McInerny *et al.* 2018), but of course, such numbers depend on the habitat surrounding the table/feeders, and hence the ecology of the birds themselves.

In addition to the aforementioned bird species, chaffinches (*Fringilla coelebs*) also commonly appeared, often also in pairs, but preferred to forage on the ground below the table. European robins (*Erithacus rubecula*) very occasionally visited, but never dunnocks (*Prunella modularis*) nor Eurasian wrens (*Troglodytes troglodytes*). A North American house finch (*Haemorhous mexicanus*) visited the seed feeders for quite a few weeks in the summer through to early October 2021 (perhaps a very off-course migrant), but has since disappeared. Interestingly, birds seemingly have their favourite feeding times; in winter this is predominantly between 08.00–10.00am, with some feeding around midday, and between 15.00–17.00pm, before the light fades.

Image: Ramona Edwards/Shutterstock.com

Table 1: Species recorded in or over garden at Heasley Mill; 28 June 2021–18 January 2022

*Species seen visiting the feeders.

Date	Species common name	Local abundance
28/06/2021	House Martin	Common
03/07/2021	Jay	Rare
04/07/2021	Dunnock	Common
04/07/2021	Blue Tit*	Common
04/07/2021	Great Tit*	Common
04/07/2021	Red Kite	A few a month
04/07/2021	Barn Owl	Rare
05/07/2021	Chaffinch*	Common
09/07/2021	Goldfinch*	Common
09/07/2021	Greenfinch*	Rare
09/07/2021	Siskin*	Rare
09/07/2021	House Sparrow*	V. Common
09/07/2021	Blackbird	Common
09/07/2021	Song Thrush	Rare
09/07/2021	Chiffchaff	Common
09/07/2021	Collared Dove	Rare
09/07/2021	Wood pigeon*	Common
09/07/2021	Great spotted woodpecker*	Common
17/07/2021	Spotted Flycatcher	V. rare
19/07/2021	Wren	Common
20/07/2021	Swift	Rare
20/07/2021	Coal Tit*	Common
25/07/2021	Bullfinch	Rare
25/07/2021	Pied Wagtail	Common
25/07/2021	Robin*	Common
25/07/2021	Jackdaw*	Common
25/07/2021	Swallow	Common
25/07/2021	Raven	Common
25/07/2021	Buzzard	Common
25/07/2021	Pheasant	V. common
25/07/2021	House Finch* (N. American sp.)	1 seen until 10/21
31/07/2021	Tawny Owl	Common
19/08/2021	Blackcap*	Rare
19/08/2021	Nuthatch*	Rare
12/10/2021	Heron	Rare
13/11/2021	Starling*	Rare
25/11/2021	Red-legged partridge	Rare
18/01/2022	Long-tailed tit*	Rare

Fig. 1a

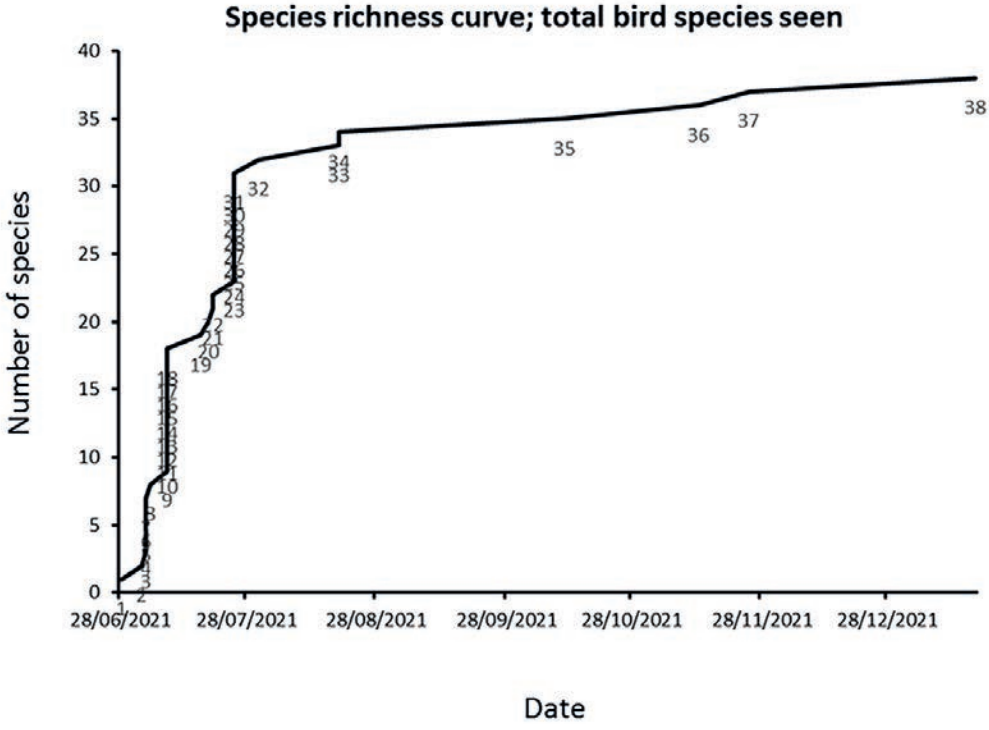
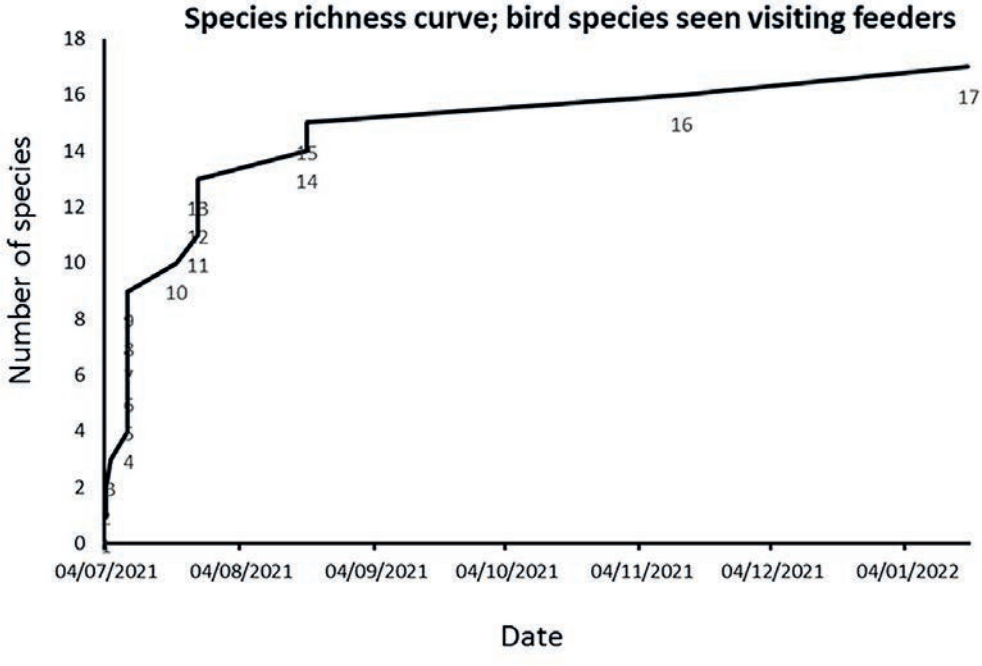


Fig. 1b



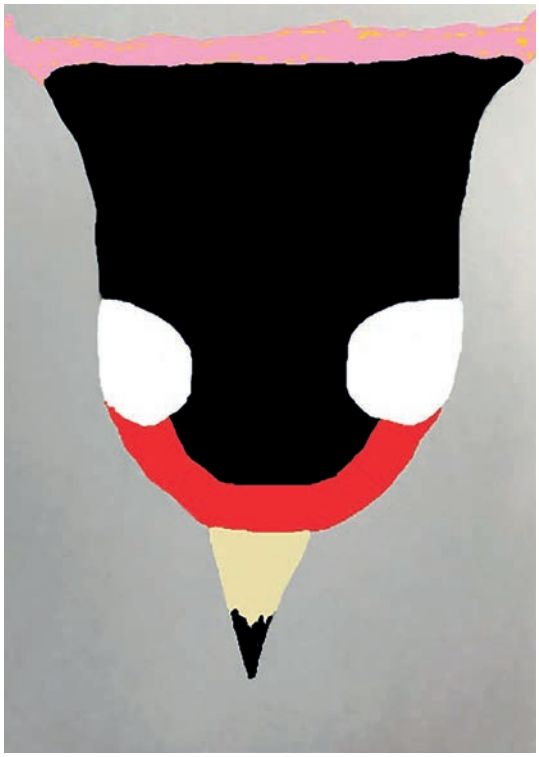
Figs. 1a & b. Species richness curves for birds observed at Heasley Mill. (a) total bird species observed in and above garden and (b), bird species observed only on feeders. Observations were made most days between 28/06/2021–19/01/2022 inclusive, except for the last three weeks of September 2021. Observations lasted around 15–20 minutes/day, usually during the period 09.00–10.00 hrs and 13.00–14.00 hrs.

RIGHT: Goldfinch displaying aposematic warning colouration.

BELOW: Schematic head of a goldfinch viewed from above, showing rudimentary head of predatory or venomous animal model, with eyes and mandible, perhaps evolving towards a hornet-like representation.

Warning signs

A great surprise was watching goldfinches (*Carduelis carduelis*). Despite their slightly smaller size and more delicate build compared to the more abundant and aggressive house sparrows (*Passer domesticus*), the sparrows generally seemed loath to chase them off the feeders. Perhaps this is because the goldfinches preferred the Niger seeds above all else, and house sparrows are less keen, so the level of competition is reduced. Or it may also be that the goldfinch, with its crimson red face mask with black and white markings, and bright yellow plumage on the wings with black and white patterning on the tips and also on the tail, is displaying aposematic warning colouration which affords them a certain level of protection. Unlike other finches, such as the bullfinch and chaffinch, which show sexual dimorphism in terms of plumage colour (brightly coloured males and more cryptically camouflaged females), both sexes in the goldfinch show similar striking colouration. When goldfinches are confronted by rivals on the feeders, they tend to open their beaks wide and flutter their wings, thereby more prominently displaying a flash of yellow warning colouration.



Images: Eitan Altman; Macaulay Library, Cornell Lab of Ornithology

Another regular visitor (with a preference for peanuts, jabbing at competitors for food with its long beak) was the great spotted woodpecker (*Dendrocopos major,* p. 32). Besides the black and white livery and red plumage found on the underside near the base of the tail in both sexes, only the male and juvenile have the bright red head markings (on the back of the head and crown, respectively), but other Eurasian and North American woodpeckers also have similar patches of bright red (Peterson *et al*. 1979; Robbins *et al*. 1983). Whilst it is probable that the bright red patch may indicate a warning to rival males and signal to attract females, red (or yellow and orange), black and white are in themselves common warning signals in nature (Cott 1940).

Potential toxicity?

Although presently not known, it is possible that these birds have a certain degree of toxicity associated with their flesh, sequestered from their insect and seed diet (goldfinches also feed their young on insects and other invertebrates), like the European migratory quail (*Coturnix coturnix coturnix*; Korkmaz *et al*. 2011) and the North American ruffed grouse (*Bonasa umbellus*; Causey 2020). Interestingly, when viewed from the top, the goldfinch shows a stylised black pattern with two large, laterally placed 'eye' spots and a red 'mandible', as if it is mimicking a predatory or venomous/noxious animal model (*LEFT*). Such defensive patterning has been noted by Professor Philip Howse in insects, notably species of Lepidoptera, for example the Death's-head hawkmoth, *Acherontia atropos* (Family Sphingidae) (*cf.* Figs. 18–20 in Howse 2021; also Howse 2014).

In the case of the woodpeckers, my guess is that the bright colouration is more important as a deterrent against would-be predators than as a sexual display signal (*cf.* also Baker & Parker, 1979). One might speculate that, like the goldfinch, their insectivorous diet and the associated toxins (e.g. alkaloids, terpenes/terpenoids, glucosinolates and cardiac glycosides sequestered from the insects' diet, probably a predominantly plant-based diet derived mainly from herbivorous insects; Opitz & Müller, 2009) may render woodpeckers unpalatable, a trait

Above: Male great spotted woodpecker on branch; is its bright colouration a deterrent against predators or a sexual display?

Images: Piotr Krzeslak/ Shutterstock.com

that is advertised with prominent warning colours (*cf.* also Cott 1940; Baker & Parker 1979). One may further speculate that many other familiar insectivorous garden birds, like some of the tits, which have contrasting colour markings (e.g. black and yellow or blue and yellow) and wagtails (e.g. grey, black and yellow or black and white), are also advertising a certain degree of toxicity and hence their colouration is aposematic in nature.

Feeding stations yield data

To provide an accurate survey of the avian biodiversity locally present at any given area, much greater spatial and temporal sampling (visual recording) would of course need to be done, rather than the use of one feeding station at one site, as here used. Furthermore, in the present study, for the sake of producing the SRC for the birds attracted to the feeding station, the data obtained (for the table and 4 different feeders nearby, 3 seed and 1 fat ball) have been lumped together. Despite these shortcomings, the data clearly allows certain trends to be discerned, and these may be insightful.

The feedings stations are definitely selective in terms of the wild bird species they attract, and some species have preferences for one food type over another (e.g. goldfinches prefer Niger seeds, great spotted woodpeckers peanuts), whilst other species such as the house sparrow have broader tastes, although still with preferences (in their case, for mixed seeds). Other species like pied wagtails (*Motacilla alba*) and dunnocks did not visit the feeding station, but often foraged below it.

In a broad brush stroke way, the data give some indication of the behaviour, feeding preferences and dynamics of the birds observed locally, hence ecology, the latter often relating to the holding of seasonally-based breeding territories, permanent residency, and/or seasonal trends involving vagrancy and migration. As stated, the SRC data shows two interesting things: (a) that nearly half the bird species that visited the

garden (45%) visited the feeders and (b) that the total number of bird species sampled represents, as expected, only a small percentage (<10%) of the total avian fauna recorded in all the various habitats sampled nationally in the UK.

Recording the birds that come to a bird feeding station/s, especially in a rigorous, systematic manner, may yield data of importance in understanding bird biology, especially behaviour and ecology, and perhaps also evolution.

Note

† Latitude 51.07608N, longitude –3.80384W; ‡ It is estimated that the radius of attraction of moths to the Rothamsted Insect Survey tungsten bulb light trap (Williams' design) is probably in the range 30-50 metres (*cf*. Bell *et al.,* 2019 and references therein).

Acknowledgements

I thank Eitan Altman and the Librarian at the Macaulay Library, Cornell Lab of Ornithology for kindly allowing me to use the photograph of the goldfinch, my wife Dr Nicola von Mende-Loxdale for discussions and Gina Douglas and Leonie Berwick for their most helpful editorial comments. My views on the colour patterning as herein observed is largely inspired by the recent works on butterfly and moth warning colouration by Professor Philip Howse OBE, who opened my eyes to such possibilities in birds.

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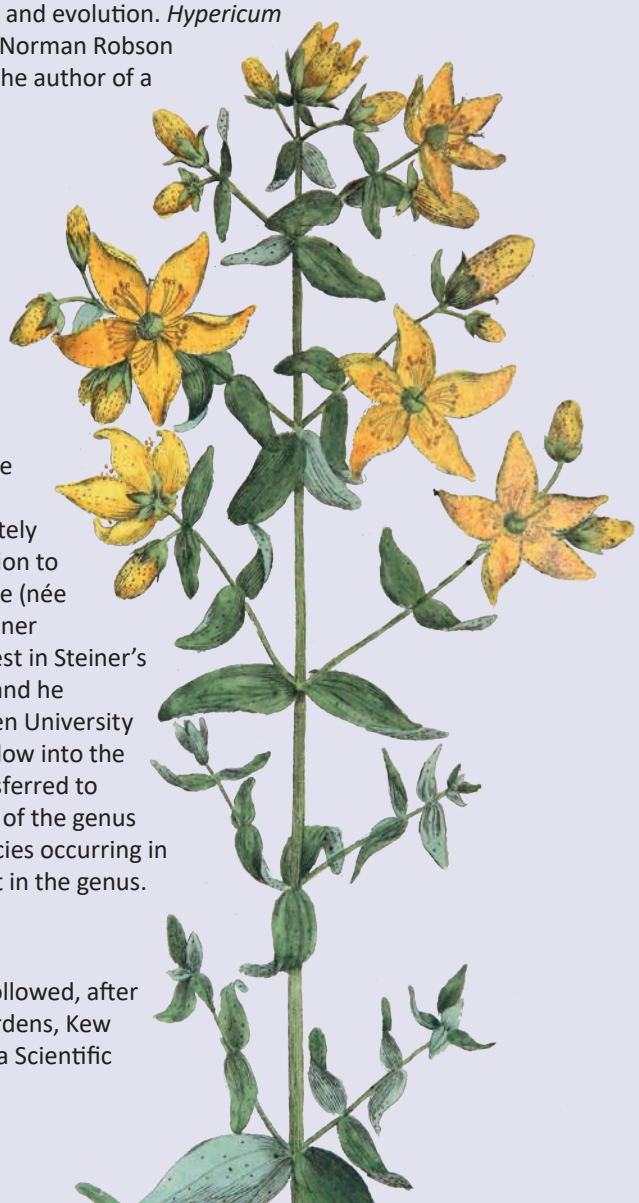
The Botanical Life of *Norman Keith Bonner Robson* (1928–2021)

by Mark Carine FLS



Right: *Hypericum perforatum* from Johan Palmstruch's *Svensk Botanik* (1803).

With more than 490 species, *Hypericum* L. (Hypericaceae), the St John's Worts, is one of the 100 large angiosperm genera that collectively comprise over 20% of flowering plant diversity. The size of such genera means that complete monographic treatments are challenging and time-consuming, and many consequently remain poorly known, leaving a substantial gap in our knowledge of plant species diversity and evolution. *Hypericum* is a notable exception, thanks to the efforts of Norman Robson who died in September 2021 at the age of 93, the author of a monograph of this large and complex group.

Early years

Norman was born in 1928 into a family of Aberdonian plantsmen. His father Keith was a director of W. Smith & Son founded in 1842, and his grandfather Alexander Robson had been one of the employees who bought out the firm after William Smith and his son both died within a few years of each other.

A disrupted school education (due in part to the Second World War but also to ill health in his teenage years) led Norman to be tutored privately for some time. Casting the net wide for a solution to his health difficulties, Norman's mother, Adeline (née Bonner) contacted Camphill, a local Rudolf Steiner community, leading to Norman's lifelong interest in Steiner's teachings. Norman's health improved greatly, and he commenced a degree in agriculture at Aberdeen University in 1946 with the expectation that he would follow into the family business. After a year, however, he transferred to botany and his final honours project, 'A review of the genus *Hypericum* L. with special reference to the species occurring in Britain', sowed the seed for his lifelong interest in the genus.

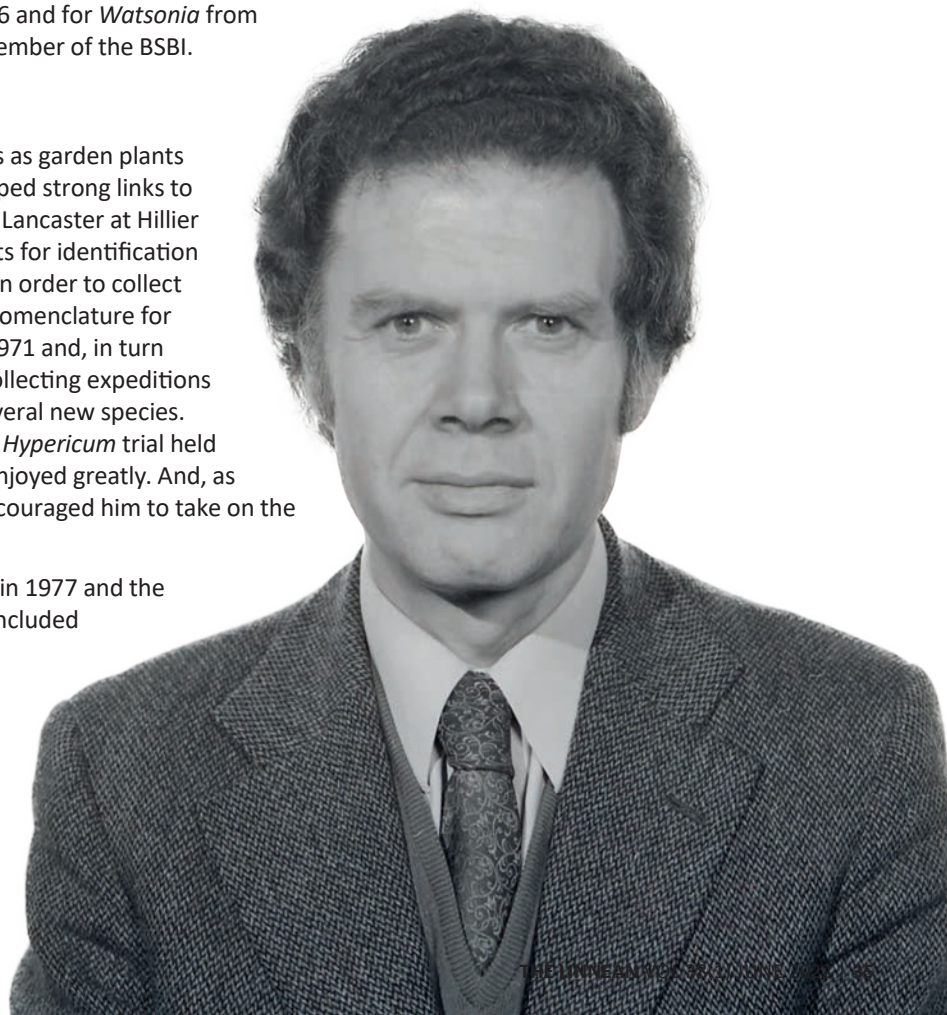
A lifelong interest begins

A PhD on *Hypericum* at Edinburgh University followed, after which Norman moved to the Royal Botanic Gardens, Kew (RGB Kew) in 1956 where he was employed as a Scientific

Officer working on *Flora Zambesiaca*. That project had been instigated by Arthur Exell at the British Museum (Natural History), now the Natural History Museum, London, as a collaborative endeavour involving, in London, both Kew and the Museum. When Exell subsequently retired in 1962, Norman moved from one collaborating institution to the other, replacing Exell as Head of General Herbarium Section I, a role that combined collections management responsibility (for families 1–66, Ranunculuaceae to Combretaceae) with work on exhibitions (notably the Krakatoa exhibition in 1984) and research. Norman continued to work on *Flora Zambesiaca,* publishing an account of Celastraceae, but turned his attention increasingly to the taxonomy of *Hypericum* and its sister group *Vismea,* publishing accounts for various Floras.

Elected a Fellow of the Linnean Society in 1958, Norman served the Society as its botanical curator from 1985–95 and on the Society's Bicentenary Committee. When SERC funded the first phase of the Linnean Plant Name Typification Project, Norman was in overall scientific charge and he was mentor to the project fellow, Charlie Jarvis, before Charlie's subsequent appointment to the permanent staff of the Museum to lead the project. Norman was also a stalwart and, indeed, an honorary member of the Linnean Club.

Norman's botanical interests and expertise were wide-ranging. He joined the Botanical Society of the British Isles in 1951 (at the time of his death he was the Society's longest serving member) and acted as referee not only for *Hypericum* but also for *Malva* and for *Vaccinium* (including subgenus *Oxycoccos)*. Norman was meticulous in his taxonomic work. When he was promoted to Senior Scientific Officer at Kew, the then Director, Sir George Taylor, had been 'particularly impressed by [Norman's] industry and the thorough manner in which he tackles his taxonomic problems'. Norman's industry and thorough manner were later put to good use as an editor, both for the *Botanical Journal of the Linnean Society* from 1968–76 and for *Watsonia* from 1968–88, after which he was elected an Honorary Member of the BSBI.



Below: Norman Robson at the Natural History Museum, London.

New species…and a monograph

Reflecting, perhaps, not only the value of Hypericums as garden plants but also his own nurseryman origins, Norman developed strong links to horticulture through his work. During the 1960s, Roy Lancaster at Hillier Nurseries in Winchester began sending Norman plants for identification and encouraged botanists from the Museum to visit in order to collect specimens. Norman subsequently assisted with the nomenclature for the *Hillier Manual of Trees and Shrubs*, published in 1971 and, in turn encouraged Roy to collect Hypericums on his plant collecting expeditions to Nepal and Yunnan, resulting in the discovery of several new species. As recently as 2018, Norman was judging for the RHS *Hypericum* trial held at the Sir Harold Hillier Gardens, something that he enjoyed greatly. And, as Norman acknowledged, it was Roy Lancaster who encouraged him to take on the monograph.

Published in nine parts over 35 years, the first issued in 1977 and the concluding part in 2012, the *Hypericum* monograph included not only descriptions and keys to the species but also detailed hypotheses of evolutionary relationships. Norman retired from the Natural History Museum in 1988, continuing as a Scientific Associate, meaning that much of the monograph was completed in retirement. It was subsequently published online as a scratchpad; his hopes that a single unified publication would follow sadly never materialised.

Above Left: Norman (*Right*) judging for the RHS *Hypericum* trial, held at the Sir Harold Hillier Gardens.

Above Right: Norman with Sara Crockett, showing the pressed specimen of *Hypericum robsonii.*

Norman's doctoral thesis had presented a detailed morphological, anatomical, cytological and geographical survey of the genus and the evolutionary hypotheses he developed in his monograph drew heavily on that earlier work. His approach was fundamentally a pragmatic one. He eschewed what he considered to be 'detailed analytical methods', including the cladistic methods that were being developed by colleagues at the Museum, arguing that they would be too slow to allow completion of the monograph in one lifetime. He was probably right.

The framework that Norman's monograph provided has nevertheless stimulated research using those approaches into questions ranging from the evolution of secondary metabolites and of apomixis in *Hypericum* to the origins of the Trans-African Rand flora and rapid radiations in the páramos of South America. When molecular phylogenetic techniques were used to study *Hypericum*, the findings revealed areas of conflict with Norman's own evolutionary hypotheses. In large part, these reflected issues of character polarity. Norman remained unconvinced and firmly challenged those new results.

Providing a foundation

In '*A Short History of Nearly Everything',* Bill Bryson wrote of meeting in a lift at the Natural History Museum '*a very nice chap called Norman who's spent forty-two years studying one species of plant, St John's Wort.*' Norman was indeed, a very nice chap, a kind and considerate gentleman of the old school. But Bryson's account of Norman's work conveyed nothing of the significance and scale of his monographic endeavour. Few are bold enough to take on the monograph of such large and complex plant groups as *Hypericum.* Even fewer complete the task. Norman did and his monograph has provided a foundation and a stimulus for much work on the genus that has followed.

I am very grateful to the following individuals for their assistance: Leonie Berwick, Adeline Crawford, Sara Crockett, Gwynn Ellis, Katherine Harrington, Emma Harrold, Nicholas Hind, Charlie Jarvis, David Jewell, Roy Lancaster, Alan Leslie and Roy Vickery.

Images: Matt Pringle; Sara Crockett

Charles Darwin &

early ideas about the origin of coal

by Barry A. Thomas FLS

Previous Main: The geological reconstruction in Crystal Palace grounds showing a coal seam either side of a central block illustrating an uplifted fault. From Donovan 2018 with permission.

Previous Lower: Charles Darwin by Walker & Boutall c. 1854, NPG x5930.

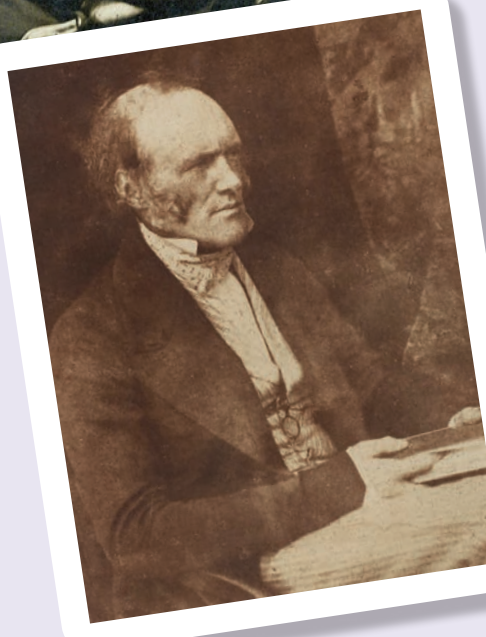
Below Left: Joseph Dalton Hooker in 1852 by William Kilburn.

Below Right: Charles Lyell by David Octavius Hill, c. 1843–47.

In the early part of the 19th century, the output of coal from British mines was rapidly increasing to meet the demands of industrialisation. When the Great Exhibition of 1851 was moved to Penge Peak, next to Sydenham Hill, the grounds were developed as part of the display. Stone was brought in to build a geological reconstruction showing a section of Carboniferous rocks with a coal seam. Although most people knew that coal was mined from seams below ground, there was no clear idea how it got there. We know today that coal originates in peat deposits accumulated from plants growing in waterlogged soil in the extensive tropical swamps of the Carboniferous Period. Periodic catastrophic events brought water-born sediments into the swamps killing the plants and covering the peat. When conditions stabilised, plants would recolonise and form peat until that was once again covered by sediments. Over time, the weight of overlying sediments compressed the peat turning it into coal, while the sediments themselves were consolidated into sandstones and shales. The original waterlogged soil is now known as the seat-earth.

The origin of coal was a subject debated by the leading scientists of the early 19th century, with the foremost of these being Edward William Binney (1812–1881), Charles James Fox Bunbury (1809–1886), Charles Darwin (1809–1882), Joseph Dalton Hooker (1817–1911), Charles Lyell (1797–1875), and William Crawford Williamson (1816–1895).

Joseph Dalton Hooker & Charles Lyell

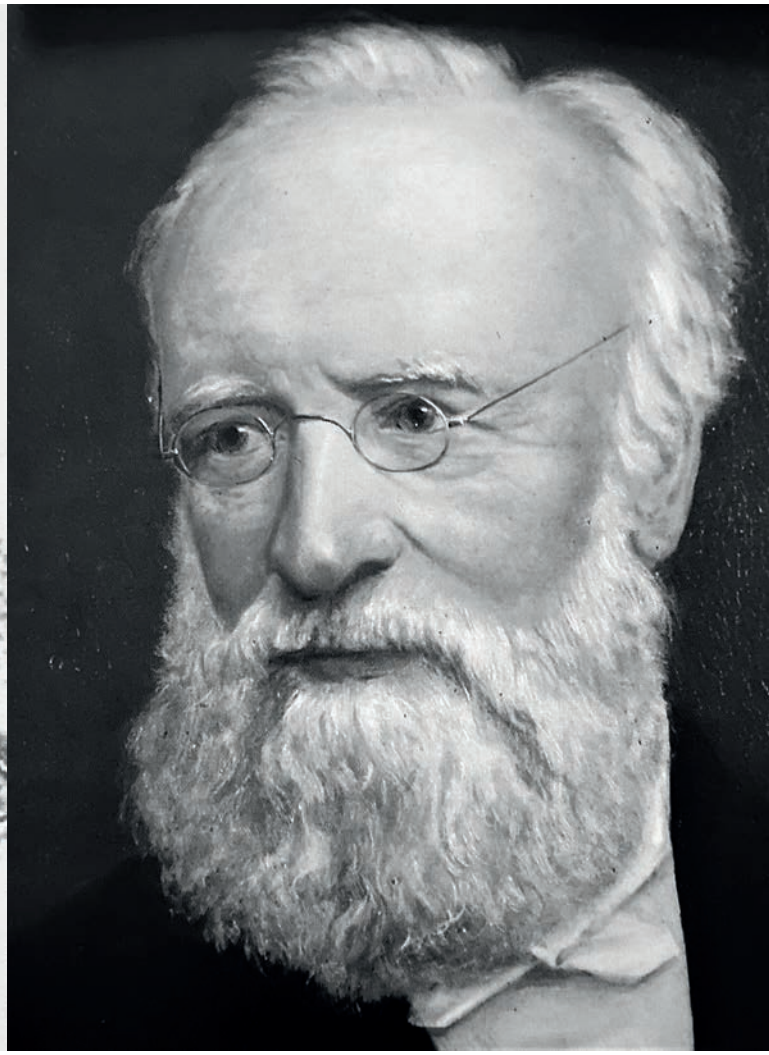


Darwin was always interested in the study of plant fossils (Thomas 2009) and he was also clearly thinking about the origin of coal. He often corresponded with Hooker and the two became close friends. Indeed, there are known to be about 1,400 letters exchanged between them, starting when Hooker became Botanist to the British Geological Survey from February 1846 to October 1847, while still in his late twenties (see Darwin Correspondence Project (DCP), https://www.darwinproject.ac.uk/). In one letter to Hooker (15 July 1846; DCP-LETT-986) Darwin wrote about Lyell, the foremost geologist of the time and a close friend. Lyell had contributed significantly to Darwin's thinking on the processes involved in evolution, eventually leading to the simultaneous publication in 1858 of papers by Darwin and Alfred Russel Wallace (1823–1913) on natural selection. Darwin told Hooker that Lyell had quoted his ideas in 'a Paper just despatched for Silliman's Journal [Silliman was the editor of the American Journal of Science]', and added 'The more I think on coal, the more utterly perplexed the subject appears to me'.

Charles James Fox Bunbury

Bunbury (*Overleaf*) now came into the picture. The brother-in-law of Lyell's wife Mary, Bunbury was a self-taught botanist, becoming a Fellow of the Linnean Society in 1833 and a Fellow of the Geological Society in December 1835. He studied plant fossils from Alabama and Europe and thought they were identical in many species (later published as Lyell and Bunbury 1846). Lyell made a suggestion that was to have profound influence on Bunbury's

Images: Doyle/Donovan; National Portrait Gallery; The Linnean Society of London; Wikimedia/The Metropolitan Museum of Art



scientific activities: Lyell '…strongly urged me to take up the study of fossil botany, which he says is not now pursued with earnestness by any one [sic] in this country' (Bunbury's diary, 22 Sept 1844).

William Crawford Williamson

Darwin was also corresponding with W. C. Williamson of Manchester, mainly about insectivorous plants, but also about the origin of coal. Williamson had sent Darwin an advanced copy of his account on the origin of coal (Williamson 1843) in which he argued that coal was formed from masses of plant material that had drifted into the sea, while a lesser amount of plant material mixed with mud formed the shales above the coal seams. Williamson believed that upright stems had been carried in this position by the weight of their roots, remaining upright because incoming sediment surrounding their lower parts ensured they stayed this way.

Edward William Binney

Binney (a solicitor living in Manchester, and an expert on the fossil plants of the coal seams of the Midlands), gave an account on the Lancashire Coalfield (1843) following that of Williamson. He detailed a number of Sigillareae standing at right angles to the strata, with some resting on top of the coal seams, and some showing roots resting on top of the coal. He then stated that, what he called the 'under coal' layer, nearly always contained *Stigmaria ficoides* (the rooting organs of the large lycophytes) without any other fragments of plants. Binney concluded that coal, in most instances, was formed where the plants grew, and that the area was subject

Above Left: Charles James Fox Bunbury, probably from about the time when he was active in paleobotany. Based on a drawing by Eden Upton Eddis.

Above Right: William Crawford Williamson from a painting by H. Brothers hanging in the Williamson Building, Manchester University.

Images: Wikipedia; J. Watson/Manchester University

Right: A reconstruction of *Sigillaria* with leafy apical parts and a fertile region with cones, called *Sigillariostrobus* (from Thomas and Cleal 1993).

to frequent subsidence as, over distance, coal seams changed thickness and split into two. However, Binney (1847) then changed his mind, publishing his account on *The origin of coal* in which he suggested that coal was formed as a submarine peat.

Darwin mentioned in a letter to Lyell that Hooker had been staying with him while:

> working on his paper on Coal Plants & we have had much interesting conversation. He has been reading with more attention, he says, than he did before reading all Bunbury's paper & several times he has been expressing his admiration at them. (24 January 1847; DCP-LETT-1056)

A significant discussion point evolved around the genus *Sigillaria,* first described by Alexandre Brongniart in 1822. It is now known to be a clubmoss found in the Carboniferous swamp forests, but its affinity and where it grew were a matter of debate. In a letter to Hooker, Darwin enclosed Binney's pamphlet (Binney 1847) adding:

> The Geological reasoning appears to me quite sound, except touching the old shallow seas. I am delighted to hear that Brongniart [1839] thought Sigillaria aquatic & that Binney considers coal a sort of submarine peat. I w^{d} bet 5 to 1 that in 20 years this will be generally admitted; and I do not care for whatever the Botanical difficulties or impossibilities may be. If I could but persuade myself that Sigillaria & Co. had a good range of depth, ie c^{d} live from 5 to 100 fathoms under water, all difficulties of nearly all kinds would be removed. (NB I am chuckling to think how you are sneering all this time.) (1 May 1847; DCP-LETT-1084)

Darwin clearly knew that Hooker would not support the concept of *Sigillaria* being aquatic for he added in his closing remarks: 'Farewell my dear Hooker & be a good boy & make Sigillaria a submarine sea-weed.' This letter upset Hooker who must have written straight back to Darwin, because in his autobiography (Darwin 1887; published five years after his death), Darwin recalled that Hooker 'is in all ways very impulsive and somewhat peppery in temper; but the clouds pass away almost immediately'. Darwin in his swift reply to Hooker included:

> I did not consider my letter as reasoning, or even as speculation, but simply as mental rioting & as I was sending Binney's paper I poured out to you the result of reading it. … Is it not probable that the same circumstances which have preserved the vegetation *in situ*, sh[d] have preserved drifted plants? […] Tell me that an upright fern *in situ* occurs with Sigillaria & Stigmaria, or that the affinities of Calamites & Lepidodendron […] as so *clear* that they could not have been marine, like, I will humbly apologise to you & all Botanists, for having let my mind run riot on a subject on which assuredly I know nothing. But till I hear this, I shall keep privately to my own opinion. (6 May 1847; DCP-LETT-1086)

He ended the letter with: 'Whether this letter will sink me still lower in your opinion, or put me a little right, I know not, but hope the latter. Anyhow I have revenged myself with boring you with a very long epistle. Farewell & be forgiving.'

On 12 May 1847 (DCP-LETT-1087), Darwin wrote again to Hooker, 'I do really think, after Binneys pamphlet, it will be worth your while to array your facts & ideas against an aquatic origin of the coal'.

It is interesting to see the interplay between Darwin and Hooker and the change in Darwin's views. Although Darwin was only eight years older than Hooker and he was already an established figure, Hooker was disturbed by Darwin's views, thinking them both naïve and incorrect. It is interesting to consider whether Darwin was deliberately provoking Hooker with his comments. Nevertheless, they remained good friends, and they continued corresponding after Hooker had left the Geological Survey in 1847.

Darwin then wrote to Williamson on the 31 January 1848 asking him to look carefully at the beds associated with coal:

> It has occurred to me that careful microscopical examination might reveal infusoria, & show whether the intervening beds were deposited under the sea, or brackish, or freshwater:—this question settled, w[d] be a great point gained. (DCP-LETT-1149)

The vegetation of the Carboniferous

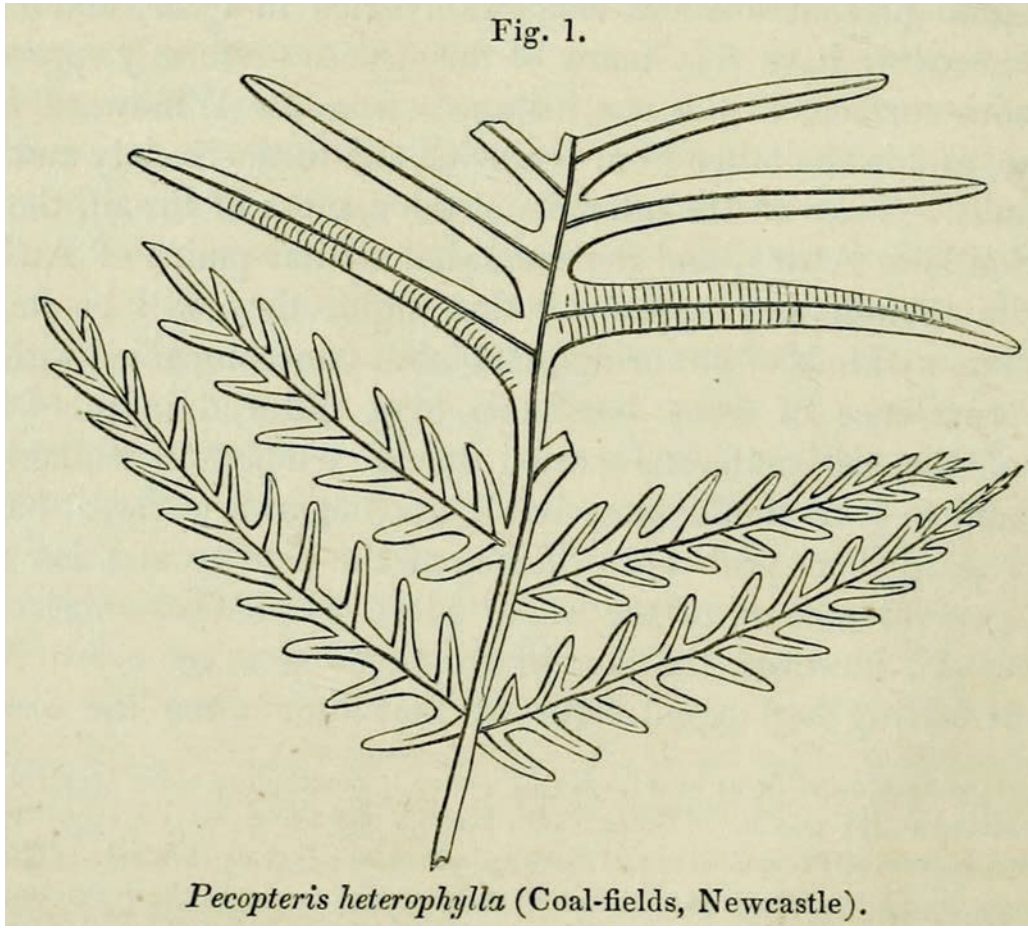
In 1848, Hooker published his account *On the vegetation of the Carboniferous period,* effectively beating Bunbury to it. Bunbury and Hooker had met in 1846 and become friends, and although Hooker's account of Carboniferous vegetation effectively stopped Bunbury's own research in this area, Bunbury continued to concentrate on identifying plant fossils (Cleal 2018). Hooker made some fundamental points in his paper, stating that there were at least 300 species of plants belonging to the British coal flora, and that the vegetation was highly luxuriant and consisting of large numbers of ferns (Fig. 9). We now know that many of these fern-like plants bore seeds and belonged to a totally different group of plants, the seed-ferns (pteridosperms). Hooker also argued that the genus *Sigillaria* should be allied to the Lycopodiaceae, their tissues and scarring being similar to *Lepidodendron*, thus effectively closing discussions about *Sigillaria* belonging to: the Euphorbiaceae, as suggested by Artis (1825), Lindley and Hutton (1831–1833) and Corda (1845); the palms by Schlotheim (1820); and the ferns by Sternberg (1820–1838) and Brongniart (1822).

In admitting that the question of how the coal plants formed coal is unknown, Hooker pointed out that the under-clay or soil, on which the coal rests, shows penetration of roots showing that plants grew in it, but there were no other parts of plants. This, together with Binney's assertion that there was no mixing of soil with the overlying coal, suggested to Hooker that the formation of peat was initiated by rooted plants decaying, so coal formation was not the result of drifting plants. He agreed with Binney that the shales above the coal were thought to be deposited by mineral-rich water incorporating plant fragments.

In the same year he published his work, Hooker joined David Hiram Williams, Geological Surveyor to the East India Company, on an expedition to Beejaghur in Central India, on the banks of the river Saone (now Son), a tributary of the Ganges, where coal deposits were reputed to exist. He wrote to Darwin from Darjeeling on 13 October:

> I will have a fling at you, even from the ends of the earth old friend. […] The 10,000 ft perpendic. of forests, flanking valleys of exceeding steepness should produce vast beds of vegetable matter in the bottoms of such valleys, but there is as little evidence of a detrital coal being forming here and, in the richest Terai forest soil; a rank, dank, fevery, & eminently vegetable mould, I find only 11 percent of organic matter […] May not heat produce dissipation of the latter?—I am too ignorant of Chemistry to judge. (DCP-LETT-1203)

After leaving the Geological Survey in 1847, Hooker became Assistant to his father, William Jackson Hooker, the Director of Kew Gardens, becoming Director himself in 1865. In the short time that Hooker was at the Geological Survey he



Right: *Pecopteris heterophylla* from Hooker 1848a, being a mirror image of the specimen illustrated by Lindley and Hutton 1831–1833, p. 113. Although it was described as a fern, it really a seed-fern (pteridosperm) belonging to the genus *Alethopteris*.

Image: BHL

accomplished a great deal, writing papers on the *Vegetation of the Coal Measures*, *On the peculiarities of Stigmaria, Remarks on the structure and affinities of some Lepidostrobus*, all published together in the *Memoirs of the Geological Survey of Great Britain* (Hooker 1848, a, b, c). His interest in the subject continued, as a letter to Darwin on 25 August 1854 (DCP-LETT-1581) shows that he was visiting Binney to prepare a paper on the fossil plants in limestone nodules found in the Lancashire coalfield. They noted that specimens of *Calamites* (arborescent sphenophytes related to modern horsetails) were absent from the limestone nodules they examined taking this absence to confirm their belief 'that some species of this genus represent the casts of the hollow or cellular axis of *Sigillaria* and *Calamodendron*, and perhaps of many other genera' (Hooker & Binney 1855). It is interesting to consider what might have happened if Hooker had stayed at the Geological Survey. British palaeobotany might have progressed at a considerably faster rate than it did.

Return to the Marine origin of coal

Darwin returned to the marine origin of coal in a letter to Lyell on 22 May 1860 (DCP-LETT-2812) knowing that he had visited Nova Scotia with the Canadian geologist John William Dawson and described fossils found there (Lyell & Dawson 1853, Dawson 1859) writing, 'What a fact about the Coal Land Shells!!!' in reference to Dawson describing fossilised terrestrial molluscs from the coal formations of Nova Scotia. This discovery was of great interest to those trying to understand of the origin of coal.

Darwin's last letter on the subject to Hooker was written on the same day, 22 May 1860:

> Lyell tells me that Binney has published in Proc: of Manchester Soc^{y}. paper trying to show that coal plants must have grown in very marine marshes.— Do you remember how savage you were long years ago at my broaching such a conjecture? (DCP-Lett-2830)

Bunbury was now the only active person studying and publishing on plant fossils. He had started writing his book, still being encouraged by Lyell who wrote to him on 30 January 1860:

> I am glad you have planned your new book. Adolphe Brongniart's article on the genera of fossil plants is a masterly production so far as I can judge. It is only by this double view, first botanical, then geological and chronological, that the subject can be thoroughly exhausted.

However, in that same year, Bunbury became the 8th Baronet Bunbury and took on running the family estates, so had little time for his research. Then the publication of Wilhelm Philippe Schimper's *Traité de paléontologie végétale* (1869–1874), which became a definitive work, effectively stopped Bunbury attempting to finish his own book.

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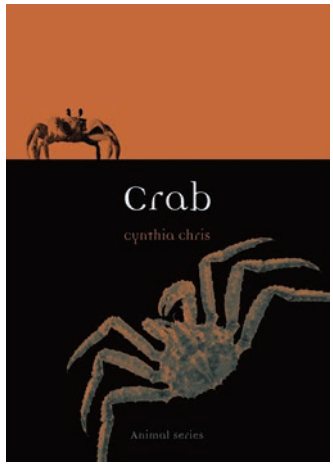
Reviews

Crab

Cynthia Chris

176pp, Reaktion Books
2021 (Paperback)
ISBN 9781789143690
Col./bw illust. £13.95



The concept of Reaktion Books' 'Animal' series is to choose an author from outside the field, a concept which can open a new window and offer original, less conventional views. Cynthia Chris is Professor of Media Culture at the College of Staten Island, New York. Her liking for crabs dates from a trip to Costa Rica, where she found herself fascinated by hermit crabs, as they disappeared into their little shells. Even though hermit crabs are not really true crabs, she accepted the challenge of the series and spent a year travelling to diverse marine biological stations to undertake research for this book.

The first and second chapters focus on the evolution and phylogeny of crustaceans, and are informative enough and easy to read. There is a long paragraph on Mary Jane Rathbun (1860–1943), a curator of Crustacea at the Smithsonian Institution, Washington, D.C. USA: an example of a number of lesser-known women, in Europe and in America, who paved the way for the female marine biologists of today. Other chapters investigate the representation of crabs in myths and popular culture; the behaviour and physiology of the crab with a rather personal approach. For example, the moulting process, fascinating for a carcinologist, is not very developed. Then she expands upon the relationship between crustaceans and humans, first at the level of alimentation, then on the impact of anthropogenic climate change on their ecological niche, and their possible slow disappearance. The author does not hide her strong beliefs as a conservationist and feminist.

Cynthia Chris has clearly taken her enrolment in this book seriously: she has compiled a bibliography, has travelled to several English-speaking biological stations and interviewed different experts of the field, and thus, the scientific information is up to date and exact.

This book is a mixture of accurate scientific knowledge made accessible to a non-scientific reader, sprinkled with more personal reflections. It is readable and indubitably very pleasing to non-academic readers, which is, in fact, the goal of this series.

Mireille Charmantier-Daures & Guy Charmantier FLS

Drawn to Nature: Gilbert White and the Artists

Simon Martin

192pp, Pallant House Gallery Trust
2021 (Hardback)
ISBN 9781869827755
Col./bw illust. £25

One of the reasons Gilbert White's *The Natural History and Antiquities of Selborne* (1789) has endured for so long is that it speaks to so many people on a plethora of levels. Whether a naturalist, a gardener, an historian, a lover of the countryside or an artist, there is something in White's writing for everyone. This book is a beautiful exploration into just one aspect of our collective fascination with parson-naturalist Gilbert White, which started with those very first art works commissioned by the author, and continues to this day.

Sadly, I have never found myself blessed with much in the way of artistic talent, so to be able to explore the swathe of art inspired by White's writing has been a wonderful step outside my usual considerations of his work. Included in *Drawn to Nature: Gilbert White and the Artists* are the works of Samuel Hieronymus Grimm, the artist commissioned by White to create the engravings used in the first edition of

The Natural History…, as well as examples of the various illustrations that have been produced for the multitudinous editions ever since, from the famous works of Eric Ravilious which strikingly illustrate the 1938 Nonsuch Press edition, to lesser known, but no less beautiful, illustrations from the last 233 years. Within that body of work it is fantastic to see the inclusion of cover art, often glanced over, and there are numerous beautiful examples of highly-illustrated covers on show which should be considered works of art in their own right.

Yet the constancy of Gilbert White's work goes far beyond the editions of *The Natural History…*, and within *Drawn to Nature* we find examples showing a direct celebration of the author and his legacy, such as the two beautiful stained-glass windows in St Mary's Church at Selborne, created to commemorate the bicentenary of White's birth in 1920, and his death in 1993. Many have been inspired by the wonderous sense of place he created in his writing, others by the wildlife he found in his garden and on his travels, and more still by Selborne itself. Some may have been inspired by more capitalist motives, through such avenues as the poster art used by the Shell company to promote driving to the countryside, or train travel to Hampshire, both of which utilise the sense of longing for a perceived bygone era encapsulated in White's picture of Selborne.

Drawn to Nature focuses primarily on illustrative art, but it opens, after Sir David Attenborough's delightful introduction, with examples of White's own poems influenced by his wonderful Selborne, as well as prose and poetry from Virginia Woolf and W. H. Auden, and modern poetic works from Kathryn Bevis and Jo Bell. White himself was an artist with words. The reason White's book has persisted is due only in part to its natural history content; its real strength has been the picture White paints with his text, a portrait of a lost landscape, as vibrant and colourful as any work of art in a frame. It is therefore fitting that we now have such a wonderful book looking at the art his own work of art inspired.

In short, although looking at one aspect of Gilbert's legacy, *Drawn to Nature: Gilbert White and the Artists* has much to recommend to everyone. It is a highly enjoyable, fascinating insight into an aspect of White's legacy which can too often be overlooked, and our understanding of the impact of this natural historian is all the richer for it. The publication itself is arresting and beautiful; friends with no knowledge of White have commented on the beautiful original artwork created for the cover and endpapers. The book's content is a comprehensive curation and discussion of the art of Gilbert White, all of which add up to it being a thoroughly pleasurable read which I know I will revisit time and time again. In my opinion, it is an essential addition to the library of any White scholar, natural historian, art historian or student of the history of publication.

Steph Holt FLS

In One Yard: Close to Nature Book 2

Warren A. Hatch

215 pp, Wild Blueberry Media LLC
2020 (Hardback)
ISBN 9781884195662
Col. illust. $35

In the middle of the COVID-19 pandemic, my own private world underwent different kind of upheaval—moving from a small town to a big city: London. I went from seeing blue tits flitting about outside my kitchen window each morning, to waking up to clanging garbage trucks and the concussive thrumming of passing trains every seven minutes. What I missed most was my tiny backyard. It was a brutal excision.

Warren A. Hatch's photograph-based book *In One Yard: Close to Nature Book 2*—a pictorial record of all life in his garden—is a mossy, cooling balm to the deep yearning for my teeny yard festooned with summer lilacs and guarded by a giant copper beech. While the garden wasn't a 'beauty', it was a haven during the desultory lockdown summer, and it focused my eyes on minute garden details and stilled my drumming fingers.

Hatch too remembers the first time he was spellbound by something very 'common': a live jumping spider under a magnifier, and in an instant, a lifelong interest in 'micro universes' was born. For years, Hatch has been pacing his 1/6 acre backyard in Portland, Oregon, USA. From mosses to lichens, bees to molluscs, worms to spiders…little seems to have escaped Hatch's loving gaze. And his book is filled with images that reveal his investigative attention. My favourites might be those of seeds, and Hatch admits that as a little boy he was also most excited by them. And why not? After all, seeds hold the biggest surprise possible—new life. Hatch's seed photos are an absolute treat, each one a marvel of natural sculptural shapes and designs.

The sharp urge to see within things is very human, as chronicled through natural history books and journals. Hatch

mentions algae scientist John W. G. Lund FLS (1912–2015) in his preface, who co-wrote the book *Freshwater Algae: Their Microscopic World Explored* with his wife, mycologist Hilda Canter-Lund. One can see why their views of the natural world would overlap. Another book precious to Hatch is Robert Hooke's famous *Micrographia* (1665).

Perhaps peering inside things feels like a gift, to peel off petals, to run a finger along the underside of a mushroom—to find out how things work. Hatch, thrillingly for us, gives in to all these urges. Who can resist the allure of the plump circles and polka dots of *Volvox* (algae) under a microscope? What Hatch sets out to accomplish is a beguilement, to capture many other realities embedded in ours. He achieves this in his photography, which is a true labour of his love, both for the resulting images and the miniature lives he studies.

However, his storytelling has a tendency to fall short of melding ecological study with an imaginative thrust. While the images are vivid, and the intricate details invite us to bring the book physically closer to view, the descriptions can be simplistic, and occasionally, erratic. For instance, we learn that some moths and butterflies are considered pests, which is a risky statement to make without the context of why and how an organism becomes a 'pest'. This could be interpreted as a similar notion to 'weeds' among plants—a rather anthropocentric idea.

Image: Warren A. Hatch

Yet, reading *In One Yard* is like flipping through an accomplished naturalist's diary with an abiding interest in how a patch of earth survives, prospers and endures. These are fragments of his days turning over flower buds, scraping up bits of soil. A flash of a butterfly's wing here, a crunch of a lichen there, or a gently swaying bee on a flower—Hatch's time in his backyard is definitely a catalogue of the wondrous offerings of common nature.

David G. Haskell's *The Forest Unseen* (2013) is another book wherein the author attempts to view the world through a square-metre of old forest in the hills of Tennessee, USA. He asks, 'Can the whole forest be seen through a small contemplative window of leaves, rocks, and water?' Haskell focuses on the age-old philosophical question of universality in the smallest units of our life, described in poet William Blake's lines: *To see a World in a Grain of Sand / And a Heaven in a Wild Flower.* How many stories can a square-metre of forest tell? As many as needles in a pine tree.

Haskell's and Hatch's books are excellent companions to one another. For instance, both write about lichens, which are two organisms in one—a fungus and an alga or a bacterium. While Hatch's distinctive imagery allows us to explore parts of the miniscule trumpet lichens (*Above*), Haskell's prose tells the story through metaphors. While one shows us the elements that make up an ecosystem (Hatch), the other (Haskell) conveys the biological connections that are missed and the histories that are buried.

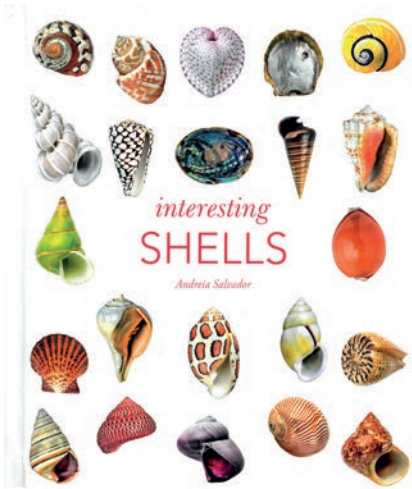
In One Yard is a marvellous first step towards discovering a passion for the natural world in common areas, whether for a child, young adult or a curious adult. While reading it I recalled why children are often easily hooked on small plants, insects and flowers. In retail parlance, this would be called 'Eye level is buy level'. I miss the time when I was at eye level of tiny wonders around us, when I didn't have to bend my creaky bones to inspect a sedum. Hatch's book did me a great service by transporting nature's charms to a universal eye level.

Padmaparna Ghosh, *Events & Communications Manager*

Interesting Shells

Andreia Salvador

256pp, Natural History Museum, London
2022 (Hardback)
ISBN 9780565095109
Col. illust. £12.99



As a teenager (many years ago), I purchased a set of postcards from what was then the small shop in London's Natural History Museum (NHM), each of which depicted a tropical marine shell from the museum's collection. That set of cards was one of the elements that first nurtured my interest in molluscs. This attractive new book, published by the same museum and written by its senior curator of marine Mollusca, might easily be the modern equivalent; perhaps as a gift for someone to spark or grow an interest in this fascinating phylum.

The (relatively small format) book consists of 121 full page colour images (sometimes across two pages) of shells from the museum's collection, accompanied by a paragraph of information with the addition of two brief statements giving the species' known range and the largest dimension of the illustrated specimen. In the introduction, the author gives a brief, simply worded overview of what shells are, their components, how they are formed and the classes of living molluscs.

'Interesting' representatives of each of the major classes of molluscs are included (although there is only one chiton and one scaphopod), and the species are not exclusively marine nor tropical. For example, the selection includes, perhaps not surprisingly, several cowries, but also species found in the UK such as *Cepaea nemoralis* and *Littorina obtusata*. A common name of each species is used, although scientific names are also clearly given (without author citations). This is also true of the index, which is in common name order.

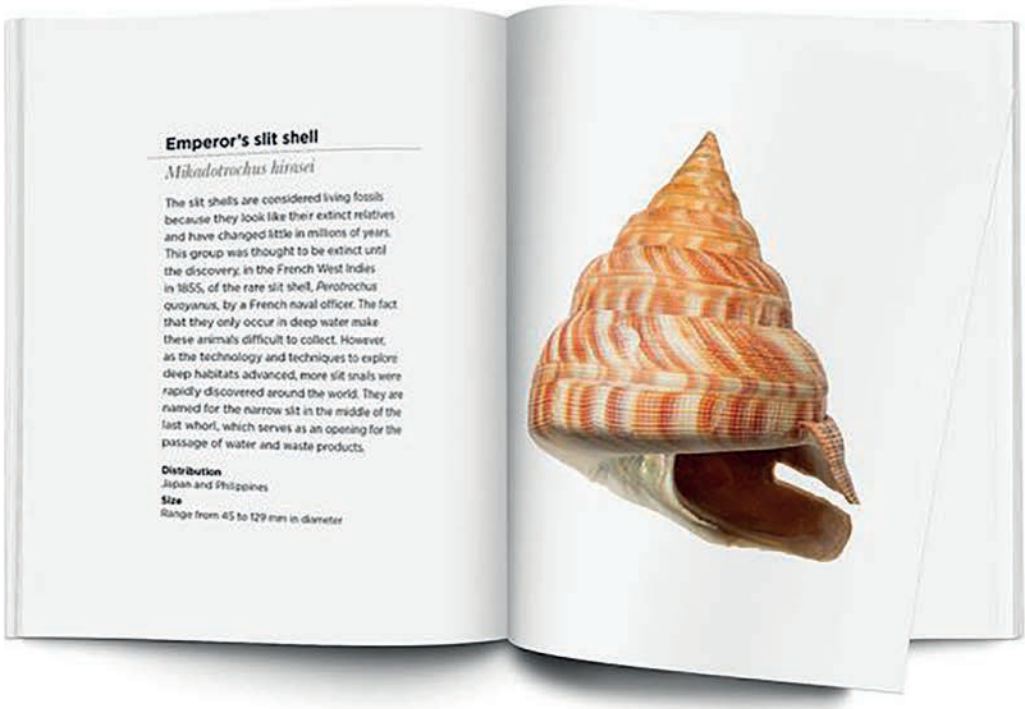
This book is not primarily an identification guide, so that the paragraph accompanying each plate is often not a description of the species, but some other information, which might include the animal's habitat, behaviour, uses by man, historical associations and environmental concerns. This is the most interesting aspect of the book and would make it an ideal occupant of a coffee table, to pick up, browse and perhaps learn something new.

It is hard to pick just a few of the many thought-provoking pieces of information that are included in this book. Some facts are fairly well known, such as the fake shell story relating to the precious wentletrap (*Epitonium scalare*), or that of the desert snail (*Eremina desertorum*) that revived after four years being glued to a wooden display tablet in the British Museum. But other examples include the red fluorescence of the strawberry top shell (*Clanculus pharoensis*), species that nurture symbiotic algae or bacteria, the reasons for chiral dimorphism in *Amphidromus* snails, sex changes in West Indian worm shells (*Vermicularia spirata*), and how many millions of kilograms of land snails the Portuguese eat every year!

Occasionally, if space had been allowed, some more detail may have added further interest. For example, the paragraph next to the image of the endangered amber snail (*Powelliphanta hochstetteri*) from New Zealand does not mention that their delicate shells consist of a very thin layer of calcium carbonate, covered by a thicker chitinous outer periostracum. A moist environment is required to avoid the shells shrinking and cracking, which sometimes happens during storage in museum collections.

Marine molluscs are particularly affected by environmental change, including pollution and global warming. The author includes as an example *Clio pyramidata*, a pelagic pteropod or 'sea butterfly', a constituent of the plankton, the transparent shells of which are particularly vulnerable to rising carbon dioxide levels and which have been proposed as a bioindicator to monitor ocean acidification.

There are a number of historical references amongst the accompanying paragraphs, for example the 17th century physician and naturalist Martin Lister and his illustrator daughters in the text accompanying the plate of Lister's conch (*Mirabilistrombus listerii*). Other topics include the HMS *Challenger* expedition of the 1870s and pioneering shell collectors, such as W. H. Benson, Hugh Cuming, Henry



Emperor's slit shell

Mikadotrochus hirasei

The slit shells are considered living fossils because they look like their extinct relatives and have changed little in millions of years. This group was thought to be extinct until the discovery, in the French West Indies in 1855, of the rare slit shell, *Perotrochus quoyanus*, by a French naval officer. The fact that they only occur in deep water make these animals difficult to collect. However, as the technology and techniques to explore deep habitats advanced, more slit snails were rapidly discovered around the world. They are named for the narrow slit in the middle of the last whorl, which serves as an opening for the passage of water and waste products.

Distribution
Japan and Philippines
Size
Range from 45 to 129 mm in diameter

Image: The Trustees of the Natural History Museum, London

Godwin-Austen, Yoichirō Hirase and Sir Hans Sloane, some of whose collections form part of the huge Mollusca collection of the NHM today.

I was gratified to see that mollusc-related scientific societies have a mention, including the Conchological Society under the entry for the pelican's foot shell (*Aporrhais pespelecani*). Contrary to what is stated, this species no longer forms part of the Society's logo, but it had done so for many years. Mention is also made elsewhere of the American Malacological Society (in the context of the shell of the endangered species that forms its logo, the spiny riversnail *Io fluviatilis*), and the German Malacological Society whose first journal editor, Wilhelm Kobelt, described the featured Japanese land snail *Euhadra senckenbergiana*.

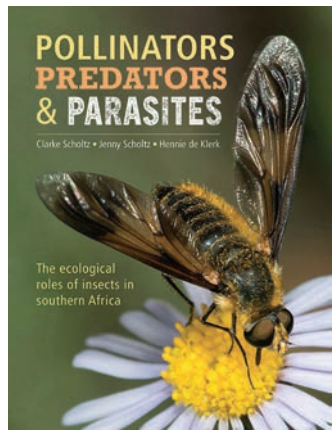
The photographs are excellent throughout and are set either on black or white backgrounds (*Above*). They are not intended primarily for identification purposes and some of the specimens are arranged more for artistic effect (e.g. *Melo aethiopicus* and *Conus gloriamaris*), but in the present context this is not a criticism. A brief glossary is included at the end, which curiously includes 'Malacology' but not 'Conchology'!

I would highly recommend this book as an attractive and accessible introduction to molluscs, but it is also a 'conchological chocolate box': dip in and sample its delights.

Peter Topley FLS

(Review originally published in *Mollusc World*, issue 58, March 2022.)

Pollinators, Predators and Parasites: The Ecological Roles of Insects in Southern Africa



Clarke Scholtz, Jenny Scholtz & Hennie de Klerk

448pp, Struik Nature, Penguin Random House South Africa
2021 (Hardback), Col. illust.
ISBN: 9780565095109—£26.50
ISBN epub: 9781775846321—£12.99

Books that attempt a broad coverage of insects suffer from the enormous diversity of these organisms, for only a sample of the species can be treated. Even with the modest fauna of the UK, which still boasts over 24,000 species, nothing comprehensive can be produced in a single volume. Such a limitation is multiplied when getting to grips with numbers of the magnitude encountered in the mega-rich region of southern Africa. But in this cleverly constructed and attractive book, the authors have surveyed and highlighted the natural history and ecological functioning of their subjects by biome instead of attempting a taxonomic trawl through the insect

orders. For each of the 13 biomes surveyed, they provide narratives on the habits of carefully selected species within guilds of insects, focusing especially, as the title suggests, on pollinators, predators and parasites. By accentuating the ecological over the taxonomic, the impact of insects on ecosystems is emphasised. There are examples of ecosystem engineers (especially termites), recyclers (notably dung beetles) and many pollinators, predators and parasitoids. The book is richly illustrated with over 1,600 colour photographs, images that are integral to the text and which were accumulated to illuminate the narratives.

Although this book has a southern African focus, a region that rejoices in exceptional habitat and species diversity, the emphasis on so wide a range of insect behaviour, ecological impact and general biology is applicable widely. As such, it will appeal to a broad readership, from entomologists and students to everyone interested in natural history. That appeal is enhanced by the accessibility of the narrative-style of the text. An attractive element of the work is the addition of a basic entomology primer in the form of an opening chapter, covering the fundamentals of morphology, physiology, development and the ecological roles of insects, and an appendix that provides a short description of each of the insect orders represented in southern Africa. The interpolation of entomological research throughout the book, especially using boxes to avoid impeding the flow of the text, furthers this appeal, so that a strong scientific element underpins the natural history flavour of the volume. Indeed, the content has been sourced substantially from an extensive review of the literature on insect biology, mainly from southern Africa: almost 300 references are listed. Yet this review is enhanced significantly by the numerous personal observations made by the authors, who have spent much time in the field, researching, conserving, and photographing insects of this remarkable region.

An introduction summarising the major biomes of southern Africa precedes the first chapter on insects and their ecological role. Thirteen chapters follow, each one covering a biome and its key species. They in turn are divided into sections highlighting the ecological aspects of their subjects. Thus, for the Fynbos (chapter 2) the primary headings are 'fynbos endemics', 'insects and the effects of fire', 'black-mound termites and nutrient recyclers', 'pollinators', 'herbivores', detritivores', and 'predators'. Within these headings, we are treated to stories about a variety of insects, selected for their ecological impact, habits, form and function and all-round natural history. There is a host of fascinating examples throughout the text, from seeds that mimic the sight and smell of dung to attract and dupe certain dung beetles, to bees with extended forelegs for collecting oils from flowers instead of nectar. These are just two of the natural history gems that run throughout this lovely and informative book on the insect life of an extraordinary region. The other major biomes, which follow the remarkably biodiverse Fynbos, are the Succulent Karoo, desert, Nama Karoo, grassland, savanna, the Indian Ocean tropical belt, the Albany thicket (an ancient vegetation type in the Eastern Cape) and the remnants of Afromontane forest. Four chapters on habitats have been added: freshwater, caves, the coastal zone, and the urban environment—the last of these providing an important dimension to the book given the ever-increasing spread of human settlement.

This substantial volume is the product of a decade of work by the three dedicated authors. Clarke Scholtz, for many years Professor of Entomology (now Emeritus) at Pretoria University, brings his deep and broad knowledge of insect biology, informed by much field research, to the book. His co-authors include his conservationist wife, Jenny Scholtz, and Hennie de Klerk, who has provided nearly all the photographs.

Full references are cited in the conventional style, listed alphabetically by author. These are preceded by abbreviated references by chapter, providing a form of quick access. References are not cited directly in the text by author and date, doubtless so as not to impede its flow. I understand the intent, but would have preferred textual superscript links to the full references, foregoing the rather peculiar abbreviated references.

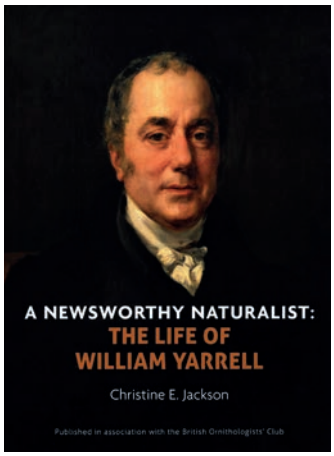
A contribution towards publication costs renders the book most attractively priced in hardcopy, and an ebook is available at half the price. While students, particularly, will value this support, all will benefit from access to such an informative and lavish production. If you are fascinated by insects, wherever you live, you should buy this book. And if you are broadly interested in biodiversity, you should acquire it and inform yourself about the diverse and absorbing natural history of these key organisms in one of the world's most biologically- and habitat-diverse regions.

While the authors of the current work offer their readers a fact-packed volume on insect natural history, they are expressly moved by the beauty of the southern African terrains, biomes and trees and by the extraordinary and absorbing lifestyles of so many of their invertebrate subjects. Anyone who has experienced southern African landscapes will surely share their sentiments.

Malcolm J. Scoble FLS

A Newsworthy Naturalist: The Life of William Yarrell

Christine E. Jackson



272pp, published in association with the British Ornithologists' Club
2021 (Hardback)
ISBN 9781913679040
Col./bw illust. £25

It has been said that a man can be judged by the company that he keeps, and the subject of this thorough biography by Christine Jackson should be thought of very highly indeed. For zoologist, metrologist, traveller, sportsman, collector, businessman and bookseller William Yarrell (1784–1856) was acquainted with numerous eminent contemporaries (many of them remaining household names). However, though Yarrell was as famous in his day, he has since slipped from our attention. This book rectifies this. In places it reads like a 'who's who' of the 19th century, and the 'index of people' covers some 18 pages.

BEWICK'S SWAN.

Cygnus Bewickii.

Image: The Linnean Society of London

Yarrell is known for the identification of the Bewick's swan (*Cygnus bewickii*) as a separate species from the Whooper swan (*Cygnus cygnus*) in 1830, and for his books *A History of British Fishes* (1834–1836) and *A History of British Birds* (1837–1843). Both books became standard texts and remained pertinent to the end of the century. They were profitable too, said to have netted the author £4,000. Jackson's book explains these three achievements in detail, along with many others, including his business and personal interests. Yarrell was an active member of 13 learned societies including the Linnean Society; elected a Fellow in 1825, he served on its Council for 25 years, was Treasurer for seven, and Vice-President from 1849–1851.

For this 'kind and good' confirmed bachelor it was not all work. As mentioned in many of the 40 obituaries published on his death, he was famed for his generous hospitality, and was good company at his home in Little Ryder Street in London, not far from where the Society now resides in New Burlington House. His home was filled with his collection of books, paintings, coins, medals, prints, silver, scientific instruments and numerous natural history specimens. We know this from the details of the sales of his chattels after his death in 1856, and Jackson highlights these sales as way of understanding the man, and his polymathic interests.

As you would expect from an author like Jackson, there are numerous footnotes, details of sources, a complete list of Yarrell's articles and more to support her account of the life William Yarrell. A biography focuses on the story of one person's life, but this is a biography of more than just one man, touching on the lives of numerous naturalists, publishers, artists and business contacts. As such, the book would appeal to more than just admirers of Yarrell, but it is his story that has drawn me in and made me a fan.

Glenn Benson FLS, *Curator of Artefacts*

Books for Review

Please contact the Editor before sending books for review (leonie@linnean.org).

Books for review should be sent to the attention of the Editor at:
Burlington House, Piccadilly, London W1J 0BF

Please note: While the Society aims to review as many books as possible, a review is not guaranteed, and is dependent on finding a reviewer and the decisions of the Editor and Linnean Steering Group.

Members

Please join us in welcoming the following new members to the Society (elected Jan–March 2022):

Fellows

Dr Jackson Achankunju
Dr Hyppolite Aignon
Dr Mohammad Javed Ansari
Dr Mohd Ashaq
Prof. Emeritus Spencer C.H. Barrett
Prof. Felix Bast
Prof. Colin Bean
Mr William Beharrell
Dr Gajanan Tryambak Behere
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Ms Laetitia Alexandratos
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Ms Polet Barragan
Ms Halima Bibi
Mr Felix Blank
Ms Shayma Bukannan

Miss Savindri Dassanayake
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Ms Frédérique Fardin
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Ms Amelia Hursham
Mr Simon Landfors
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Ms Savannah Mapes
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Mr Ryan Schmidt
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Mr Manuel Tiburtini
Ms Lisa Tikoisuva
Mr Keelan Underwood
Ms Jaqueline Vieira
Ms Audrey Walshe
Mr Ramesh Wilson
Mr Anthony Woodgate
Mr Tracer Yong

Lives remembered

David Bramwell MBE (25 Nov 1942–20 Jan 2022)

Born in Liverpool, Dr David Bramwell was elected an FLS in 1973, and for a time he was an Assistant Editor of the *Botanical Journal of the Linnean Society*. A major player in the development of the role of botanic gardens from the 1970s onwards, he would be known as 'El Inglés' during his time as the Director of the Jardín Botánico Canario Viera y Clavijo, Gran Canaria, a role he took on between 1974–2012. He would also be given an honorary position at the famous Gabinete Literario, promoting science and the arts.

In 2001 David became Vice President of the International Association of Botanic Gardens, having published 150 papers on the flora of the Canary Islands, making him a world expert. His dedicated work earned him many awards including the Sir Peter Scott Medal from the International Union for Conservation of Nature (IUCN), the International Canary Islands Award 2013 and The 'Henry Shaw' Gold Medal from Missouri Botanical Garden. David also had a positive impact on the careers of younger colleagues, which includes many of our Fellows. His warm character and sense of humour will be sadly missed.

Sherwin Carlquist (24 Feb 1944–1 Dec 2021)

Dr Sherwin Carlquist grew up in southern California, a stone's throw from the Huntingdon Library and Botanical Gardens, which was the starting point for his interest in plants. Going on to study Botany at the University of California, Berkeley (1952–1956), he continued with his postdoctoral studies at Harvard University before beginning his teaching career at Claremont Graduate School (1956–1992).

He authored many plant taxa, but it was during a trip to Western Australia in 1974 that he discovered the genus *Alexgeorgea*; its female flowers and fruits are mainly subterranean, with the stigmas protruding above ground.

A pre-eminent plant biogeographer and island biologist, Sherwin served as a Plant Anatomist at Rancho Santa Ana Botanic Garden in California from 1984 to 1992. His books *Island Life* (1965), *Hawaii: A Natural History* (1970) and *Island Biology* (1974) outlined trends of dispersal and evolution, but most importantly, inspired a new generation of students who could use his ideas and studies as exemplars of evolutionary trends.

Perhaps best known as a, if not *the*, world expert on wood anatomy, Sherwin wrote monographs on the woods of most families of the Asteridae, and many other orders. His work on the wood anatomy of Gnetales was of critical importance to our understanding of the origins of flowering plants.

Sherwin was elected a Fellow in 1975, going on to be elected as a Foreign Member of the Society in 2014. The Society awarded him the Linnean Medal in 2002, and in 2011 he won the Botanical Society of America's esteemed Grady L. Webster Structural Botany Publication Award. He was highly regarded by his peers and his students alike; his thinking was always 'ahead of the game' and often inspired new lines of research. The genus *Carlquistia*, a relative of the Hawaiian silversword, is named for him.

Jennifer [Jenny] Mary Edmonds (25 Feb 1944–20 Feb 2022)

Dr Jennifer Edmonds (née Gray) was a familiar face at the Linnean Society for many years, having been elected to Fellowship early in 1975. She served on the Society's Council from 1984–1987, and again from 1999–2001. In 2004, she was chosen as one of our Vice Presidents.

Jenny, as she was more commonly known, studied under botanist Jack Hawkes at the University of Birmingham (Hawkes was also later elected as a President of the Linnean Society) on South American *Solanum* species. She would go on to work as a botanist on projects at Cambridge (a Fellow of Darwin

Images: Wikimedia; http://sherwincarlquist.com; The Linnean Society of London

College), Oxford and Leeds, as well as the Royal Botanic Gardens, Kew; at the latter, she worked as a Research Associate on the Flora of Tropical East Africa. Her areas of research included the Solanaceae, in particular *Solanum nigrum*, or the black nightshades, and related species. Jenny also studied and published on economic plants like *Corchorus* (Tiliaceae) in coordination with The International Board for Plant Genetic Resources (IBPGR) and International Jute Organization (IJO).

In 2005, Jenny was appointed Tercentenary Coordinator by the Society, organising many of the Society's activities for Linnaeus's tercentenary year in 2007. The programme contained a myriad of events, including joint meetings with the University of Göteborg and the Royal Society, tours and receptions at Chelsea Physic Garden and the Royal Botanic Gardens, Kew, and an incredibly popular Anglo-Swedish excursion retracing Linnaeus's steps through Gotland. She was presented with one of the seven Linnean Tercentenary Bronze Medals in May 2008. She will be greatly missed.

Sylvia FitzGerald (7 May 1939–22 Nov 2021)

We were very sad to hear of the passing of Sylvia FitzGerald, former Librarian at the Royal Botanic Gardens, Kew, late in 2021. A Fellow since 1992, Sylvia was a dedicated member of the Society's Library Committee, and for a time, its successor, the Collections Committee. She was part of a group that founded the European Botanical and Horticultural Libraries Group (EBHL) in 1994, and she attended the 20th EBHL annual meeting as a VIP guest in 2013.

Mike Frohlich (24 Nov 1947–Dec 2021)

Professor Michael (Mike) Frohlich FLS passed away suddenly in December 2021. A native of Michigan in the US, he graduated from the University of Michigan and moved to Harvard, where he completed his PhD on *Heliotropium* section *Orthostachys* (Boraginaceae). After teaching at Union College in Schenectady (New York), he was awarded a fellowship to work with Elliot Meyerowitz at CalTech, during which he developed the skills in plant development that were the major focus of his later career. These skills took him back to the University of Michigan and then to the Natural History Museum in London (NHM), where he pursued his interest in the origins of the angiosperms, with studies on gymnosperms (notably *Welwitschia*) and early diverging flowering plants (notably Nymphaeales). Following retirement from the NHM, he became an honorary researcher at the Royal Botanic Gardens, Kew, where he continued to pursue these interests.

A hugely well-read scientist, Mike was always generous with his knowledge and could be relied on to remember where a particular technique had been published or to come up with an interesting alternative approach. His interests were not only scientific—others included languages, jazz music and ceramics, and he became an accomplished glass blower in retirement. Mike was elected as a Fellow of the Society in 2006 (*Below Left:* Mike, on the right, being admitted by then-President Vaughan Southgate).

Fittingly, his final paper (recently published in the *Botanical Journal of the Linnean Society*: https://doi.org/10.1093/botlinnean/boab082) was on *Euploca* (a segregate of *Heliotropium*, the genus that started his career), and he saw and approved the proofs of this before his untimely death. He will be much missed by family, colleagues and friends.

Sir Peter Harper CBE (28 April 1939–23 Jan 2021)

Born and raised in Barnstaple in Devon, UK, Professor Sir Peter Harper CBE was a world-renowned clinical geneticist. His father Richard was a GP, with Peter following in his footsteps into the field of medicine, attending Exeter College at Oxford University in 1957 (also drawn in by lectures in genetics and biology at the Department of Zoology). He went on to complete his clinical training in London in 1964, before moving to study under Sir Cyril Clarke at the University of Liverpool, where Peter continued his medical training and research into inherited oesophageal cancer, as well as insect genetics. In 1967 he met his future wife Elaine; marrying in 1968, they would have two children, Matthew and Emma, and adopt Nicholas, Katy and Lucy.

In 1969, a move to Johns Hopkins in Baltimore saw Peter start to specialise in neurogenetics, and he carried out a study of myotonic dystrophy, a condition that he would focus on for the rest of his clinical career. Peter moved back to the UK in 1971, taking up a lecturing post at the University of Wales College of Medicine in Cardiff, from where he would begin to build the Institute of Medical Genetics. Here he would

Images The Linnean Society of London; Wellcome Images

also focus on another disorder, Huntington's disease. He was Editor of the *Journal of Medical Genetics* from 1986–1996, a member of the Human Genetics Commission, and published *Practical Genetic Counselling* (1981, which would expand far beyond its intended audience of non-specialists, becoming a standard text for genetic counsellors), *A Short History of Medical Genetics* (2008) and *Evolution of Medical Genetics—A British Perspective* (2020).

His home county would instil a lifelong love of the natural world, which he shared with his children and grandchildren, taking moth traps on many a holiday. Peter was elected as a Fellow of the Linnean Society in May 1989, and he enjoyed several of the Society's field trips and excursions. He was a giant in the field of genetics, having been awarded a CBE (1994) and a Knighthood (2004), but he will be equally remembered for his generous leadership and welcoming nature.

E. O. Wilson (10 June 1929–26 Dec 2021)

The 'modern Charles Darwin', Professor Edward O. Wilson was born in Birmingham, Alabama, USA in 1929. A childhood injury from the dorsal spine of a fish would leave him without sight in his right eye, but it also led him to focus on the world of smaller organisms like ants, which he could study close up, and in detail. What he learned within this microcosmic setting would allow him to expand his thinking to a global scale.

Edward studied biology at the University of Alabama, and went on to graduate studies at Harvard University, where he was drawn in by the Museum of Comparative Zoology and its ant collection. In 1954, he travelled to Melanesia to carry out fieldwork on ant taxonomy and biogeography, which resulted in the idea that species distinctions should be more clearly defined, as well as theories on genetic divergence (when competing for resources). His work on chemical signals in insect communication and social organisation was also far reaching.

In 1967 he published the seminal work *The Theory of Island Biogeography* with Robert MacArthur which investigated 'principles of population ecology and genetics to explain how distance and area combine to regulate the balance between immigration and extinction in island populations'.

His fascination with ants and their social interactions (sacrificing themselves to save the colony) culminated in the publication of *The Insect Societies* (1971). These ideas would eventually be expanded upon in *Sociobiology: The New Synthesis* in 1975. The work studied the social behaviours and evolution of organisms ranging from bacteria to larger animals, including humans, for the first time. However it reignited the 'nature versus nurture' debate and his views were challenged by several well-known scientists who felt the work might provide support for sexist and racist concepts. While still controversial, some scientists now consent to Wilson's argument that the genetics of 'human nature' allow flexibility in behaviour in response to culture.

After winning the first of his two Pulitzers in 1978 for *On Human Nature*, Edward wrote arguably his most personal work, *Biophilia* (1984), which outlined for the first time how human affinity for living things is fundamental to our humanity.

Edward was elected as a Foreign Member of the Linnean Society (FMLS) in 1994 and won the Society's Tercentenary Medal in 2007, alongside Sir David Attenborough and Professor Steve Jones. He passed away at age 92 at the end of 2021.

Reference

Hölldobler, B. (2022). Edward O. Wilson (1929–2021): Naturalist, conservationist and synthesizer who founded sociobiology. *Nature.* Accessed 4 April 2022): https://www.nature.com/articles/d41586-022-00078-7

Deaths Reported to Council

Dr Roger Beauchamp
Dr David Bramwell
Prof. Sherwin Carlquist FMLS
Dr Jennifer Edmonds
Mr Ernest Emmett
Ms Sylvia FitzGerald
Dr Michael Frohlich
Prof. Peter Harper
Mr Neal Houghton
Mr Jeremy Jenkins
Mr Rudolf Jenny
Mr Ronald Kemp
Dr Sir Christopher Lever
Mrs Gertrude Looi
Dr Thomas Lovejoy
Dr Paul Parker
Mr Charles Stanton
Prof. William Stern
Prof. Edward O. Wilson FMLS

Mak Sau 麥秀 (active Guangzhou, China 1770s) for John Bradby Blake (1745-1773), illustration of the tea plant (Camellia sinensis), inscribed: 曳茶 E Chaw, ink and colours on unmarked paper with traces of pencil, Oak Spring Garden Foundation, Upperville, Virginia

TEA

Nature Culture Society 1650-1850

Richard Coulton
Queen Mary University of London

Jordan Goodman
University College London

Romita Ray
Syracuse University

THE LINNEAN SOCIETY OF LONDON
22–24 JUNE, 2022

The LINNEAN SOCIETY of London

OAK SPRING GARDEN FOUNDATION

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From tea to teapots; from taste to trade. This meeting will explore natural histories, Chinese porcelain, the impact of tea on literature and more.

Three-day Conference, 22–24 June 2022: This international meeting will address natural, cultural and social histories of tea between the mid-17th and mid-19th centuries. Arguably the first truly modern globalised commodity, the process by which tea attained such pre-eminence depended not just upon the commercial efforts of merchants, but also upon a cultural framework of knowledge and practice constructed primarily in China, Britain, Europe, and India.

Among other topics, the meeting will explore natural histories of the tea plant; the mobility of Chinese tea and porcelain; European attempts to cultivate tea; imaginaries of tea in literature and art; tea and material culture; tea, identity, and the formation of the British Empire.

This meeting is generously co-sponsored by the Linnean Society of London, Syracuse University (USA), and Oak Spring Garden Foundation (USA). The conference organisers would also like to thank Todd B. Rubin for his generous support.

Hosted by the Linnean Society of London and organised by Richard Coulton (QMUL), Jordan Goodman (UCL), and Romita Ray (Syracuse University).

This is an online conference and free to attend. After registering, the Zoom webinar link will be sent to you the day before the conference. BOOK NOW: www.linnean.org/tea