Editorial

A full length portrait of Alfred Russel Wallace (p. 3) now hangs in our Meeting Room alongside that of Darwin. Together the portraits commemorate:

THE FIRST COMMUNICATION OF THEIR VIEWS ON THE ORIGIN OF SPECIES BY NATURAL SELECTION AT A MEETING OF THE LINNEAN SOCIETY ON JULY 1ST 1858

Today many biologists take the view that Wallace's contribution was merely to prod Charles Darwin into writing the *Origin of Species* and in the popular mind Darwin is identified as the author of the theory. But this is far from the truth: Wallace not only enunciated the principle of natural selection in his Ternate essay of 1858 but had also published the most important pre-*Darwinian* contribution to the theory of evolution in his Sarawak essay of 1855.[1]

It is maintained that Darwin only realised the importance of the diversity of closely related species on the Galapagos archipelago after the ornithologist John Gould had identified the finches for him. Yet Wallace in his 1855 paper noted in dealing with geographical distribution:

> "Such phænomena as are exhibited in the Galapagos Islands, which contain little groups of plants and animals peculiar to themselves, but most nearly allied to those of South America, have not hitherto received any, even a conjectural explanation. The Galapagos are a volcanic group of high antiquity, and have probably never been more closely connected with the continent than they are at present. They must have been first peopled, like other newly-formed islands, by the action of winds and currents, and at a period sufficiently remote to have had the original species die out and the modified prototypes only remain. In the same way we can account for the separate islands having each their peculiar species, either on the supposition that the same original emigration peopled the whole of the islands with the same species from which differently modified prototypes were created, or that the islands were successively peopled from each other, but that new species have been created in each on the plan of the pre-existing ones. St. Helena is a similar case of a very ancient island having obtained an entirely peculiar, though limited, flora."

These two essays of Wallace established a complete theory of the origin of species. Moreover Wallace dealt with the matter far more thoroughly and logically than did Darwin in his 1858 Linnean essay. Thus Wallace never subscribed to the inheritance of acquired characters.

> "Some of my critics declare that I am more Darwinian than Darwin himself, and in this I admit they are not far wrong" (Wallace, 1908).

As a previous President had pointed out

> "The early essays of Darwin and these two essays together of Wallace provide perhaps

1 'On the Law which has regulated the Introduction of New Species' (*Ann. Mag. Nat. Hist.* (2) 16: 184–196, Sept. 1855). We have already seen the effect this essay had on Lyell (*The Linnean* 14 (2): 17) while its effect on Edward Blyth is recorded later in this issue (p. 11)

'Wallace's House', Ternate – where he wrote his 1858 essay.
(Photograph taken by the President, Sir Ghillean T. Prance.)

the most remarkable sustained and independent parallelisms of argument in the history of science (Pantin, 1959).[2]

Sadly in the *historical sketch* in the 6th edition of *The Origin of Species* Darwin makes no mention of Wallace's first essay and merely points out that

"the theory of Natural Selection is promulgated by Mr Wallace with admirable force and clearness"

Then in the *Introduction* – referring to the Linnean publication:

"Lyell and Hooker – honoured me by thinking it advisable to publish with Mr Wallace's excellent memoir, some brief extracts from my manuscripts."

These rather meagre remarks do little to emphasise the importance of Wallace's contributions to the theory of the origin of species. Perhaps this is why he has been so neglected?

Finally, although Darwin put some 8 names forward for election to the Royal Society (including that of his son), it was left to Thistleton Dyer to persuade Wallace to become an FRS in 1892, 34 years after the publication of the joint paper and 10 years after Darwin's death.

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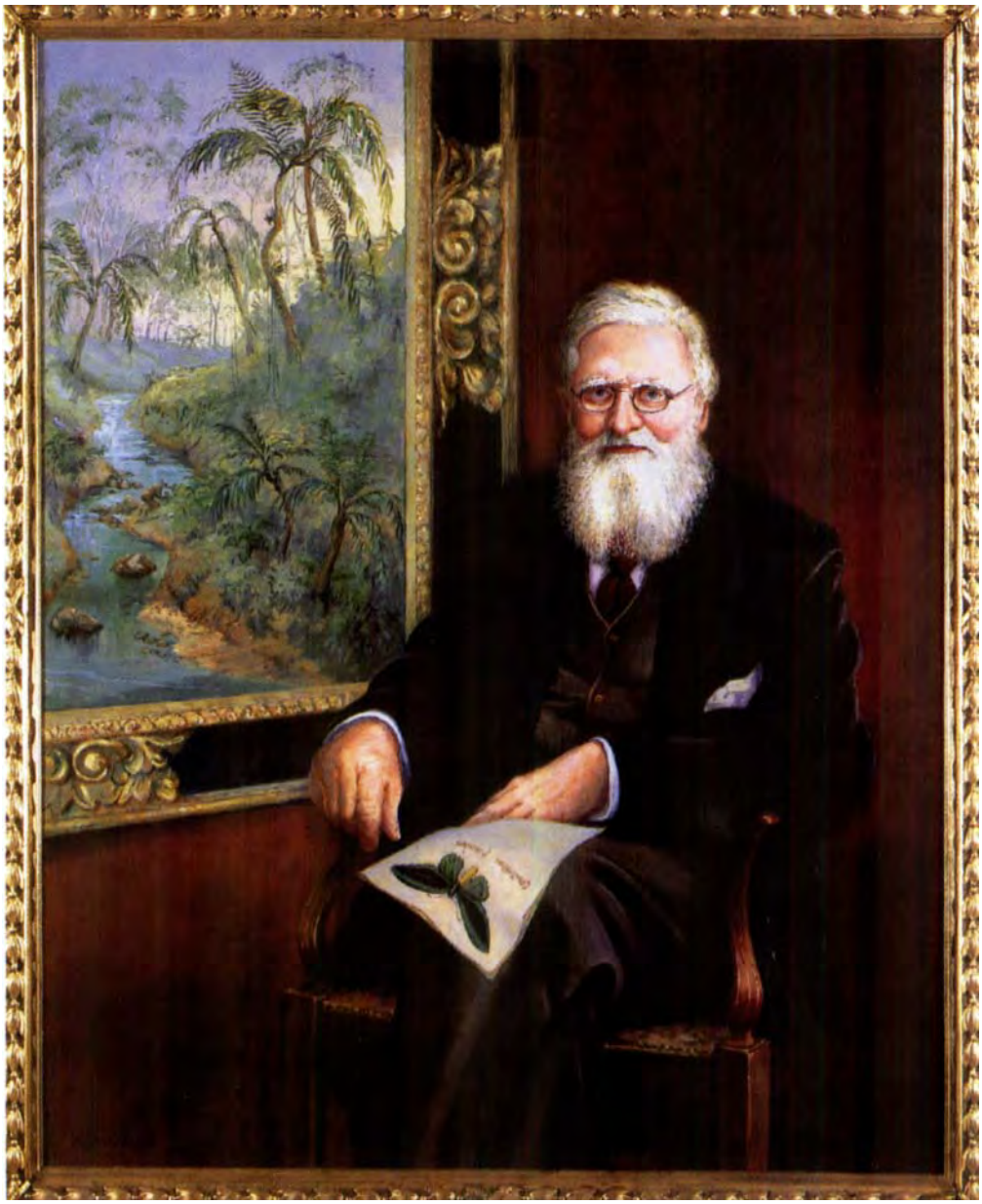
2 As Huxley later remarked "none of us suspected that the heart of the problem lay through them [variability and the struggle for existence] until Darwin and Wallace dispelled the darkness, and the beaconfire of the *Origin* guided the benighted"



Alfred Russel Wallace
(Painting by Roger Remington)

Society News

On Friday, 29th May the Society was visited by His Imperial Majesty The Emperor of Japan. This was a great honour for a Society for which H.I.M. has always retained great affection. Coming so soon after the Anniversary Meeting, brief details of which are to be found elsewhere in this issue, it was agreed that The Emperor should sign

The Programme Card, which came out with unusual promptness this year, features a discussion *Making Sense of Genetic Modification*. This was a rapid *(too rapid -Ed.)* response to a botanist, who felt that the Society should be seen to be doing something about this vexed area. The inevitable result was the discovery that the University of Oxford was running a short course on genetic manipulation techniques for financiers and the like on the same day (25th September) which, though very different in concept to our own, tied up a number of potential speakers.

Our meeting is designed to provide information on the scientific background to genetic modification of plants and a forum to discuss the implications for all of us of the application of the new technology. It has now been arranged for **Friday, 27th November 1998,** when Dr. Brian Johnson, of English Nature, and Dr. Sandy Thomas FLS, of the Nuffield Foundation's Bioethics Committee, will be amongst those joining us. We are hoping for as wide a cross-section of attendance of those interested as possible. All will be welcome; no charge will be made, *but we would like to know if you are coming.*

a specially illuminated page in the Roll and Charter Book, after meeting both the staff and the present Officers together with those in office at the time of his previous visit in 1981, when he was admitted a Fellow: Professor Stearn, Mr. Hutt, Dr. Kermack and Miss Young. Then, after admiring the newly unveiled portrait of Alfred Russel Wallace (a necessary tactic to enable the media to reassort themselves in the Library), the President escorted H.I.M. to the Library, where he met a few Fellows, mainly members of Council, and others, before immersing himself in ichthyology with a group of a dozen fish biologists led by Professor Gardiner, Past-President, and including Professor Peter Miller, from Bristol University, and his research team of three, who with Dr. Anthony Gill, of the Natural History Museum, constitute most of the UK's expertise on the gobiidae, the preferred Imperial taste in fish. Professor Miller also provided a poster display for the occasion. Those privy to these discussions, including Dr. Alun Anderson, Editor of *New Scientist*, who includes fluency in Japanese amongst his many talents, noted a particularly wide-ranging and informed Imperial interest in biology, which, it was said, had confounded the Director of the Royal Botanic Gardens on the previous day. No such problems beset the President of the Linnean Society on this occasion.

The Emperor spent an hour in the Society. As no less an authority than *The Daily Telegraph* remarked next day, it had been a relaxed occasion and it was entirely appropriate that H.I.M. should have received a generous reception from the crowd of a few hundred who had gathered outside the Society's rooms as he left.

Members are asked to note that the annual Book Sale will take place at the conclusion of the evening meeting on 12th November, which will be addressed by **Professor R McNeill Alexander FRS** on *Elasticity in Animal Movement*. The Chairman of the Library Committee informed Council that not only does the Sale raise money for the Library, but it also allows the Library to fill gaps in its holdings. Please come – and bring what you can, preferably before the day so that the volumes can be marked up.

The Society has received £2500 from the **Golden Bottle Trust**. This continues a tradition of donations from the Trust for which the Society is most grateful. The money is used to help younger scientists attend meetings of the Society.

Fellows will scarcely have failed to note that the Natural History Museum has received a grant of £0.5M to enable researchers **from other EU countries only** to access the collections of the Museum and the collections at Kew, at the Chelsea Physic Garden and the Linnean Society. Priorities for this particular pot of gold are determined by a small committee. Interactive application forms are available on www.nhm.ac.uk/science/science_marketing/bioresource/index.html. Alternatively, the Society has application forms. Other major museums and collections within the EU have received similar support.

In addition to the meeting on genetic modification, the Society is planning a meeting on **Friday, 20th November** to provide information to Members and others on the two-year old initiatives being undertaken by the Society to ensure that biodiversity, and specifically taxonomy, forms part of the European Union's future plans for research (Directorate-General XII) or enviroment (DG XI). The initiatives are know as Euro+Med PlantBase and Fauna Europaea. The former has come from an examination of the future of the five-volume *Flora Europaea*, which the Society publishes with CUP. Details will follow.

The Society has contributed £100 to the **Bob Savage Palaeontological Trust**, which provides money for students travelling to sites of palaeontological interest as a mark of respect for the work of Professor Savage for the Society. Professor Savage served on the Council of the National Trust as the Society's representative for 8 years until his death earlier in the year. During that time he made many contributions to the Trust, both nationally and locally, particularly the vexed task of chairing its committee on stag hunting in 1992/93. An obituary of Professor Savage appeared in *The Daily Telegraph* on 22nd May; the Society was represented at his funeral by the Executive Secretary. Council has nominated Dr. Patrick Morris FLS to replace Professor Savage on the Council of the National Trust, a nomination which has been received with enthusiasm by the Trust. The Society has received a legacy of £1000 from the estate of Professor Savage to help with the costs of publication.

Earlier in the year, the Society sponsored a day's meeting on Friday, 9th April at the University of Bath on *Insect Societies: Models for the Evolution of Biological Organisation*, which formed part of a four-day meeting on mathematical ideas in biology. The meeting was a significant success, being attended by around one hundred delegates from all over the world. Details of the abstracts of the presentations on the day and the posters that accompanied those presentations can be found on the Internet at www.maths.bath.ac.uk/~nfb/conf98plenaryabs.html and www.maths.bath.ac.uk/~nfb/conf98posterabs.html or copies can be obtained from the Society.

Talks have been held by the Society with the London Natural History Society, who meet in our rooms, to see whether stronger links can be forged between us.

Two of our Fellows, **Azra and Peter Meadows**, at the Division of Environmental and Evolutionary Biology at the University of Glasgow note that there is now a global interest in environmental conservation and management and the preservation of the world's biodiversity. Nowhere is this more so than in Asia, with its huge mountain ranges and massive river systems. The Indus River together with its tributary rivers and surrounding lands is one such system. It rises in the Hindu Kush and western Himalayas, flows through Pakistan, and enters the Arabian Sea through the mangrove swamps of the Indus Delta east of Karachi.

In the mountain areas through which the river flows, habitat diversity, species richness and geological contrasts are often astonishing to the eye. Small valleys of great beauty with lush vegetation and small village communities are separated by awesome mountain passes devoid of vegetation. The Chitral area is one of the most remote of these, and until recently was an autonomous kingdom. It still harbours the unusual Kalash people in the more remote and narrow valleys. However Chitral is changing. Deforestation and hillside erosion are developing and a number of species are endangered. These latter include the Markhor, the snow leopard, the western Tragopan Pheasant, the Siberian Crane and a number of plant species.

The International Hindu Kush Expedition, which will take place during summer 1999 will address these problems. Thirty world authorities from the USA, UK and Pakistan will investigate the biodiversity of the Chitral area and the impact of man over a two month period. The expedition will focus on natural resources and biodiversity, rural communities and land use – including irrigation, river function and environmental degradation, and on hillside stability, glaciers and natural hazards. The expedition is multidisciplinary and will include biologists, civil engineers, geographers, geologists and anthropologists. It will report its results in an International Symposium planned for 2001, which, it is hoped, will take place in the Linnean Society. Needless to say, Azra and Peter would be grateful for any advice or offers of assistance in connection with the expedition.

Another of our Fellows, **Sir Christopher Lever** has been commissioned to write a book on *The Cane Toad: History and Ecology of a Successful Colonist.* Sir Christopher has already written some five books and numerous papers, chiefly dealing with introduced species, and he would welcome any scientific information on the cane toad, which has been introduced very widely in the Pacific and Caribbean regions. christopher@linnean.demon.co.uk should enable contact to be made; alternatively fax +44 (0) 1344 891744.

The Society has been asked to note the **Oleg Polunin Memorial Fund**, administered by Charterhouse School, which exists to support botanical/ biological fieldwork, abroad or in the UK. Applications to the Fund, which are considered in February each year, should be made to the Headmaster, Charterhouse, Godalming, Surrey GU7 2DJ. A number of Fellows have benefited from this fund in the past.

The Anniversary Meeting[3]**. The President** took the Chair and welcomed some one hundred and twenty members and their guests to the meeting. In view of the

3 A fuller account of the Anniversary Meeting will appear in the Annual Report for 1998.

pivotal place of Alfred Russel Wallace in the meeting (see below), he particularly welcomed members of the Wallace family and others connected with Wallace who had come to witness the portrait of Wallace to be unveiled later in the day.

Apologies were received from **Professors Bisby, Hawkes, Rehkämper** and other Fellows.

The following signed the Obligation in the Roll and Charter Book and were admitted Fellows: **John George Best, Kåre Bremer, Sylvia Mann, Charles Bahr Redington, Jan Salick, Charles Sheppard, Camilla Faye Speight, Ruth Lise Andersen Stiff** and **John Martin Williamson Topp.**

The following were elected Foreign Members: **Kåre Bremer, Friedrich Ehrendorfer** and **Niels Peder Kristensen**. The following was elected Fellow *Honoris causa*: **David Frederick Attenborough.**

The following were elected to Council: **Dr AE Brafield (Z), Dr JR Edmondson (B), Dr RC Fisher (Z), Professor MRD Seaward (B), Miss AK Walker (Z)** and **Professor PJ Whitfield (Z).**

The Officers elected were: President, **Professor Sir Ghillean Prance**; Treasurer, **Professor G Ll Lucas**; Zoological Secretary, **Dr VR Southgate**; Botanical Secretary, **Professor CJ Humphries** and Editorial Secretary, **Dr DF Cutler**.

The following awards were made: The **Linnean Medal for Botany** to **Dr. Mark Wayne Chase FLS**, the **Linnean Medal for Zoology** to the late **Dr Colin Patterson FLS FRS,** the **HH Bloomer Award for Zoology** to **Mr William Claud Wright,** who was unable to attend through ill-health, **the Bicentenary Medal** to **Dr Roderic Dugald Morton Page,** the **Jill Smythies Prize** to **Mrs Rodella Anne Purves** and the **Irene Manton Prize** to **Dr Alexander Weir.**

The Society has now a fine portrait of Alfred Russel Wallace to match that of Charles Robert Darwin. Copies of both these portraits have been made and used to produce two folding cards, with a picture inside of the plaque in the Meeting Room which notes the occasion in 1858 when the two papers by Darwin and Wallace were read to the Society. Thanks to Mr. Taylor Pescod FLS, the Chairman of the Library Committee, the plaque is now a good deal more legible. These cards will be available from the Society – why send cards of conifers, holly, reindeer, robins, even a bearded *Homo sapiens* in funny red artefacts, at Christmas when with a bit of imagination you can impress your friends by telling them something about how this bizarre collection of species got here? Lest we be accused of partiality, the Society still stocks Jenny Brasier's cards portraying gold, frankincense and myrrh, and another resplendent with the aforesaid holly. And, whilst the frankincense tree is an endangered species, the cards are not.

Council meets on 15th October 1998, 21st January, 18th March and 21st May 1999 and the Programmes Committee on 3rd November 1998 and 4th May 1998 during the 211th Session of the Society. Members are asked to note that the 21st January meeting of Council is the one where decisions are taken on new Council Members, on Foreign Members and Fellows *Honoris causa,* and on medal and award winners. 1999 is also the year when the President-Elect is chosen for office in the years 2000–2003. Nominations for all these from the wider Fellowship would be most welcome.

Picture Quiz

The July quiz (14(2): 5) feature Edward Blyth (1810–1873) one of the most highly regarded ornithologists of his time. Born in South London on 23rd December 1810 he was the eldest of four children. At the age of 10 (following the death of his father) his mother sent him to Dr Fennell's School at Wimbledon where he remained for the next 5 years when he left to study chemistry under Mr Keating of St Paul's Churchyard with the intent of going on to university. But it was not to be – for already by this stage he had developed so great an interest in natural history that he would often get up at three and four o'clock in the morning, making notes, sketching skeletons and then on summer mornings would go out on the nearby Wimbledon Common collecting insects and identifying birds.

At 21 he used his small inheritance to purchase a druggist's business in Tooting and over the next 10 years supplemented his income through writing (during this period he rented a small room in Pall Mall so that he could be closer to the British Museum and to several private libraries).

In 1836 he produced an edition of Gilbert White's *Selbourne* with copious zoological notations, especially on birds such as the cuckoo and swallow, while in 1840 he dealt with the mammals, birds and reptiles in an illustrated translation of Cuvier. He also wrote regularly for Rennie's *Field Naturalist* as well as contributing original communications to both Loudon's and Charlesworth's series of the *Magazine of Natural History* (1835, 1836, 1837 – see Appendix 1)

When Charlesworth's *Magazine* ceased publication he continued to write for its successor the retitled *Annals and Magazine of Natural History.*

Then after a short stint as Curator of the Ornithological Society (and following the failure of his druggist's shop in Tooting) he was offered by the East India Company the paid position of Curator of the Museum of the Asiatic Society of Bengal in Calcutta in 1841. Here he remained for the next 20 years devoting his life to the study of the natural history of India – describing and classifying the birds and mammals of that continent.

During this period he contributed to the *Indian Field*, the *Indian Sporting Review* (osteology of the elephant, Feline animals of India, etc.), *The Calcutta Review* (on the birds of India etc.), and in 1849 he published a catalogue of the birds in the Society's Museum. His Catalogue of the Mammalia in that Museum was published after he had returned to England (1863) whereas his Catalogue of the Mammals and Birds of Burma was published posthumously in 1875 in an extra number of the *Journal of the Asiatic Society of Bengal.*

Meanwhile in 1854, at the age of 44 he married Mrs Susan Hedges, a widow he had known back in Tooting, but she died three years later.

In 1861 ill health compelled his return to England (on a pension of £150 per annum) where in the remaining 11 years of his life he contributed regularly to *The Ibis* (letters and papers mainly relating to his ornithological work in Asia), *The Zoologist*, the Zoological Society of London, *Annals and Magazine of Natural History*, *The Naturalist*, the *Analyst*, *Field Naturalist* and under the *nom-de-plume* of *Zoophilis* to

The Field and to *Land and Water*. He also had papers published in *Nature* on animal distribution.

He died of heart disease 27 December 1873 – four days after his 63rd birthday.

Blyth was a humble and self-effacing character whom Gould described as one of the first zoologists of his time and the father of that science in India.

Hume noted:

> "It is impossible to overstate the extent and importance of Blyth's many sided labours. Starting in life without one single advantage, by sheer strength of will, ability and industry, he achieved a reputation rarely surpassed, and did an amount of sterling work such as no other single labourer in that field has ever compassed."

But the most trenchant remark is that made in the DNB:

> "His marvellous memory made him the storehouse to which many observers had recourse."

One of these was Charles Darwin.

Edward Blyth's early articles in the *Magazine of Natural History* proved a rich source of information for Darwin's notes on transmutation during the years 1838–39, particularly with respect to variation and hybridization in birds and mammals.[4]

By the time the *Origin* was published Blyth had become one of Darwin's most trustworthy sources:

> "an eminently capable judge whose opinion, from his large and varied stores of knowledge I would value more than anyone"

and accordingly he cites Blyth some five times. In the *Variation of Animals and Plants under Domestication* he refers to him as

> "an excellent authority"

and even as late as *The Descent of Man* (1871), Darwin continued to use information gleaned from Blyth's papers and letters (on sexual selection) and cites him no less than 82 times.

Thus we conclude that Darwin not only found Blyth's early observations and factual information of value in his formulation of the theory of natural selection, but also many of his subsequent observations (contained in later publication 1842–1867) which were used as supporting evidence for both the *Variation of Animals and Plants* and the *Descent of Man*.

Although Darwin came to rely on Blyth's observations he initially questioned Blyth's judgement – underscoring such phrases in his early papers (1835, 1837) like, "my experience" and remarking in the margin "this shows what different inferences <the observer> may draw" (S. Sheets-Pyenson, 1981: 243).

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4 As Manier (1979) noted): Edward Blyth ranks among the 20 most frequently cited authors in Darwin's notebooks and early manuscripts, *see also Appendix 1*.

The earliest extant letter from Blyth to Darwin is dated 8 January 1855 (Beddall, 1973) and refers to letters from Darwin written in the preceding November[5]. However, Darwin had met Blyth before the latter departed for India in 1841. Thus in a letter to Hooker (10 May 1848) Darwin asks:

> "Did you see Mr Blyth in Calcutta, he would be a capital man to tell you what is known about Indian zoology, at least in the Vertebrata: he is a very clever, odd, wild fellow, who will never do, what he could do, from not sticking to any one subject. By the way, if you should see him at any time, try not to forget to remember me very kindly to him: I liked all I saw of him.– "

Blyth's subsequent correspondence with Darwin throughout 1855 was voluminous to say the least and comprised some 10 letters and memorandums, several of a dozen or more pages filled with detailed and eclectic information[6] much of which proved of great value to Darwin for his researches into the origins and variation of domesticated animals. Blyth also suggested lines of research such as an examination of ancient monuments for representations of the domesticated plants and animals of earlier civilizations:

> "Both the Humped Ox and the European Ox are represented in Egyptian paintings and monuments" (letter to Darwin April 22, 1855).

Also the perusal of ancient manuscripts:

> "Domestic cats are familiarly referred to in various ancient Sanskrit writings, of 2000 years ago and upwards" (letter to Darwin August 4, 1855).

Moreover he supplied invaluable other facts which he had remembered such as:

> "But Sir John Ross (I think it is) relates how a Newfoundland bitch of his habitually played with the Wolves that came about the ship and if I mistake not was lined by one, so there is nought of the antipathy between Wolf and Dog insisted upon by Buffon" (letter to Darwin April 22, 1855).

information which Darwin later used in *The Origin* (p.427).

In an annotation of Blyth's letter of Aug 4, 1855 Darwin had written:

> "what a memory you have".

Nevertheless Blyth's initial belief (see his papers of 1835, 1837) in the theory of multiple centres, still persisted:

> "I could never perceive that it necessarily follows that species of independent origin (so far as we can infer this in any case) should differ at all" (letter to Darwin 8 October 1855).

Darwin's annotation:

> "This is a new argument for double creation".

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5 Darwin's letters to Blyth during the period Blyth was in Calcutta (1841–62) have not been located.

6 All told the Blyth letters from Calcutta comprise 250 single sheets – written in what Blyth himself described as "a villainous scrawl" and Darwin – "a dreadful handwriting"

However, towards the end of 1855, Blyth read Wallace's paper in the *Annals and Magazine of Natural History: "On the Law which has Regulated the Introduction of Species"* – and in his next letter to Darwin (8 December 1855) he devoted 4 of the 8 pages to an analysis of it.

> "What think you of Wallace's paper? Good! Upon the whole ... ... Wallace has I think put the matter well and according to his theory, the various domestic races of animals have been fairly developed into *species*."

Then Blyth interjects information on variation in wild species.

> "The group of Indian monkeys affined to the Bengal *Entellus*, and the group of Indian and Malayan gigantic squirrels so diversified in colour and yet each race so remarkably true to its colouring, afford capital data for Mr Wallace to descant upon in reference to his views."

And then he asks Darwin again:

> "What do you think of the paper in question? Has it at all unsettled your ideas regarding the persistence of species – not perhaps so much from novelty of argument, as by the lucid collation of facts and phenomena."

From this last comment it is clear that Blyth (like Lyell see the *Linnean* 14 (2):17) had grasped the significance of Wallace's 1855 paper.

In 1911 an article appeared in *Nature* entitled *An Apparently hitherto Unnoticed "Anticipation" of the Theory of Natural Selection* in which the author (H.M. Vickers) pointed out that in 1835 Mr Edward Blyth in a paper with the elaborate title *An attempt to Classify the "Varieties" of Animals, with Observations on the Marked Seasonal and other Changes which Naturally Take Place in Various British Species, and which do not Constitute Varieties* (*Mag. Nat. Hist.*, 1835) had demonstrated the idea of sexual selection and seemed to indicate that he recognised the principal of natural selection or the survival of the fittest though he failed in its true application – believing that it operated for the conservation of the species rather than the progression.

In *The method of organic evolution* (1895) Wallace wrote

> "The Darwinian theory based on certain facts of nature, which though long known to naturalists, were not understood in their relations to each other and to evolution. These facts are variation, rapid multiplication and the resulting struggle for existence, and survival of the fittest. Variation is the fundamental fact".[7]

Darwin in his introduction to the 6th edition of the *Origin* gives a few examples: W.C. Wells, 1813 who wrote on variation and selection by domestication; P. Mathew, 1831 who not only dealt with origin of species but also natural selection.

What is not in doubt is that in 1835 Blyth recognised the principle of natural selection and maybe its application to breeding. He also showed an understanding of sexual selection (Schwartz, 1974).

In 1879, Geldart, failing to recognise Blyth's non-evolutionary point of view

7 As Beddall (1973:95) later pointed out *varieties for Blyth were derivatives from the perfect and perfectly adapted type, not stepping stones to new species.*

suggested that Blyth (1835) should take priority over Darwin in the development of the theory of natural selection. Then 100 years after the publication of the *Origin* Loren Eiseley (1959) reopened the discussion by claiming that Darwin took the theory of natural selection from Blyth (1835). Yet like Vickers (above), Eiseley recognised that Blyth had failed in its application.

> "Like Lyell somewhat earlier, Blyth had glimpsed the negative aspects of the struggle for existence and the way in which species were eliminated. He failed to see, however, that natural selection was a potentially liberalising rather than conservative factor in life." (Eiseley, 1959)

Thus Blyth maintained (1835: 46) that there was a conservative force at work which helped maintain species stability:

> "The same law, therefore, which was intended by Providence to keep up the typical qualities of a species, can be easily controverted by man into a means of raising different varieties; but it is clear that, if man did not keep up those breeds by regulating the sexual intercourse, they would soon revert to the original type".

Several of Blyth's subsequent papers (1836, 1837) show that far from elucidating the theory of natural selection they support his belief in special creation and more importantly the fixity of species. Thus Blyth's paper *On the Psychological Distinctions between Man and all other animals* etc. 1837 – argues that man's ability to reason separated him from the brutes (see *The Linnean* **13**(3): 1) that depend on instinct alone. Later in the same paper (ibid., p. 80) Blyth reasoned that in the case of those birds which are the quarry of birds of prey – if their behaviour and or colour departed from the typical specific character, either in lack of vigilance or in matching its normal background, then they would be sacrificed to appease the appetite of the destroyer – thereby limiting the geographical range of species and so

> "maintain their pristine characters without blemish or decay to their remotest posterity."

In other words Blyth was using the principle of natural selection to prove that species were immutable!

That Darwin was familiar with the works of Blyth there is no question and as both Eisely (1959) and Sheets-Pyeson (1981) have demonstrated, Darwin read all of Blyth's early articles in the *Magazine of Natural History* as they were published – making marginal notes and comments.

Thus in the margin of one of Blyth's papers *On the Counterfeiting of Death, as a Means to escape from Danger, in the Fox and other Animals, Mag. Nat. Hist,* 1837, p 573, where Blyth is commenting that dogs will not devour the birds that feed on offal and garbage:

> "and indeed there may be of providential instinct in this circumstance of dislike; for vultures, and kites, and ravens, and crows, etc., were intended to be messmates with dogs over their carrion, and seem to be appointed by nature as fellow scavengers to remove all cadaverous nuisances from the face of the earth."

Darwin has scribbled

> "if so my theory wrong." (Sheets-Pyeson, 1981).

Blyth's Reed warbler.

Bearing in mind that at this time Darwin was going through innumerable papers published in a variety of natural history journals collecting evidence on how species became modified – it is clear that Blyth's early papers could not have contributed to the construction of his theory of natural selection since like Lyell, Blyth used the principle of natural selection (implicit in the penalisation of variants from the specific type) to prove that species remain constant (de Beer, 1960).

On the other hand Darwin found Blyth's factual information contained in both his early and later papers as well as in his letters, not only reliable but also of great value (see appendices 1, 2, 3, 4) particularly in the compilation of the *Descent of Man* and *Variation of Animals and Plants under domestication.*

Today Edward Blyth's memory is perpetuated in the vernacular names of two birds:

Blyth's pipit – *Anthus godlewskii* (Taczanowski) and

Blyth's reed warbler – *Acrocephalus dumetorum* Blyth.

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APPENDIX 1

Darwin's notebooks on the transmutation of species

The first notebook began in July 1837 was finished probably in February 1838. Blyth's name and works do not appear in the extant portion of this notebook (de Beer, 1960)

Notebook B February — July 1838

199e Bustards in Germany.—

Athenæum. No. 537. Feb. 1838. p. 107. Mr Blyth states that all «genera of » birds in «N.» America & Europe, which have not their representative species in each other, are migratory species from warmer countries. When will this paper be published it will be curious,— Some general statement about mundine & confined genera.—

Notebook C July 15 1838 — October 21 1838

36 Waterhouse's remarkable fact of no forms perculiar to *word* to special districts???? north of 30°,— ,* may be connected with, Mr Blyth's statement of Birds of Europe & America, which are of different forms being migratory, also with Temminks fact of forms being within Tropics. — . Europæan birds at Japan, connected with Europæan forms on Himalaya?? — This is very remarkable, when we consider number of quadrupeds in Eocene period. Have the Edentata & Marsupial forms been chiefly preserved, — where shut up by themselves without other animals? but they were not shut up!!

*Blyth 1838a On the geographical distribution of birds. *Athenæum* (537) 10 Feb

'Mr Blyth... took a rapid survey of the modern theories of zoological provinces ... and called particular attention to the following fact, which he was not aware had been previously announced — viz. that those North American birds which have no

generic representative in Europe, and those European genera which have no species proper to America, are, almost without exception, migratory, belonging to types of forms characteristic of those regions where they pass the winter.

70 When talking of races of Man. — black men, black bull finches, from linseed *— not solely effects of climate on some «antecedent races, perhaps not on now existing»

*Blyth 1835. An attempt to Classify the 'Varieties' of Animals with Observations on the Marked Seasonal and Other Changes which Naturally Take Place in Various British Species and which do not constitute Varieties. *Mag. Nat. Hist.* 8, 1835:40-53.

Blyth 1835 'The influence of particular sorts of food may be exemplified by the well-known property of madder (*Rubia tinctorum*), which colours the secretions, and tinges even the bones of the animals which feed on it of a blood-red colour: as another familiar instance, may be cited the fact, equally well known, of bullfinches, and one or two other small birds, becoming wholly black when fed entirely on hempseed.'

149 Mr Blyth remark that a resemblance between some form in birds is visible, when young, but not when old, — thus speckled form of young blackbird good remark if general, —*

*Blyth 1836b Further Remarks on the Affinities of the feathered Race; and upon the Nature of Specific Distinctions *Mag. Nat. Hist.* **9**,1836: 505-514.

Blyth 1836b 'The blackbird has, when young, a spotted breast; and, in fact, the characters of its nestling plumage alone forbid its alienation from the spotted thrushes. Where, indeed, can we trace the line of separation between Mérula and Philomèla even?'

197 Insects shamming death, most difficult case to imagine how art acquired.* —
They reason however on this to a degree,
Mem Spider only dropping where ground thick. — shamming death it is but being motionless.

*Blyth 1837b On the counterfeiting of death, as a means to escape from danger in the fox and other animals *Mag. Nat. Hist., n.s,* **1**,1837:566-574.

198 Study Mr Blyth's papers on Instinct.* — His distinction between reason & instinct very just;[1] but these faculties being viewed as replacing each other it is hiatus & not saltus.[2] — The greater individuality of mind in man, is analogous to greater individuality of bodies of some animals over those of others. — the mind of different animals less divided. — But as man has heredetary tendencies, his mind is still **only** a divided body. #p3. language seems to supply instincts, — & those powers which allow of, acquirement of language, heredetary & acquirable, —[2]
therefore mans mind not so different from that of brutes[3]
Hard to say what is instinct in animals, ‹‹& what reason›› in precisely same way not possible to say what habitual in men & what reasonable[4]—
Same action may be either in same individual

199 p. 7. is not squirrel hording, & killing grains. aquirable through hoarding from short time. — My theory must encounter all these difficulties. —
Knowing that animals have some reason, & actions habitual, it surely is not worthy interposition of deity to teach squirrel to kill ears of corn[1]

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according to my views, habits give structure, ... habits precedes structure, ... habitual instincts precede structure. — duckling runs to water. before it is conscious of web. feet. —

p. 7. Mr Blyths arguments against squirrel using reason in hiding its food is applicable to any habitual action. [2]even which Man performs.— child striking a post in passion. —

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Habit instinct gained during life. — do Elephants easily acquire habits is this the Key to their mental powers.?

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p. 8. mistakes of instinct are external contingencies, where the habit is not applicable.[3]

*Blyth 1837a On the Psychological Distinctions between Man and all other Animals; and the consequent Diversity of Human Influence over the inferior Ranks of Creation, from any mutual and reciprocal Influence exercised among the Latter. *Mag. Nat. Hist., n.s.* **1** 1837: 1-9, 77-85, 131-141.

198–1: 2, "The distinction is, that, whereas the human race is compelled to derive the whole of its information through the medium of its senses, the brute is, on the contrary, supplied with an innate knowledge of whatever properties belong to all the natural objects around, which can in anywise affect its own interests or welfare;' and *passim*. Passage triple scored. Darwin noted at the bottom of the page,'?? Child fears the dark—before reason has told it—' and in the margin, 'Connexion is less obvious between man. yet real'.

198–2: 3, "The human infant, too applies instinctively to the breast, like the young of all other mammalians; but unlike those, it has to attain all its after-knowledge through the medium of its external senses. It looks to its nurses, and those about it, for information; and these are capable of so communicating their attainments, as very materially to assist the infant learner in its acquisition of knowledge. It is preposterous to assert the contrary, as has been done; or to pretend that it rests on the choice of the infant whether or not it will learn. Practically, it cannot help doing so; and it is equally monstruous to deny that human beings can so communicate the results of their experience, that, with what in addition is ever accumulating, each generation must necessarily rise in 'knowledge above the last.' Passage double scored.

198–3: 2–3. Darwin marked the following passage with four exclamation marks, 'Witness a thrush that has captured a wasp, first squeezing out the venom from its abdomen, before it will swallow it. Or see a spider trying to cut it clean away. Can aught analogous be traced in the action of inexperienced man? Whence, then, the acquired knowledge on which these animal could reason to act thus?' (p.2),. He drew a line to connect this passage to the following one on p.3. 'The human infant, too, applies instinctively to the breast, like the young of all other mammalians;...'

198–4, probably pp. 3–7, 'I wish not to defend the untenable doctrine, that the higher groups of animals do not individually profit by experience; nor to deny to them the capability of observation and reflection, whereby to modify, to a considerable extent, their instinctive conduct: neither do I assert that the human race is totally devoid of intuition, when I see the infant take naturally to the breast; when I perceive the force of the maternal attachment, and the ardour of the several passions: which latter, however, are, of course, but incentives to conduct common to both man and animals. In only the human species are the actions resulting from them unguided by intuitive knowledge. All I contend for is, that the ruling principle of human actions is essentially distinct from that which mainly actuates the brute creation, whence the general influence of the two is diverse in kind; and I mistake if I cannot establish the position,' (pp. 3–4). Last sentence scored.

199–1: 7–8, 'Proceed we, then, to examine into the presumed sagacity of those provident creatures, as the ant and harvest mouse, that habitually lay up a store for future need, and even provide against all possible injury from germination, by carefully nibbling out the corcule from each grain. [Hence, CD's reference to 'Killing'.]... I have a tame squirrel, which, though regularly fed all its life from day to day, nevertheless displays the intuitive habit of its race, in always hoarding the superfluities of its food. ...
Thus it plainly appears, that the instinct of each animal is adapted to its proper sphere; for the mode of life it was destined to pursue, and for that only.'

199–2: 7, 'I have repeatedly seen the same animal act ... upon a smooth mahogony table ... deposit its nut, give it a few quick pats down, and finally thus leave it wholly unconcealed.'

199–3: 8, 'a tame marsh tit ... used habitually to drop the remainder of the almond ... he had been picking, into the water-glass attached to the cage, although he never could thence reobtain it, and his water was thus daily rendered turbid.'

222 Mr Ed Blyth does not believe in circular or linear arrangements*. —[1] Thinks passages very rare., in anatomical structure. — «the passage between — owls and hawks only external» intermediate groups often have full structure «of one class» & full of second—this class of facts «analogous to petrel-grede. external» appears to be a puzzle against my theory, —[2]

*Blyth 1836a. Observations on the various seasonal and other external Changes which regularly take place in Birds, more particularly in those which occur in Britain; with Remarks on their great Importance in indicating the true Affinities of Species; and upon the Natural System of Arrangement. *Mag. Nat. Hist.* **9:** 1836, 394-409

222–1: 401, 'All organised matter is, of course, intrinsically allied in its nature, as contradistinguished from that which is not organised; ... Next, we have a grand primary distribution of all organic matter into the animal and vegetable kingdoms; a division too obvious to be for a moment called in question, and universally allowed; admitted even, inconsistently enough, by those who hold that every natural assemblage of species, great or small, forms part of some quinary circle.'

222–2 Blyth 1836b: 509–10, 'Very lately the American scaup (pochard) was found, on comparison, to be distinct from that of Europe, although the difference almost wholly consists in the obliquity of its wing spectrum; a character which, however, proved to be fixed and constant. Had there not been this diversity, the two species would have been, of course, equally distinct; yet how should we have discriminated them apart.'

Notebook D October 1838 — 10 July 1839

95e Sept. 11.

Mr Blyth, at Zoolog. Meeting stated, that green-finch, all linnets red-pole, goldfinch, hawfinch— in nursling plumage resembles that of Cross-beak—*
In lark if I understand right, all species have same character which is mottled, & not like any existing species—

*Blyth 1838. Remarks on the plumage and progressive changes of the Crossbill and Linnet. *Proc. Zoo. Soc. London.* 6:115

Blyth 1838:115, 'Mr. Blyth made some remarks on the plumage and progressive changes of the Crossbills, — stating that, contrary to what has generally been asserted, neither the red nor saffron-tinted garb is indicative of any particular age. ...
'He also exhibited a Linnet killed during the height of the breeding season, when the

crown and breast of that species are ordinarily bright crimson, in which those parts were of the same hue as in many Crossbills; and observed that the same variations were noticeable in the genera *Corythraix* and *Erythrospiza*.' The remainder of Blyth's information is not reported in the 11 September *Proceedings* and, thus, reflects informal discussion at the meeting. Note that the lark was also discussed in the preceding paper.

Notebook E 1838 – 39

125 doctrine of young birds retrogressing—*

*Blyth 1836a On the geographical distribution of birds. *Athenæum* (537) 10 Feb.

Torn apart Notebook 1839 – 41

There is ibex of Alp Pyrenees & c— (see Blyth's work on Ruminants, —* these species must have migrated to those mountains, when the cold was intense just like alpine plants—

*Blyth 1841. An amended list of the species of the genus *Ovis*. *Ann. Mag. Nat. Hist.*, 7: 248-261

FRAG 6v—1 Blyth 1841. Darwin scored the description of *O.Aries*, the domestic sheep (p. 256) and noted at the end of the article: '14 wild species'.

The above information, including all the footnotes (denoted by the asterisks) have been extracted from:

Charles Darwin's Notebooks, 1836–1844, Geology, Transmutation of species, Metaphysical Enquires. Translated and Edited by P.H. Barrett, Peter J. Fautrey, Sandra Herbert, David Kohn, Sidney Smith. Cambridge U.P., Cambridge 1987. viii + 478pp.

APPENDIX 2

In *The Origin* (6th Edition) Darwin cites Blyth on five occasions. All the information being from personal communications:

1. Humped Indian cattle are of different aboriginal stock than European cattle.
2. All fowl are descendants of the wild Indian fowl *Gallus bankiva*
3. Mr Blyth has seen a specimen of the Hemionus with a double shoulder stripe
4. Capable judges, namely Mr Blyth has reported that flocks of crossed geese are perfectly fertile.
5. Indian humped and common cattle are perfectly fertile.

APPENDIX 3

Variation of animals and plants under domestication

In this work Blyth has some 50 citations almost a third of which are personal communications ("Mr Blyth informs me"), the remainder have been patiently extracted from Blyth's papers by C.D. from as far back as 1840 (a total of 14 papers).

1. On the Pariah dog (*Indian – Sporting Review*, 1856)
2. Hybrids of dog and jackal (*Indian – Sporting Review*, 1856)
3. Early domestication of cats in India and mummied bodies (p.c.)
4. Origin of domestic and wild cat (p.c.)
5. Crossing of domestic and wild cat and on
6. Indian cats resembling *Felis claus* (*Ann. Rep. Asiatic Soc.*, 1856)

Clue: Darwin's mentor?

7. On striped Burmese ponies (*The Field*, 1861)
8. Stripes of the ass (*Mag. Nat. Hist.*, 1840)
9. Indian wild pigs (p.c.)
10. On humped cattle (*The Indian Field*, 1858)
11. The occurrence of *Bos frontosus* in Irish crannoges (*Proc. Irish Acad.*, 1864)
12. Fertile crossing of zebras and common cattle (p.c.)
13. On the species of sheep (*Ann. Mag. Nat. Hist.*, 1841)
14. On the fat tailed Indian sheep (*J. Asiatic Soc. Bengal*, 1847)
15. On the origin of the goat (*Land and Water*, 1867)

16. Rabbit breeding in India (p.c.)
17. Number of tail feathers in fantails (*Ann. Mag. Nat. Hist.*, 1847)
18. Lotan tumbler pigeons (p.c.)
19. Number of tail feathers in *Ectopistes* (p.c.)
20. and on *Columba affinis* (*Ann. Mag. Nat. Hist.*, 1847)
21. Pigeons roosting in trees (*Ann. Mag. Nat. Hist.*, 1857)
22. On *Columba leuconota* and *C. intermedia* of Strickland (p.c.)
23. Variation in colour of croup in pigeons (*Ann. Mag. Nat. Hist.*, 1847; 1857)
24. Voluntary domestication of rock pigeons (p.c.)
25. Feral pigeons on the Hudson River (*Ann. Mag. Nat. Hist.*, 1857)
26. Sub species of pigeons (p.c.)
27. Pigeon fanciers in Delhi (p.c.)
28. Hybrids of *Gallus sonneratii* and domestic hen ("excellent letter" by Blyth in *Gardeners Chronicle*, 1851)
29. Hybridity of *Gallus temmninckii* and domestication of *Gallus bankiva* (p.c.)
30. Crossing of wild and tame fowl in Burmah (*Ann. Mag. Nat. Hist.*, 1848, *Gardener's Chronicle*, 1851)
31. Restricted Range of the larger gallinaceous birds (p.c.)
32. Feral fowls in the Nicobar Islands (p.c. including skins from China)
33. Black skinned fowls near Calcutta (p.c.)
34. Weight of *Gallus bankiva* (*Ann. Mag. Nat. Hist.*, 1848)
35. Degeneration of the turkey in India (*Ann. Mag. Nat. Hist.*, 1847)
36. On the colour of goldfish (*Indian Field*, 1858)
37. On the Ghor-Khur (*Asinus indicus*) and on *Asinus hemionus* ("see Mr Blyth's excellent paper in" *J. Asiatic Soc. Bengal*, 1860)
38. Number of eyes of *Gallus bankiva* (*Ann. Mag. Nat. Hist.*, 1847)
39. On the breeding of birds in captivity (*Report Asiatic Soc. Bengal*, 1855)
40. Co-existence of large and small breeds in same country (p.c.)
41. On the drooping ears of the elephant (p.c.)
42. Homology of leg and wing feathers (p.c.)

APPENDIX 4

The Descent of Man and selection in relation to sex

This work contains 82 citations to Blyth (this includes all the footnotes which list the publications mentioned in the text). Of the 40 or so references to Blyth, about half have been extracted from his published works (from 18 papers published between 1837 and 1869) while the majority (21) are personal communications (I am informed by; Mr Blyth informs me)

1. On the structure of the hand in Hylobates (p.c)
2. Observations on Indian crows (p.c.)
3. On the development of the horns in the koodoo and eland (p.c.)
4. On the pugnacity of males of *Gallinula cristata* (p.c.)
5. On the presence of spurs in female *Euplocamus* (p.c.)
6. On the pugnacity of the Amadavat (*Estrelda*) (*Land of Water*, 1867)

7. On the spoonbill and convolutions of the trachea of the crane (p.c.)
8. Moulting of *Anthus* (*Ibis*, 1867)
9. On the moulting of bustards, plover and *Gallus bankiva* (*Land and Water*, 1867; *Ann. Mag. Nat. Hist.*, 1848)
10. On the Indian Honey-buzzard (*Land and Water*, 1868)
11. On the sexual differences in colour of eyes of hornbills (p.c.)
12. On *Oriolus melanocephalus* plumage (p.c.)
13. On *Palaeornis javanicus* plumage (p.c.)
14. On the genus *Ardetta* (Blyth in Cuvier 1840)
15. On the Peregrine falcon (*Mag. Nat. Hist.*, 1837)
16. On *Dicrurus* (*Ibis* 1863)
17. On *Platalea* (*Ibis*, 1864)
18. On the immature plumage of birds (Blyth in Cuvier 1840)
19. On representative species of birds and their plumage ("remarkable facts recorded by Mr Blyth – see his admirable paper in *J. Asiatic Soc.*, Bengal, 1850" also, on *Ardeola Ibis* 1861)
20. On the young of *Turnix* ("Mr Blyth believes resemble the adult male")
21. On anomalous young of *Lanius rufus* and *Columbus glacialis* (*Mag. Nat. Hist.*, 1837)
22. On the sexes of young of sparrows and on the Palestinian sparrow (p.c.)
23. On the ascertainment of the sex of nestling bullfinches (by puffing out breast feathers) and gold pheasants (*Mag. Nat. Hist.*, 1837)
24. On orioles breeding in immature plumage ("Mr Blyth informs me that certain herons are apparently dimorphic with white and coloured individuals of same age – being observed")
25. On the sexes and young of *Buphus* (p.c.) and *Anastomus* (*Ibis* 1867)
26. On the young of the blackcap (p.c.) and blackbird (*Mag. Nat. Hist.*, 1837)
27. On the young of the stonechat (p.c.)
28. On the white plumage of *Anastomus* (*Ibis*, 1867)
29. On the horns of the *Antilope bezoartica* (p.c.) and on the mode of fighting of *Ovis cycloceros* (*Land and Water*, 1867)
30. On the voices of gibbons (p.c.)
31. On the crest of the male goat (*Land and Water*, 1867)
32. On the colours of *Portax picta* (p.c.)
33. On the colours of the *Antilope bezoarctica* (p.c.)
34. On this colours of the axis deer (p.c.)
35. On the sexual differences in colour in *Hylobates* (*Land and Water*, 1867)
36. On the hog deer (*Land and Water* 1869)
37. On the white hair of an aged monkey (p.c.)

There were four correct answers: Geoffry Fryer, Adrian Lister, T.H. Nicolson and David Wells all of whom will receive a celebratory mug.

From the Archives

Some noteworthy early British floras and their diverse authors
Part Two

The first British flora using both the new classification and the new binomial systems of Carl Linnaeus (1707–1778) was *Flora Anglica*, 1762, published by a London apothecary, William Hudson (1734–1793) [See Part One, *The Linnean*, July 1995]. A second edition in 2 volumes was published in 1778, but, even so, copies were difficult to obtain and it became clear that a replacement was needed. Sir Thomas Gery Cullum (1741–1831) MRCS, FRS, FLS 1790, a physician at Bury St Edmunds, Suffolk, had already begun an augmented version of Hudson's *Flora* in 1774, but as he had got no further than the letter 'D', when the second edition appeared, he gave up his project. What he had done was printed privately as *Florae Anglicae Specimen imperfectum et ineditum anno 1774 inchoatum*. Dr. Richard Pulteney (1730–1801), physician and botanist of Blandford Forum, Dorset, had also commenced a concise British flora, but his friends dissuaded him from continuing and, instead, he converted the preface into a two-volume work, *Historical and Biographical Sketches of the Progress of Botany in England, etc.*, 1790.

It was not, in fact, until the start of the new century, that the long-awaited flora, *Flora Britannica*, 1800, (2 vols in 8vo; vol. 3, 1804; price 27 shillings), finally came out. James Edward Smith (1759–1828) had begun this celebrated work in 1794; he dedicated it to his friend and adviser, T.G. Cullum. Smith was the son of a prosperous mercer of Norwich. He studied medicine and botany at Edinburgh. At one time, he had taught botanical art to Queen Charlotte and her daughters and had also taken care of their extensive herbarium. Smith founded the Linnean Society in 1788, having bought most of the books and collections of Carl Linnaeus four years earlier. He was knighted in 1814.

Flora Britannica followed a style similar to that of *Flora Anglica*. The book is in the same 8vo size; the names and classification scheme are Linnean; there are no illustrations. References are given to works published since Hudson's time, including Charles Abbot's *Flora Bedfordiensis*, 1798 [See Part One]. Although by 1800, the

palustris. 3. VIOLA acaulis, foliis reniforminus glabris, radice repente.

Viola paluftris. *Sp. Pl.* 1324. *Huds.* 379 *With.* 261. *Lightf.* 506. *Curt. Lond. fasc.* 3 *t.* 58. *Engl. Bot. t.* 444. *Abbot* 190. *t.* 3.

V. palustris rotundifolia glabra. *Moris. Hist. v.* 2. 475. *Sect.* 5. *t.* 35. *f.* 5. *Raii Syn.* 364.

b. V. rubra striata Eboracentis. Raii Syn. 365. *Fl. Dan. t.* 83.

Angl. Marsh Violet.

Figure 1. *Flora Brittanica* p.246

use of English for scholarly works was gaining ground, Smith chose to retain the traditional Latin for the text, since it allowed his book to be read throughout Europe, even as far away as Russia. *Flora Britannica* remained the standard work for many years and has its place today as an historical resource.

Simultaneously with his *Flora*, Smith published an epitome, *Compendium Florae Britannicae*, 1800 (price 7s. 6d.; Ed. 6, 1828). It is a slim handbook for carrying about on botanizing trips. The text is in Latin giving only the plant's botanical name, a brief description, location and flowering-time. In the margins of his own, annotated, copy [in the Society's library], Smith has added the volume and plate number of illustrations in *English Botany*, 1790–1814, (36 vols in 8vo), a collection of hand-painted engravings by James Sowerby (1757–1822) FLS 1793. Sowerby also wrote the text, except that for volumes 1–6, which was anonymously written by Smith. *English Botany* is a kind of British flora, but there is no botanical arrangement. Sowerby published the plates in batches depending on when he got the specimens. He received a constant supply sent from all parts of the country, including some from Abbot. Sowerby provided plate 3 (identical with plate 444 in *English Botany*) for Abbot's *Flora Bedfordiensis*, 1798, [See Part One]. The other five plates are almost certainly by Sowerby.

3. V. *palustris*, acaulis, foliis reniformibus glabris, radice repente.
Palud. muscos. 4.4. *Stolon. nulli. Fl. pallidi, venosi.*

Figure 2. *Compendium Florae Britanicae* p. 36.

Smith did not bring out an English translation of his *Flora Britannica* for many years – *The English Flora*, 1824–36 (5 vols in 6, 8vo; price £3:12:0; second and final edition, 1828–44). It was over a year after his death before *A Compendium of the English Flora of Sir James Edward Smith*, 1829, in 8vo, appeared (price 7s. 6d.). This is a translation by Dr Aeneas McIntyre (1787?–1843 – perhaps till 1860) LLD, FLS 1825, a Classics master at a school on Streatham Common, Surrey. He was a founder-member of the Botanical Society of London and "VPMSL" [what?]. Many years earlier, however, the need for such a flora, in English, for the home market, had already been met. In 1806, *A Synoptical Compend of British Botany, etc.*, a pocket-book flora in 12mo, was published by John Galpine, gentleman and former nursery and arboretum owner of Blandford Forum, Dorset.

John Galpine (1771–1806) ALS 1788, was the son of John Kingston Galpine whose family business he inherited. In 1797, he married Kitty Clapcott, the daughter of a local brewer. She survived her husband by 43 years, dying in 1849, aged 78. By 1800, Galpine seems to have given up the nursery, though it continued, run by various leaseholders, throughout the century. In July 1803, at the resumption of hostilities with France, he joined the 18th Royal Irish Regiment of Foot as Paymaster, rising to the rank of Captain before he died, at the early age of 35, on 6 January 1806. There had been a serious epidemic of influenza in Blandford in 1800. Did he perish from some similar fatal outbreak? Or, was his premature death caused through his war

III. VIOLA. Violet.

• Stem none.

1. V. *hirta*, 13.894. (Hairy V.) Leaves heart-shaped, rough with hairs, as well as their stalks. Calyx leaves obtuse. Lateral petals with a hairy central line.
Chalky soil. 4.4. *Scyons short. Fl. blue, streaked with black, scentless.*

2. V. *odorata*, 9.619. (Sweet V.) Scyons creeping. Leaves heart-shaped, early smooth as well as their stalks. Calyx-leaves obtause. lateral petals with a hairy central line.
Woods. 4.3.4. *Scyons very long. Fl. deep purplish blue, fragrant.*

3. V. *palustris*, 7.444. (Marsh V.) Leaves kidney-shaped, smooth. Root creeping. Lateral petals with a hairy central line.
Mossy bogs. 4.4. *Scyon 0. Fl. very pale blue, with purple streaks.*

Figure 3. Smith's *A Compendium of the English Flora* p. 47.

service, ironically just a few days after the publication, on 1 January 1806, of his unusual and successful book?

The Galpine nursery and arboretum specialized in "Useful and Ornamental Hardy Trees, Shrubs, Plants", etc. for the garden. In the catalogue for 1789 (price 6d.) a beautiful new rose, called the "Kingston" or "Blandford Rose", was advertised at 7s. 6d. a plant. This small, double, pink, rose had the singular honour of being selected by the flower-painter, Mary Lawrence (fl. 1790–1831) as one of her *Collection of Roses from Nature*, 1796–99 (price 12gns) a folio volume of 90 hand-coloured plates in stipple, dedicated – of course – to Queen Charlotte.

Miss Lawrence usually obtained her specimens through London nurserymen, one of whom, in 1805, named *Rosa Lawrenceana* for her. In the case of the Blandford Rose (plate 21, 1797), she may have received the flowers from Galpine himself. When he applied to become an Associate of the Linnean Society in 1798, he gave his address as Great Portland Street. Miss Lawrence was a near neighbour, living in Queen Anne Street, Portland Place, where she gave expensive lessons in flower-painting, charging a half a guinea each for a series of lessons, plus an entrance fee of one guinea. Her pupils would have been fashionable ladies practising the hobby of the day. She exhibited at the Royal Academy, asking half a guinea for her flower pictures.

The Blandford Rose was of a type that had only a limited life span. By the early 1830s it had died out completely, its price having fallen to a mere 4 shillings a dozen plants. The rose had had its day, but, unlike Galpine's book, which did not continue beyond the fourth edition in 1834, it has not been forgotten. The Blandford Rose has recently flowered anew in a modern guide to flower embroidery,

In spite of its unmanageably long title, running to 15 lines, Galpine's *Synoptical Compend of British Botany*, 1806, was a "conveniently portable" book, in 12mo. It

67. *R.* LAWRENCEANA Swt. *Miss* Lawrence's *China* Rose.

Identification. Sweet Hort. Suburb.; Lindl. Ros., p. 110. ; Don's Mill. 2. p. 582.

Synonymes. R. semperflorens minima *Sims Bot. Mag.*, t. 1762. ; *R.* indica var. α acuminata *Red. Ros.*, 1. p. 53. ; *R.* indica Lawrence*ana* Red. Ros., 2. p. 38.

Engravings. Red. Ros., 1. p. 53. ; and our *fig.* 509.

Spec. Char., &c. Dwarf. Prickles large, stout, nearly straight. Leaflets ovate acute, finely serrated. Petals acuminated. (*Don's Mill.*, ii. p. 582.) Native of China. Flowers small, single or semidouble, pale blush. A shrub, 1 ft. in height, which flowers throughout the year. The beautiful little plants called fairy roses are nearly all varieties of *R.* Lawrence*ana* ; and they are well worthy of culture, from their extreme dwarfness (often flowering when not nore than 6 in. high), and the beautiful colour of their miniature rose-buds, the petals of which appear of a much darker hue than those of the expanded flower.

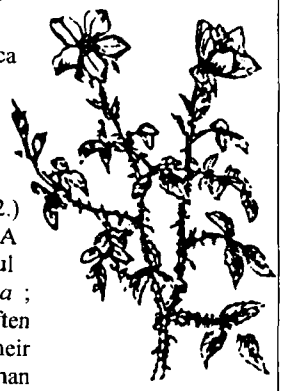

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Figure 4. *Arboretum et fruticetum britannicum* by J.C. Loudon, 1838, v. 2, p. 772.

is an abridgement – in English – of Smith's Latin *Compendium*. Using an original tabular format, the book is a kind of checklist. Galpine gives both Latin and English names, locations and flowering-times on one page; a brief description (with some words in abbreviation) opposite.

In the Preface, Galpine declares that the object of the book is "to facilitate the knowledge of our English Plants among lovers of Botany", some of whom would be "wholly ignorant" of the Latin language. Like Abbot, he clearly has women in mind and may also have been thinking of his fellow nurserymen, who bred and sold an increasingly diverse selection of plants to an increasingly knowledgeable public. To keep the size "as commodious as possible for the Pocket", however, he deliberately omits the *Cryptogamia* (ferns, mosses, algae etc.), as being more difficult to identify than flowering plants and of less interest to the general reader.

Notwithstanding its high price of 10s.6d., the *Synoptical Compend* proved an immediate success, the edition soon selling out. A reissue was unfortunately delayed by Galpine's untimely death. The publisher, Samuel Bagster (1772–1851) did not, in fact, bring out a second edition until 1819, but that was still many years in advance of Smith's *English Flora* (1824–36) and ten years before the English translation of his *Compendium*. Galpine's original work had been corrected by "a distinguished member of the Linnean Society" [who?] and, this time, the cryptogams are included, ferns and mosses, in particular, then beginning to come into favour as indoor plants and for the newly popular conservatory.

Bagster dedicated this edition to the President and Fellows of the Linnean Society, presenting one copy to Sir James Edward Smith, and another to the President of the Royal Society, Sir Joseph Banks. This edition was as popular as the first, and a further edition followed in 1829, the same year that the translation of Smith's *Compendium* appeared. At that time, Abbot's *Flora* was still available, priced at 6s.6d., indicating

(17)

CLASS V. PENTANDRIA ORDER I. MONNGYNIA.

	LINNEAN NAMES.	ENGLISH NAMES.	Soil or Situation	Col. of the Flow	Time of Flow.	Duration	Refer. to Fig.
90	POLEMONIUM.	GREEK-VALERI.					
	1 cæruleum . . .	jacob's ladder	Mount.	blue	6.	P.	E. B. 14.
91	CAMPANULA.	BELL-FLOWER					
	1 rotundifolia . .	. round leaved .	Heaths	blue	8,9.	P.	E. B. 866.
	2 patula	. . spreading . .	Past.	viol.	7,8.	B.	E. B. 42.
	3 Rapunculus . .	. . Rampion . .	Hedge b	purple	7,8.	B.	E. B. 283.
	4 latifolia	. . . giant . . .	Sha. m.pl	purple	8.	P.	E. B. 302.
	5 rapunculoides	. . creeping . .	Woods	blue	8.	P.	. . . .
	6 Trachelium . .	Nettle-leaved	Woods	viol.	7.	P.	E. B. 12.
	7 glomerata . . .	. . clustered . .	Chal. pa.	viol.	7,8.	P.	E. B. 90.
	8 hybrida	. . . corn . . .	Corn fi.	viol.	8.	A.	E. B. 375.
	9 hederacea . . .	. ivy-leaved .	Moi. s pl.	blue	6-8.	P.	E. B. 73.
92	PHYTEUMA.	RAMPION.					
	1 orbiculare . . .	round-headed	Chal. pa.	viol.	8.	P.	E. B. 142
93	JASIONE.	SCABIOUS.					
	1 montana . . .	. . . sheeps . .	Can. pas	blue	6,7.	A.	E. B. 882.
94	LOBELIA.	LOBELIA.					
	1 Dortmanna . .	. . . Water . . .	Lakes	blue	7.	P.	E. B. 140.
	2 urens	. . . acrid . . .	Heaths	blue	8,9.	P.	E. B. 955.
95	IMPATIENS	BALSAM.					
	1 Noli me tangere	. . Yellow . .	Wat.s.pl	yel.	8.	A.	E. B. 937
96	VIOLA.	VIOLET.					
	1 hirta	. . . hairy . . .	Chal. so.	blue	4.	P.	E. B. 894
	2 odorata	. . . sweet . . .	Sha. pl.	purple	3,4.	P.	E. B. 619
	3 palustris	. . . marsh . . .	Mos.bogs	blue	4.	P.	E. B. 444
	4 canina	. . . dogs . . .	Heaths	blue	4-6.	P.	E. B. 626
	5 lactea	cream-coloured	M. hea.	cream	5.	P.	E. B. 445

(17)

CLASS V. PENTANDRIA. ORDER I. MONOGYNIA.

SPECIFIC CHARACTER.

90. POLEMONIUM.

1 L. pinnated: Fl. erect: cal. longer than the tube of the corolla. . . .

91. CAMPANULA.

1 L. radical reniform: those of the stem linear. . . . . .
2 L. straight: radical lanceolato-oval: pan. spreading: cal. denticulated.
3 L. waved: radical lanceolato-oval: pan. compact. . . . . .
4 L. ovato-lanceolate: stem very simple, cylind: pedunc. 1-flow. fruit drooping.
5 L. cordato-lanceolate: stem branched: Fl. scattered, 1-rowed. nodding: cal. reflexed. *Morris. Hist.* v. 2. 460. *sect.* 5. *t.* 3. *f.* 32.
6 Stem angular: L. cordato-lanceolate, sharply serrated: cal. hispid: pedunc. axillary, few-flow.
7 Stem. angular, simple: Fl. sessile, in a terminal head: L. ovate, crenated.
8 Stem sometimes branched at the base, straight; L. oblong, crenated, undulated: cor. shorter than the calyx, caps. prismatic.
9 L. cordate, 5-lobed: petioled, smooth: stem lax. . . . . .

92. PHYTEUMA.

1 Head roundish: L. crenated: radical ones cordate. . . . . .

93. JASIONE.

1 . . . . . .

94. LOBELIA.

1 L. linear 2-celled, very entire, stem nearly naked. . . . . .
2 Stem rather upright, lower leaves obovate, denticulated: uppermost lanceolate, serrated: Fl. racemose.

95. IMPATIENS.

1 Pedunc. many-flow. solitary: L. ovate: joints of the stems swelling.

96. VIOLA.

1 Stemless: L. cordate, piloso-hispid, as well as their petioles: cal. obtuse.
2 Stemless: stolons creeping: L. cordate, smoothish, as well as their petioles: cal. obtuse.
3 Stemless: L. reniformi, smooth: root creeping. . . . . .
4 Stem when becoming adult, ascending, channelled: L. oblong-cordate: cal. acute.
5 Stem ascending, cylind. L. ovato-lanceolate: stipulæ inciso-serrated.

Figure 5. Galpine's *Synoptical Compend* 1806.

its continued usefulness; Smith's *Flora* cost 27 shillings. Galpine's augmented *Synoptical Compend* was quite highly priced at 10s.6d. A fourth and final edition came out in 1834.

Galpine dedicated the Compend to William George Maton (1774–1835) MD, FRS, FLS 1794, FSA, physician to the Queen, Vice-President of the Linnean Society and well-known for his antiquarian and botanical knowledge. During the summer, Dr Maton practised at Weymouth, Dorset, then a fashionable watering-place. It was there that he was introduced to Queen Charlotte and asked to solve a question of botany! When Galpine applied to become an Associate of Linnean Society in 1798, Maton was one of his sponsors. Another was the Revd Thomas Rackett (1757–1841) MA, FRS, FLS 1794, FSA, Rector of Spetisbury (3 miles south-east of Blandford), a botanist and antiquary, and a great friend of Maton's. They had toured Wessex together in 1797. Rackett planted exotic trees in the Rectory garden; did he get them from Galpine's nursery? He certainly appreciated his book, presenting a copy of it to Smith. Some of Rackett's trees are still alive in Spetisbury and, in the grounds of Bryanston School at Blandford, there stand some of the largest and most magnificent London plane trees in England, another living legacy from the Galpine arboretum.

Since the age of ten, Rackett had been a friend of the distinguished physician and botanist, Richard Pulteney (1730 – 1801) MD, FRS, FLS 1790, FSA, who practised at Blandford. Indeed, all three were close friends and often met together to exchange ideas, perhaps at Pulteney's house to admire his garden, or at the Rectory at Spetisbury to marvel at the unusual trees planted there. They would also examine the contents of Rackett's Cabinet of Curiosities, including items collected on his recent tour. He, meanwhile, deftly sketched their likenesses. Was Galpine, who lived next door to Pulteney, one of the company too? Did they discuss his project and give him help and advice from their combined experiences as authors of botanical works themselves?

Galpine's third sponsor was another botanist and arboriculturalist, Aylmer Bourke Lambert (1761–1842) FRS, FLS, 1788, FSA, founder-member and Vice-President of the Linnean Society. He lived at Heytesbury, near Warminster, Wiltshire (about 30 miles from Blandford). He kept up a prolific correspondence with Pulteney and must have known of Galpine's planned pocket-book flora. He also may well have given Galpine useful suggestions. How unlucky it was, that Galpine did not live to benefit from the success of his publication. It would have brought him personal recognition and, with his knowledge and the backing of his eminent botanical acquaintances, who knows what other useful and popular books he might not have written and thus have made his mark as a botanist himself?

ENID SLATTER

Correspondence

23.4.98 Gonville and Caius College, Cambridge

Dear Editor.

The National Trust

In your Annual Report for 1997, p.21, Dr Savage (the Society's retiring representative on its Council) reports that the National Trust has decided to ban deer hunting on its properties, notably on the Quantocks and Exmoor, because of its supposed cruelty. But whether or not the Trust should take sides on what is a controversial matter not directly related to its primary objects of conservation, is arguable.

There is no question that being chased for a couple of hours, before being humanely despatched with a shot to the head, must cause considerable distress to the stag. But not necessarily more so than do many of the other ways in which it can be expected to die: the lives of most wild animals are all too often "poor, nasty, brutish, and short".

By banning hunting on its land, the National Trust will almost certainly put an end to stag hunting altogether. At present, deer are often to be seen outside Trust property, where they do a good deal of damage to agriculture and forestry. But this is tolerated by the local people, who quite like to see deer around, and many enjoy hunting them as well. If however that is to be stopped by outsiders, farmers will in all probability want to take their profit in venison, by shooting wild deer on their own land which

they are legally entitled to do. That will lead to the elimination of Red Deer as a truly wild species in Devon and Somerset, and they will soon be confined to a sort of wildlife park managed, and culled, by the National Trust. And many, not only supporters of stag hunting, might think that a pity.

Now that stag hunting has been banned from their property, one may be sure that next there will be demands from National Trust members to ban fox hunting as well. That is because many people nowadays don't like the idea of killing animals for sport, even though a good case can be made for hunting with hounds being a more humane way of controlling foxes than is shooting, trapping, poisoning, or gassing. And few would deny that foxes do have to be controlled, one way or the other.

And then what about shooting pheasants for sport, which are sometimes wounded rather than killed outright. Some might think that was cruel, and should be banned as well.

Yours truly,
C.B. GOODHART

Department of Biology, University of Miami,
Florida 33124-0421

24.3.98

Dear Brian,

I have read with great interest the article on Seba's herpetological specimens in the Paris Museum by Thireau and the Spracklands. Their discovery is indeed important historically but poses a potentially serious nomenclatural problem.

Although Linnaeus referred to Seba's plates in many of his 1758 descriptions, he also refers to descriptions and/or plates from other pre-Linnaean works as well. At least for the herpetological material, almost all Linnaean names are based on actual specimens seen by Linnaeus as documented by Lönnberg (1896) and Anderson (1898), in Svenska Vet.-Akad. Handlingar 22(IV:1): 1-45 and idem 24 (IV:6): 1-35, respectively. These examples are all types (either holotypes or syntypes).

Thireau and Sprackland argue (Art. 72 of the International Code of Zoological Nomenclature) that Linnaeus's reference to Seba's plates makes the specimens upon which they are based syntypes. This opens the door for them to select Seba's specimens as lectotypes in preference to specimens actually seen by Linnaeus and preserved in the Swedish collections. While most herpetologists have refrained from designating lectotypes for Linnaean names, the possibility now arises that lectotype designations could be made merely to enhance the value of one institution's collection over another.

Perhaps the International Commission should consider this matter and its consequences.

Yours sincerely,
JAY M. SAVAGE

Biology Department, University College,
Gower Street, London WC1E 6BT

13.7.98

Dear Brian,

The mystery picture on p.5 of July's *Linnean* is Edward Blyth (1810–1873). Blyth was Curator of the Bengal Museum, Calcutta, and an avid correspondent of Charles Darwin, who acknowledged Blyth for many examples of variation and selection which he used in the *Origin* and the *Descent of Man*. In a series of essays in 1835–37 in the *Magazine of Natural History*. Blyth proposed what he termed the 'localizing principle'. He recognised that the natural variation produced in species would be subject to selection, which would prune the less poorly adapted individuals and serve to keep the species at its adaptive peak. There are similarities to what we would today call 'stabilising selection'. Blyth also clearly saw the analogies between selection in the wild and under domestication, but he did not accept that the former could lead to directional evolutionary change – 'descent with modification'.

Yours sincerely,
A M LISTER

Serendip, Old Farm,
Illington, Thetford,
Norfolk IP24 1RP

15.7.98

Dear Professor Gardiner

Picture Quiz 14(2): 5.

With an interest in SE Asian ornithology, I should know who this is: Edward Blyth, curator of the museum of the Asiatic Society of Bengal in Calcutta. 'A very clever, odd, wild fellow'; correspondent and urger-on of Charles Darwin. Bird taxonomy was his main professional activity, and the Malay Peninsula seems to have been one of his special interests (still 'further India' as the Straits Settlements were, of course, then administered from Calcutta). The Calcutta post he took up in 1841, and died in Britain in 1873, at which point I am afraid my home resources also dry up and I need to get to a few good obituaries.

Yours sincerely,
DAVID WELLS

To the Executive Secretary

Homewood, Swallowcliffs
Nr Salisbury, SP3 5PW

Dear Sir....

Pure genealogy with its doubtful yarns of glory is fun but a bit barren. Finding one's ancestry in some smelly Norman pirate lordling, a hunchback Flemish weaver or a mad Celtic prince might be interesting but is biologically unsupportable since one is, by one's genes alone, barely related to one's triple great-grandfather, and since

cuckolding is a common pastime, one is more likely to be related to one's next-door neighbour in the long run.

You suggested some time ago that it might be a good thing to set up a human genetics section for the Fellows themselves. They are canny enough to know their relatives and lateral relationship is as good as longitudinal for investigation.

The Human Genome study (*NB Society Meeting on 15th October - Ed.*) is fine for identifying genes themselves but the study of what genes actually control is vital and must be uncovered relatively quickly.

It is no good thinking in terms of a quick PhD or much in the way of grants: results are too slow for most organisations. It is perhaps best to think of the whole investigation as a hobby with the advantage of the occasional paper.

There is an advantage, too, in working with one's kin in that lies are detectable and they will talk more easily with their own blood.

Anyway, if anyone is interested, I am quite willing to act as coordinator until someone more effective comes along. We can communicate by writing or, indeed, the occasional meeting. Allow for the fact that with one gammy hand I cannot type. We can keep it as informal as you wish, until we are forced to change by circumstance. The new banking experiment on iris-code identification might open a new field of gene influence. Costs need be no more than postage, travel and experimental work and a lot of us may be able to borrow material from our own labs. We can discuss difficulties of approach and experimental openings.

If the project meets with your approval we can present it as a possibility. Not everyone will be interested but I am sure some might find it exciting.

Yours sincerely,
PATRICK F. JAMES

To the Executive Secretary

Dear Sir....

The Crown Amphitheatre, Wye

Below the Crown on Wye Downs in Kent is a disused quarry. This area falls within both an Area of Outstanding Natural Beauty and a site of Special Scientific Interest. Within the Borough of Ashford, the land is owned by Wye College, University of London, and managed in association with English Nature. Wye quarry therefore is an area requiring sensitivity but, given this, various possibilities emerge and can be combined to enhance what is already a place of considerable appeal.

Development

In 1995 it was proposed that a lobe of the former chalk quarry be developed as an amphitheatre – that part of the quarry being at that time a V shaped declivity, overgrown and littered with assorted rubbish. Discussions between the College and English Nature evolved a provisional design and eventually the Borough Council was approached for advice and support.

Work began with the College farm staff clearing the site to permit an accurate

survey, completed electronically on 23rd December 1995. After preparation and initial fundraising excavation began in December 1996 using machinery supplied by English Nature and completed in January 1997. This served primarily to relocate material required to form the stage. Thereafter virtually all the remaining work was done with hand tools during 1997 and 1998. This was to ensure that the necessary degree of detail was obtained. A series of curved concentric tiers was developed defined by material cut from railway sleepers, held in place by anchor posts and back-filled from the chalky overburden. By August 1997 the theatre could accommodate 110 people and by mid-1998 this had been enlarged to 140. There is some scope for a further increase in seating capacity but it is probably wise to work with the existing design and learn the lessons it has to teach before becoming more ambitious.

Ethos

The term 'ecotheatre' has been coined to indicate the ethos of the project. Quite often sites of scientific interest are chiefly the concern of ecologists and it is assumed that ecological considerations are not only paramount but the only ones which matter. However if the means can be found to appeal to quite different interests (in this case theatre) there can be developed a model mechanism for imaginative management of such sites. Theatre enthusiasts need to know about constraints imposed by the bird breeding season and ecologists learn that even commonplace hawthorn bushes can have poetic significance for a group of actors.

'This hawthorn brake our tyring room'
Midsummer Night's Dream, Act 2, Scene 2.

i.e. This hawthorn thicket shall be the place where we put on our attire – the dressing room.

Even though the theatre is not yet quite complete, the evidence is that 'ecotheatre' as a concept can work. The interest has been considerable already and the venture is, so far as we can discern, unique.

There would appear to be every advantage in publicising what has been achieved and in developing a collaborative and sensitive programme to exploit the remarkably interesting prospects it offers.

GEOFFREY P. CHAPMAN

Dear Brian, 1 July 1998

The National Trust – Biology as well as Buildings

I am honoured to follow in the footsteps of the late Bob Savage as the Statutory nominee of The Linnean Society on the Council of the National Trust. He was a very popular member of Council, much admired for his concern, wisdom and good humour. It is a hard act to follow. I hope I shall not have to hold the ring between pro- and anti- hunting lobbies, as he did when he chaired the National Trust Panel of enquiry into deer hunting on Exmoor. My aim will be to raise the profile of Biodiversity, both within the Trust itself and with the wider public, among whom it is not generally understood that the Trust plays a key role in the conservation of our natural as well as our cultural heritage.

The National Trust for Places of Historic Interest or Natural Beauty (to give its full title) is the largest private landowner in Britain. The Trust, not the Nation, owns nearly 20% of Britain's National Nature Reserves, over 400 Sites of Special Scientific Interest, 900 km of coast and half the Lake District National Park. These land holdings imply that the Trust owns most of the remaining red squirrels in England and Wales. About 8 species of butterflies owe their continued existence to the Trust and the Trust is also the largest single guardian of British dormice. The Trust's role is of international biological significance: it owns some of the most important seabird colonies in Europe. Tweny one of Britain's list of EU Special Protection Areas for birds include Trust land and 64 of Britain's candidate sites for European recognition as Special Areas of Conservation include Trust properties. This is despite our heavily populated countryside. The UK Government's Biodiversity Action Plan (established under the Rio Convention) short-lists 121 internationally significant species for conservation, 38% of which occur on Trust land, as do 40% of the British Red Data Book plant species. So, the National Trust is a major player in the Biodiversity scene, but few people realise this.

The Trust's active and highly skilled management of this magnificent contribution to the conservation of our national heritage is carried out by its Wardens and Land Agents, guided when necessary by a team of (only!) three full time Nature Conservation Advisers based in Cirencester. This aspect of the Trust's work receives an increasing proportion of the £140 million pounds it spends annually, but wildlife remains inconspicuous among the Trust's priorities.

The Trust has a Nature Conservation Advisory Panel, of which I have recently become Chairman, These are expert volunteers who meet 2 or 3 times per year to review topics of concern to the staff. At our most recent meeting, for example, we discussed the preparation of "Statements of Significance" which are being drafted for each NT property. This is a herculean task but one in which nature conservationists could take a lead because we are already familiar with the formulation of information on why a particular site is of biological significance. However, as the name implies, the Panel is advisory and can only offer advice.

My appointment to the Council of the National Trust is very timely and will, I hope, enable me to increase the biological input to its meetings. I shall do my best to drip, drip on the stone to alter the NT's image of itself, and with the public, as centred on old buildings and historical landscapes. It will be a long job and I hope to retain the support of the Linnean Society as their representative long enough to have some effect. Already there are signs of a small shift in that next year, the centenary of the acquisition of Wicken Fen, much of the Trust's promotional activity and education work will focus on nature conservation and a 'focus on wildlife' working party is already meeting to prepare for this. I hope the National Trust and the wider public will come to recognise that biodiversity is an integral part of the conservation of both 'historic interest and natural beauty' and therefore central to the Trust's aims.

Yours sincerely,
PAT MORRIS

(Dr Patrick Morris of Royal Holloway, University of London has been appointed as the Linnean Society's statutory nominee to the Council of The National Trust).

What the eye does not see

'That not for man is made
All colour, light and shade...' Edmund Gosse 1849–1928.

Our vision gives us a wonderful picture of the world about us, with infinite details of shape, form and movement, contrasts of light and dark, and colours. But there are two important aspects of the visual world that are hidden from us: light of the near ultraviolet region of the spectrum and the degree of light polarisation. Both are often regarded as somewhat obscure subjects yet they have important implications and applications from natural history through the physical sciences to technology. Both are detected by most insects and by many vertebrates other than mammals, and it is often important for us to understand how the world looks to other species – what are we missing? Both these topics offer many suprises, some beautiful demonstrations and much valuable interdisciplinary stimulation.

'...to add another hue
Unto the rainbow...' William Shakespeare 1564–1616.

The existence of ultraviolet rays was established at the very beginning of the 19th century from their blackening effect on silver chloride – effectively the photographic process. The significance of these rays on animals was established in a series of elegant and exhaustive experiments by the great public figure and scientist Sir John Lubbock in 1879.

Working in the basement of the Royal Institution, Lubbock used an arc lamp and quartz prism to throw a spectrum on the floor of an arena containing ants. Knowing that ants will 'rescue' any pupae found exposed to the light, he scattered pupae in all parts of the arena. In the red-lit region the ants left the pupae alone and even put pupae down there, suggesting that they regarded it as dark and safe. But the ants quickly cleared pupae from the blue and violet regions of the arena and most quickly of all from the region beyond the visible violet. Lubbock's later experiments established beyond doubt that the spectrum of ant vision does not coincide with that of our own. Indeed ultraviolet sensitivity (and insensitivity to red) now appears to be a common feature of insect vision.

'And other eyes than ours
Were made to look on flowers,
Eyes of small birds and insects...' Christina Rossetti 1830–1894.

In 1891 Paul Knuth noticed that several flowers such as White Bryony (*Bryonia dioica*) are very attractive to pollinating insects although their flowers are far from showy, often being small and greenish. But when he photographed the plants in sunlight, he found the flowers then stood out boldly from the surrounding foliage. Knuth correctly deduced that the camera was recording ultraviolet light reflected by the flowers in sunlight and that that this was also responsible for attracting the insects.

The classical studies of bees by Karl von Frisch, begun in the 1920s, showed that 'white' light to a bee consists of all wavelengths from ultraviolet through blue and green to yellow, but does not require red. The two ends of our spectrum (violet-blue and red) when mixed together give purple; by analogy, von Frisch coined the term

Figure 1. Three flowers photographed in colour and in near ultraviolet light (UV-A). Left: dandelion (*Taraxacum officinale*); the centre is true yellow while the surround is 'bee purple' (yellow plus near UV). Middle: *Rudbeckia*; there is no visible colour change along the petals of this variety but the UV-A pattern is striking. Right: *Potentilla reptans* with 'true yellow' patches and nectar guides on a background of 'bee purple'.

'bee purple' for a mixture of the extreme ends of the bee spectrum (ultraviolet and yellow). This turns out to be a common combination in many flowers that we simply call 'yellow' (Figure 1).

In 1958 Karl Daumer, interested in what a bee sees as it searches for nectar and pollen, photographed a wide range of flowers both in black-and-white and in ultraviolet alone. He discovered a variety of patterns in flowers that had been thought to be a single plain colour. Often a UV-dark centre contrasted with a brightly UV-reflective surround. Nectar guides, the radial lines as on pansies that 'show the bee' where to go for nectar, turn out to be commoner than suspected because they may be visible only in the UV (Figure 1). Red poppies were also a puzzle because their red colour should be dark to insect pollinators, but it turns out that they are also UV-bright. I have also found a deep red potentilla (*P. nepalensis*) that is very UV-bright. Perhaps one might call this combination 'butterfly purple' as butterflies are rather exceptional among insects in seeing red at one end of their spectrum as well as UV at the other.

'The tulip and the butterfly
Appear in gayer coats than I...' Isaac Watts 1674–1748.

Butterflies also look at one another, so one might expect some of their patterns to include significant UV components. In 1970 Yoshiaki Obara in Japan photographed the Small White butterfly (*Pieris rapae*) in both black-and-white and in UV. The two sexes differ only slightly in visible light: the female has two small black spots on the forewing while the male has only one. But the female reflects UV strongly while the male does not. So the female is 'true white' or 'bee white' (white plus UV) while the male is a quite different colour for which we have no name (all wavelengths *except* UV). So a butterfly could easily distinguish between the sexes at a distance. But when I looked at our College collection a few years ago, I found only a small difference since the males were only slightly less UV-reflective than the females. A student, Alan Rees, examined the species systematically as his final-year undergraduate project. At the Natural History Museum he found that specimens from Japan showed the marked difference described by Obara, but those from Hawaii eastwards through North America, Europe and Asia showed only slight dimorphism. In China there were both types but it is not yet clear whether they coexist in some areas. If we could see UV as a colour, males of the two forms would look clearly different and might well have been given distinctive names. It seems dangerous to classify butterflies by their colour patterns if we overlook colours that are often very bright to them. Many species have UV reflection patterns that enhance or modify for their eyes the patterns that we see. Examples are found in birds too: both green and yellow budgerigars (and also a black parrot) show some high UV reflectances and are able to see this themselves.

'Sometimes a light surprises...' William Cowper 1731–1800.

My own UV-viewing devices show that many things look very different in the extended visual spectrum. A nice demonstration for a lecture is called 'Find the Lady'. Three small discs are laid out on an overhead projector: one is clear (perspex) and two are just the same shade of blue. Then they are viewed in UV and the 'odd man out' is now dark while the other two are transparent. One of the blue discs (of cobalt glass) is as clear as the perspex but the other (blue acetate) is opaque to UV; the

acetate is therefore 'true blue' while the glass is 'blue + UV'.

In another example, an opaque black filter becomes as clear as window glass while a clear film is totally opaque to UV. One can easily improvise such filters. Some crystals of potassium nitrite quickly dissolve in water in a Petri dish. On the overhead projector the dish looks as clear as the control dish of water, but the water is transparent to UV (as shown by the UV viewing devices or by fluorescent paper) while the nitrite solution is 'as black as ink' and absorbs the UV.

The complementary filter, visibly opaque but UV-clear, is made by cobalt sulphate solution in a third dish; this is deep red but when the dish is put on a plate of cobalt glass, they each block the visible colour of the other and the combination is black. But both are UV-transparent and so they appear clear through the viewer or in the fluorescence test.

A final 'inorganic' example uses four white powders. Two, barium sulphate and magnesium oxide, are very reflective in UV and are 'true' white. But both titanium oxide and zinc oxide are very dark in UV; although both these are used as pigments in so-called 'brilliant' white paint, they must appear coloured to a bee.

'The atoms of Democritus
And Newton's particles of light...' William Blake 1757–1827.

The reason why man and other mammals do not see UV raises some interesting issues. Certainly it is not because of any problem in photochemical detection. Although light travels as waves, it is absorbed in discrete energy packets called quanta. In 1905 Albert Einstein showed that quantum (or photon) energy is inversely proportional to the wavelength. (Einstein was awarded the 1922 Nobel Prize for this work, the citation specifically excluding special relativity, also published in 1905, and general relativity which followed in 1915.) Thus blue light of wavelength 467 nm has a quantum energy 50% greater than deep red light of 700 nm; the intensity of light is quite irrelevant since a bright light simply has more quanta and a dim one fewer. Now vision depends on quantum energy: one quantum must be powerful enough to produce one molecular transformation in a retinal cell. This effectively sets the long-wave limit to vision, for above 700 nm the quantum energy is too low to change the receptor molecules, making true vision impossible in the infrared. More sensitive molecules would also be prone to spontaneous transformation due to thermal agitation, especially in warm blooded animals. But the band of near UV, or UV-A, seen by many animals covers the range 320–400 nm, with quantum energies more than twice that of deep red light. There is therefore no problem of detection. At the even shorter-wave UV-B band (280–320 nm) quantum energies are sufficient to cause cell damage in the retina and sunburn of the skin unless protective measures are taken. At UV-C (below 280 nm) the quantum energy can disrupt DNA and initiate tumours. Fortunately the ozone layer of the upper atmosphere forms an effective screen below 280 nm but the consequences of 'ozone holes' become clear.

'And see, no longer blinded by our eyes...' Rupert Brooke 1887–1915.

The real problem with mammalian eyes seems to lie with chromatic aberration. Any simple lens has a shorter focal length for shorter wavelengths, so blue light forms an image nearer to the lens than red light. In the eye this effect is quite moderate for

wavelengths above 500 nm (blue-green) but rapidly worsens through the violet and becomes very pronounced indeed in the UV-A. Now our trichromatic colour vision is achieved by having three different cone types. But, unlike the three responses of a television camera or colour films, which are regularly spaced in the blue, green and red, those of human retinal cones are both wide and irregular. Our 'red' and 'green' cone responses, for instance, overlap almost entirely and their peaks are close together at 564 nm and 534 nm ('red' cones are actually most sensitive in the yellow-green).

In this situation an out-of-focus image in one part of the spectrum, due to chromatic aberration, could fog the sharp image of another wavelength on the same receptor cells. In particular, admitting UV to the eye would degrade images rather severely, so it is screened out by the proteins of the lens that absorb below 400 nm. The recent discovery of UV vision in some rodents does not seem to invalidate this argument as they appear to be colour blind and are probably short sighted as well.

In other vertebrate classes the responses of different cone types are generally spread more evenly across the spectrum and every cone has a coloured oil droplet that acts as an optical filter and sharpens its responses, reducing overlap. Thus a bird can focus different colours in turn without suffering fogging from other wavelengths. But for over 100 million years, when the dinosaurs ruled the earth, our mammalian ancestors were nocturnal and lost colour vision. Some mammals such as the primates later reacquired cone differences but they did not regain the oil droplet filters. In insects, of course, compound eyes do not form a simple image and chromatic aberration is therefore irrelevant.

'There's a certain slant of light...
But internal difference
Where the meanings are...' Emily Dickinson 1830–1886.

Light that is polarised in different ways looks just the same to us but, as with UV-A, it can be distinguished by most insects and by a wide variety of non-mammalian vertebrates. Light waves, like a wiggled rope but unlike sound waves, vibrate at right angles to their line of propagation. (Actually there is an electric vibration at right angles to a magnetic one but *the* plane of vibration will here be regarded as that of the electric component.) In 'ordinary', unpolarised light this plane is constantly rotating at random through all possible directions; but in polarised light the vibration is constrained to one plane only. It surprises many people that most light in nature has at least a preponderance of waves in one direction (partially polarised light) and that it is used for many purposes by animals as well as having diverse applications in human technology.

'We all know what light is; but it is not easy to tell what it is...'
Samuel Johnson 1709–1784.

A simple demonstration consists of transmitting a polarised microwave beam of 3 cm wavelength to a polarisation sensitive receiver. Rotating either by 90° abolishes reception. A grid of parallel wires spaced about 8 mm apart is perfectly transparent to the beam in one orientation but completely opaque when turned at right angles. Reducing the wavelength by 50,000 times to that of visible light needs 'grids' of atomic dimensions within crystals or polymers, but experiments can then be beautifully

demonstrated using an an overhead projector.

One way to polarise light uses 'dichroic' materials – in which regular arrangements of atoms or molecules divide the light into two polarised components, one of which is absorbed while the other, vibrating at right angles, is transmitted freely. Tourmaline is a natural example but manufactured polaroid sheet is more convenient. One sheet blocks half the light reaching it but the transmitted half is almost completely plane polarised. A second sheet may pass all of this or block it completely when turned through a right angle – when the polaroids are 'crossed'.

'The purest and most thoughtful minds are those which love colour the most...' John Ruskin 1819–1900.

The magic begins when a cellophane jam-pot cover is inserted between crossed polaroids, for it effectively twists the plane of polarisation so that light appears once again. Actually it only does this strongly in four directions and not at all at 45° to these, so turning the disc makes the light wax and wane four times for each rotation. This property is called birefringence: the light is again divided into two components, and one has a greater velocity of propagation through the film. When the two components emerge they recombine, but the plane of polarisation is at a new angle about 90° from the original.

This is actually a special case with a rather simple result. Thicker films show that the effect of birefringence is different for different wavelengths so that a randomly folded film of clear cellophane produces a brilliant set of colours. Such colours can also be seen in stressed regions of clear plastic objects such as geometry instruments, giving great and unexpected beauty to some familiar objects. This principle is used for visualising stress distributions in acrylic models of engineering structures, from simple levers to cathedrals, or to examine newly blown glass objects for vulnerable stresses. It can also be exploited to make an extremely beautiful form of kaleidoscope in which the colours, as well as the patterns, can be varied at will.

Crystals as well as polymer films act on polarised light, and geological microscopes use the induced colours to identify minute crystals within sections of igneous rock (Figure 2). A vivid 'do it yourself' demonstration can be given by two pieces of polaroid and a few grains of silver sand (clear quartz – Figure 2). Optional cellophane films can be added for extra effect. Indeed, with a little care and ingenuity in

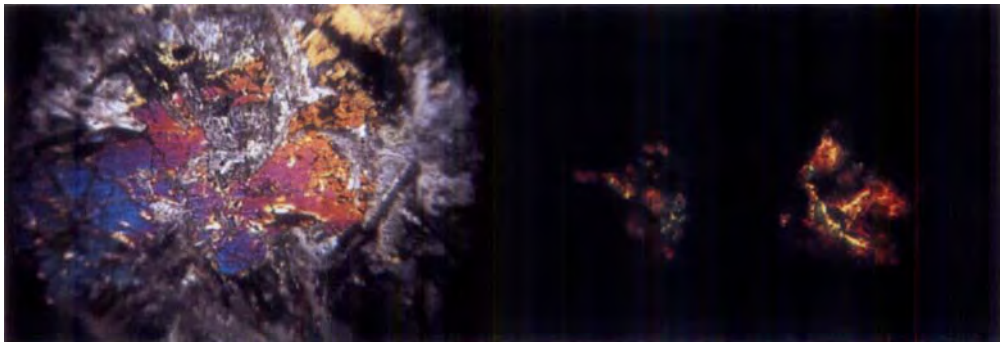

Figure 2. Minerals photographed between crossed polaroids under a rather basic microscope with improvised accessories. Left: a thin rock section. Right: grains of silver sand (rough clear quartz).

improvising accessories, even the most basic compound microscope can be used for quantitative measurements.

'The shining levels of the lake...' Alfred Tennyson 1809–1892.

Light becomes polarised when reflected by any shiny, non-metallic surface. At one angle of incidence (called Brewster's angle, whose tangent is equal to the refractive index) the reflected light is 100% polarised. So sheets of black perspex (or clear sheets painted black on the back) can be used to make very cheap polarisers of large aperture. Their only drawback is that a fairly strong light is needed to make a bright image. In a wonderful natural application of this principle, flying waterboatman bugs (*Notonecta*) check the Brewster angle of light reflected from water surfaces just to confirm its aquatic nature before taking the plunge.

'Where did you get your eyes so blue?
Out of the sky as I came through...' George MacDonald 1824–1905.

Finally, light becomes polarised when it is scattered by small particles, as can be shown by some dramatic bench demonstrations. The sky is blue (as eyes may be) because scattering affects shorter blue wavelengths more than longer red ones; the sky is also very bright in the near ultraviolet with its even shorter wavelengths. All the scattered light has a pattern of polarisation in rings around the sun, getting stronger (up to 100%) towards the arc that lies at 90° to the sun. This pattern can be used as a light compass even when the sun itself is obscured by cloud; indeed it can still be detected, though it is much weaker, under quite thick overcast.

The pattern is detected by many insects, usually using upward facing facets sensitive to the ultraviolet. They and possibly other animals such as some birds use the pattern for orientation and navigation. It has also been used by man for navigating aircraft over the Arctic and there is evidence that the Vikings used it (detected by a dichroic crystal) when sailing the north Atlantic long before the magnetic compass was available.

'Under... twilight the water mirrors a still sky' W.B. Yeats 1865–1939

A striking effect of combined scattering and reflection can be seen when the sky is reflected in water. When the light is from the side (at dawn or sunset) the sky at 90° is almost 100% vertically polarised; its reflection in smooth water then fades in the 'foreground', where the line of view approaches Brewster's angle (53°) and only horizontally polarised light can be reflected. This sometimes allows one to see below the surface as if wearing polaroid sunglasses, although mountains, buildings or clouds reflect normally because their light is unpolarised. This effect often shows in photographs but has any landscape artist ever depicted it? (a small reward is offered!) It might also have implications for fishing birds.

This article does not allow the consideration of rotation of polarised light by stereoisomer molecules in solution. That effect is very important in technology and has profound implications concerning life on earth, but it does not relate to vision. It is only one of a number of topics that relate to physics, chemistry and geology as well as natural history. Far from being an obscure phenomenon, polarisation has great significance throughout science.

DAVID PYE

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[This article is based on a demonstration lecture adaptable for audiences from 10 years to adults.]

Louis Compton Miall (1842–1921) – the origins and development of Biology at The University of Leeds.

On Thursday 11 September 1997, John Battle, Minister for Science, opened the Louis Compton Miall Building at the University of Leeds. The new £6.6 million building, composed of eight floors and covering approximately 5,800 usable square metres, houses the School of Biology. This was created from the merger of the three former departments of Pure and Applied Biology, Genetics and Animal Physiology and Nutrition. With over 100 members of research and teaching staff, the School offers 11 different degree schemes to over 700 registered undergraduates. In addition to a degree in Biology similar to that first initiated by Miall in 1875, Leeds currently offers degree courses in Animal Physiology and Nutrition, Animal Science, Applied Biology, Applied Zoology, Biology of Plants, Ecology, Genetics, Human Genetics, Genetics in Relation to Medicine, and Zoology. At the post-graduate level, the School also offers taught M.Sc. courses in Biodiversity & Conservation, and in Crop Protection & Biotechnology. With approximately 90 post-graduate students registered for higher degrees, the Leeds School is now one of the largest centres for interdisciplinary biological research in this country. It is currently under the headship of Professor Michael R. Hollingdale.

The official opening of the Miall Building coincided with the British Association for the Advancement of Science's Annual Festival of Science which was held on the Leeds campus during the week of 7–12 September. Associated with this, it also

Figure 1. The Louis Compton Miall Biology Building, Leeds University (Photograph: Adrian Hick).

coincided with a one day 'Mason Conference' on "Sounds Interesting: Diversity in Bioacoustics" presented by the Linnean Society and attended by the Executive Secretary. John Marsden was thereby able to attend both the official opening ceremony of the School and the accompanying festivities! Hopefully the latter were more enjoyable than the ensuing BAAS session, whose disasters are eloquently related in the Society's 1997 Annual Report![8]

For the first time, the University of Leeds biological collections are housed together in a complex comprising the Museum, the Herbarium, an Insect Collection Room and a Preparation Room. The dates and modes of origin of both the Zoological Museum and the Herbarium are as yet largely unknown. The origin of the Museum is thought to have coincided with Miall's appointment to, and tenure as, Professor of Biology. The Museum Accessions book was started in 1915, but it records that in 1898, the "Museum consisted of cases along the corridors (of the Baines Wing – which formed part of the original Yorkshire College) which disappeared in the alterations to the Department in 1907–08". The Museum then also included "A small number of skeletons – many spirit preparations particularly fishes – mostly from the Wheelhouse collection of the original Medical School". The Museum proper was established in the old Botanical Laboratory in 1908, a year after the retirement of Miall and during alterations to the original Department of Biology, when it was divided into the two Departments of Botany and Zoology. It was extended in 1933/4 by the incorporation of the old 'Lecture Room'. The Insect Collections were started in the 1890's with the

8 *The Linnean*, 14(1): 4 (1998).

purchase of the Boult Collections of Lepidoptera, and followed in about 1900 by the aquisition of part of the R.H. Meade Collection of Diptera. The Herbarium is known to have existed in the old Biology Department in 1890, but again it is not known who started the botanical collections.

During the move, the old display cases from the original Museum were dismantled, reassembled and refurbished in the new building. The Herbarium cabinets, which lined the walls of the tea-room of the old Department were similarly reassembled and refitted in the Miall building.

The rehousing of the Zoological display specimens was accomplished relatively quickly though much of the collection has unfortunately had to be stored in boxes in the basement of the new building. However, many of the specimens within the Museum have now been rearranged and labelled for display, for the first time, by a volunteer gap-year student during the past few months. The Insect Room has so far remained a somewhat extensive depository of innumerable cabinets and drawers which appeared during the move, but it is hoped that they will be properly curated in the near future. Due to a previous insect infestation in the old building, all the herbarium material was deep-frozen prior to its rehousing in the Miall building. Since 35–40,000 specimens are involved, the packing of the specimens for the move, their preparation for freezing and their re-housing in the refurbished herbarium has taken just over a year. During these processes, however, many of the collections have been re-ordered, all generic covers replaced and labelled, and inventories made of all the collections and bequests. In addition, large numbers of seed, fruit, wood and slide collections were 'discovered' and have now been reboxed.

Since the move, we have been delighted and encouraged by the interest shown in all of these biological collections, particularly by students. The Museum itself doubles as a large seminar and meeting room and is also used for teaching, using the specimens on display. It thereby provides a wonderful opportunity to portray and use specimens otherwise not encountered by many of our students, and has undoubtedly been responsible for arousing their interest in whole animal biology – a factor reflected in the large number of undergraduates now choosing animal options for their final year projects. Similarly, the rejuvenation of the herbarium has aroused considerable interest in whole plants. The discovery during the move of the classificatory systems used to order the herbarium specimens, together with the preparation of an inventory, means that for the first time, specimens of a given family, genus and species can be retrieved easily on demand. Suites of specimens that have been used for the first time in undergraduate and M.Sc. practicals, to demonstrate botanical diversity, have again initiated considerable interest, and even incredulity, that the University holds such collections! It is perhaps fitting that such interest in whole organism biology has been revived in a building named after Louis Compton Miall, thereby hopefully turning the subject full circle. It is further gratifying that among members of the Miall family attending the opening ceremony of the new building was Joanna Miall, who is currently a second year biology undergraduate in the department that her great great grand-father founded and developed. It is an appropriate time therefore to briefly consider Miall's work in biology and education and in particular the part he played in establishing the discipline at Leeds.

Figure 2. Louis Compton Miall

Louis Compton Miall was a Victorian polymath, a distinguished biologist and a pioneer in science education in this country (Baker and Bayliss, 1983). His scientific work at first was mainly in botany and geology, and especially palaeontology, but later he extended his studies to include vertebrate anatomy and entomology. He published, in all, 23 books, several co-authored, and wrote widely in the fields of science, natural history, nature study and education.

Louis Miall was born in Bradford, the son of a Congregationalist minister. Educated at Silcoates School in Wakefield, he began his career teaching classics in a private school. A turning point in Miall's career came in 1864 when the Bradford Philosophical

Society was reformed and Miall was invited, on the recommendation of R.H. Meade a local physician and naturalist, to become secretary and curator of their museum. Amongst his main responsibilities was to arrange an annual course of lectures for the society. He invited, and thus came into personal contact with many of the leading scientists of the time including Owen, Huxley, Pengelly, Rolleston and Wallace, all of whom came to Bradford to lecture. He also had to give his attention to the collection of objects "mostly given by people who wanted to get rid of them.....what was I to do with badly stuffed birds, shells and miscellaneous things which were of no value and in which I myself was not prepared to take any interest".[9] He was successful nevertheless in developing the museum but his own experience later led to a firm conviction about the questionable value of many records and specimens, "we have had more than enough of unintelligent collecting and unintelligent records of occurrence" (Miall, 1877). He was later to strongly criticize much of the work done by amateur naturalists and their societies (Baker and Bayliss, 1985) and wrote, for example, that "It would be much if I could persuade some few working naturalists to lay aside their technical lists and records of parish distribution, and study the works of Nature with open eyes" (Miall, 1895).

One event which helped to establish his reputation was the discovery, in the summer of 1868 by a local miner, of an important local fossil later to be described and named by T.H. Huxley. Miall, realising the importance of the find, managed to organise the careful removal of the Labyrinthodont from the Bradford coal pit and to arrange transport to London. It was named *Pholiderpeton scutigerum* Huxley (now *Eogyrinus attheyi* Watson) and is part of the Bradford Natural History collection at Cliffe Castle Museum in Keighley. Miall later prepared important reports on Labyrinthodont fossils for the British Association which met in Bradford in 1873.

In 1871 Miall moved to Leeds, following his appointment as curator and assistant secretary of the Leeds Philosophical and Literary Society. He helped to establish the Leeds Philosophical Museum and "raised the Collection to a high position among Provincial Museums" (Clark,1924). He wrote popular guides to the fossil and bird collections, improved the quality of the material and displays, and continued his research, which included the dissection of a female Indian elephant which had died locally and took three years to complete. His book, *The Anatomy of the Indian Elephant* (Miall and Greenwood, 1878) was the result of this work. Miall remained curator of this museum for 20 years and honorary curator for a further 17 years.

The Yorkshire College of Science, the forerunner of the University, was founded in Leeds in 1874 and Miall was appointed a year later as lecturer in biology. In 1876 he became the first Professor of Biology establishing and, over the next 30 years, developing the department. At first many of his classes were in the Philosophical Hall where he could use the valuable collections and facilities before the existing campus was established. He thus became one of a small group of distinguished foundation Professors who established the teaching, research and organisation of the College and, later, the University. He has been described as "one of the great figures of the first

9 Handwritten manuscript probably prepared by L.C. Miall's daughter, Winifred Wager, from his comments/notes and currently in the possession of Leonard Miall his grandson.

30 years" of the College and University (Shimmin, 1954). The University recognised this fact at its foundation in 1904 by awarding him an Honorary D.Sc., the only degree he held. He had been elected to a Fellowship of the Linnean Society of London in 1881 and to a Fellowship of the Royal Society in 1892.

Miall's early work in botany and geology was varied and local. He collected in Norway and in the Yorkshire Dales and wrote on *The Geology, Natural History and Prehistoric Antiquities of Craven in Yorkshire* (Miall, 1878). His first book, in collaboration with Benjamin Carrington, was entitled *The Flora of the West Riding* (Carrington and Miall,1862) which included advice for beginners in botany – method, zeal and perseverance. However, it was later admitted that the list of plants and localities it contained was "quite contrary to his maturer teaching" (Wager, 1922). He published early papers on the botany of Malham and articles on the geology of the area around Bradford. A shift in emphasis in Miall's scientific work is apparent from the early eighteen eighties when he began work on insects.The publication of a series of papers in *Science Gossip* on the anatomy of the Cockroach (Miall and Denny, 1884) and books on the *Natural History of Aquatic Insects* (Miall, 1895), *Injurious and Useful Insects* (Miall,1902) and *The Structure and Life History of the Cockroach* (Miall and Denny, 1886), marked him out as a pioneer in the study of insects. Miall believed in the merits of collaborative work and, reflecting on his own partnerships, wrote, "I greatly believe in the value of association. It is good that two men should look at every doubtful structure and criticise every interpretation" (Miall, 1898). Summarizing his scientific writings, obituary writers described his work in entomology as "amongst the most important memoirs on insect structure and development published during the latter half of the nineteenth century" which have been "an inspiration to many naturalists" (Smithells and Wager, 1921). Miall leaves a fine record of geological and biological research and writing behind him but it is perhaps his work in education for which he will be more widely remembered "as one of the most sane and enlightened reformers of his time" (Smithells and Wager, 1921).

His early experiences, when he had to struggle to learn science for himself and later, in his teaching career, led to the strong conviction that productive workers in science recognise "that the best part of their learning they got for themselves". As a teacher he was pre-eminent. A former student described how a class was "Stimulated by guiding questions, they had to discover facts by observation and experiment, and record conclusions in sketches and notes".[10] He deprecated aimless work, "which spring from no real curiosity about Nature and attempts to answer no scientific questions" (Miall,1895) and became dissatisfied with the results of lecturing to elementary classes. He therefore changed things around, developed his own methods and put the practical class before the lecture, the latter then being used to obtain the facts from the practical and draw the general results and conclusions. It was however in school teaching and especially in Nature Study that he took a particular interest.

Miall was an advocate for the study of living animals and plants, in particular their life histories, and wrote "If by chance I should be addressing any young naturalist

10 Anonymous, Professor Louis Compton Miall, D.Sc., F.R.S., *The Gryphon*, March 1920: 61.

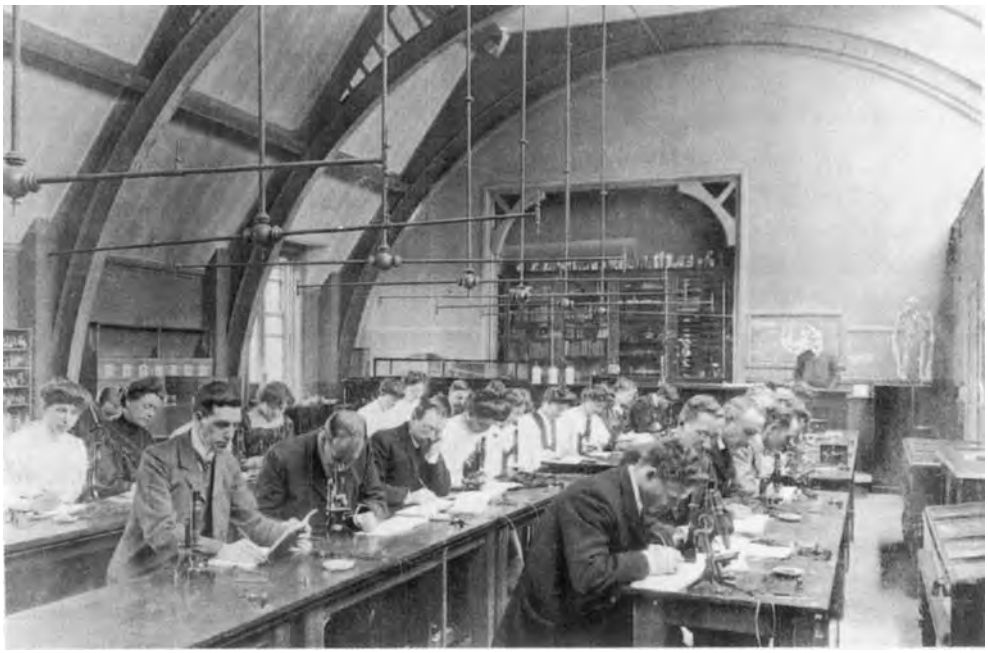

Figure 3. A biological laboratory in the University of Leeds around 1904.

who thinks of attending to life-histories, I would beg him to study his animals alive and under natural conditions. To pop everything into alcohol and make out the names at home is the method of the collector, but life-histories are not studied in this way" (Miall, 1898). He developed these views in his Presidential address to the Zoology Section at the British Association Meeting in Toronto. His *Object Lessons from Nature* (Miall,1890) and his lectures and other publications on this subject, did much to place Nature Study in schools on a sound scientific basis.The spirit of Gilbert White shows through in his books *Round the Year* (Miall, 1896) and *House, Garden and Field* (Miall,1904) as well as in his edition of *The Natural History of Selbourne* (Miall and Fowler, 1901).The report of a British Association committee on the teaching of botany in schools was published in 1904.[11] Miall chaired the group and emphasis was placed on the importance of studying living plants and doing experiments, and the encouragement of pupils to enquire for themselves. Miall provided evidence to the Royal Commission on Scientific Instruction and the Advancement of Science, acted as an Inspector to schools in the North, wrote several papers on the teaching of science subjects and set out his ideals, advice and aspirations in *Thirty Years of Teaching* (Miall, 1897). In his evidence to the Royal Commission, he objected to the way science teaching was conducted "by such means as reading out *slowly* notes to be taken down verbatim and committed to memory" (Miall, 1872) and elsewhere expressed the view that the important role of the teacher was to lead the pupil or student to discover for

11 Report on The Teaching of Botany in Schools. Report of the British Association for the Advancement of Science, Southport 1903, 1904: 421.

themselves. The importance of Miall's work in education was recognised at the British Association Meeting in Dublin in 1908 when Miall was president of the Educational Section. He used the opportunity to give his views on 'Useful knowledge' and concluded "Truly useful knowledge is mastery.....inquiring, by looking hard at things, by handling and doing, by contriving and trying, by forming good habits of work, and especially the habit of distinguishing between the things that signify and those that do not" (Miall, 1909).

Retirement came in 1907 whereupon his department was split into the separate departments of botany and zoology and he left Yorkshire to spend the next eleven years in Letchworth, Hertfordshire. After the death of his wife he moved back to Yorkshire to live in Ben Rhydding near Ilkley. Miall had a stroke and died on 21 February 1921. Thorpe summed up his character as "a cultured well-read man with many interests..... a somewhat fastidious critic with a high standard of excellence, but with sympathy and a sound judgment" (Thorpe, 1921). An earlier tribute, which must have given him great pleasure, was received just over a year before he died. This letter from several of his former professorial colleagues at Leeds read – "The twelve years that have passed since you left us have not lessened our respect for your work done here and our esteem for yourself. Now, as then, you are to us the model of a University Professor – a born inquirer, truth-loving.....wise, honourable, devoted alike to the studies of nature and of man".[12] In addition to his research and writing about science and education, he had a love of music and art, an interest in the classics, modern languages, and the history of science. His contribution to biology, science education and the University of Leeds ensures his place as one of the pioneering professors of the nineteenth and early twentieth centuries in this country.

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Third best taxonomy

When I came from Nigeria to Kew in 1951 to revise the *Flora of West Tropical Africa* I was advised by Dr A.W. Exell (of the then BM(NH)) to aim for the Third Best – how shocking!! But Exell told me that this was Winston Churchill's instructions to the boffins who were designing new devices in World War II – 'The First Best is never achieved, the Second Best comes too late, so aim for the Third Best – something good that comes in time to be useful'.

With all the present day concern for biodiversity and the call for 'pragmataxonomy' and 'quick and dirty' accounts of flora and faunas for particular regions, it seemed to me that it would be useful to recall the story of the FWTA by J. Hutchinson and J.M. Dalziel, the first edition of which was published in four parts between 1927 and 1936. The idea of producing this *Flora* was put by Kew to the Colonial Office in 1922 and copies of the correspondence were reproduced in the Preface to the first part of the FWTA (1927). Hutchinson and Dalziel started work on the *Flora* in September 1923.

Hutchinson (elected FRS in 1947) was a member of the staff of the Royal Botanic Gardens, Kew, and Dalziel a medical doctor who had worked in Nigeria from 1905 to 1911. Their work was financed by the four British West African Governments. The *Flora* was published, by the Crown Agents for the Colonies, in four parts in paper-back and sold for a total of £3-14-0 (£3.70).

By the time I arrived in Nigeria (January 1943) the FWTA was widely available in the offices of the agriculture and forestry departments and some other institutions, and was on sale at the CMS Bookshops. It was, I think, similarly available in the other British West African countries. By 1950 stocks of the FWTA were exhausted, the demand for it had greatly increased as a result of post-war developments in agriculture,

forestry and education. Furthermore, collections and observations by field workers had made it evident that a thorough revision was needed. It was clear that a substantial number of genera and species, and a few families, had to be added and that revision of many genera was called for in the light of new information since the 1920s and early 1930s.

In 1949 the idea of a revision was developed at Kew and was put to the Colonial Office (where Geoffrey Herklots, a botanist who had worked in Hong Kong for many years, was in a key position) and to the British West African Governments. I was invited to undertake this revision, starting in 1951, and my salary and expenses were shared by Nigeria 50%, Gold Coast 40%, Sierra Leone 8% and The Gambia 2%.

An essential element in the revision, as in the production of the first edition, was the direct support and facilities given by Kew especially the assignment of Nigel Hepper to assist me. After I returned to Nigeria in 1957, Hepper continued the work and successfully obtained help from specialists in a number of the families; this help came from several other institutions in western Europe and was given voluntarily. Hepper was left to oversee the work by himself, with no committee. His secretarial support was paid for by the Crown Agents. Publication of the second edition was as follows:- Vol. I, part 1 (1954); Vol. I, part 2 (1958); Vol. II (1963); Vol. III, part 1 (1968) and Vol. III, part 2 (1972); plus Ferns by A.H.G. Alston (1959). The total selling price for these was £10-90.

West Africa is fortunate to have had, for several decades, these reference works on all (or at least most) of its flowering plants, gymnosperms, ferns and allied plants, in concise form. By contrast, other parts of the tropics have much more detailed accounts of some, but not all, families, published over the past fifty years in numerous separate parts.

RONALD KEAY
November 1997

Library

At the moment this is going to press we are in the middle of the usual summer tasks of cleaning and reshelving books and journals. It is difficult to predict how much we will have managed to do by October. So far the students have cleaned some of the European journals from Italy, Switzerland and Austria which, being housed in a corridor, had accumulated some black sticky dust since they were last done a few years ago. The other section of journals to be cleaned is those from Japan, India and other parts of Asia. The main focus will be on books on evolutionary biology, one of the subject areas much in demand at present.

Incoming books at the moment exceed the rate at which they can be catalogued, partly due to other more immediate priorities earlier in the year (State visits do involve a lot more than the visit itself). With any luck some of this accumulation will have been dealt with by the end of the summer. Mrs Jeanne Pingree has now managed to sort and list all Prof. Lucas's Survival Service Commission papers and those have now been removed into storage. Meanwhile the cataloguing of all the associated

conservation papers which accompanied them continues with outside help whenever the opportunity permits.

Donations and other accessions

The following list includes donations received since the last issue as well as a list of major other accessions for the past year. Some of the "Book Sale" items which were set aside to fill gaps in the Library have not yet been listed here.

Dr J.R. Akeroyd	[Cavanilles, Antonio Joseph] *El botanic Antonio Joseph Cavanilles [1745-1804] (catalogue of an exhibition*. 63 pp., illustr., Jardi Botanico, Valencia, 1996.
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Dr G. Creber	Wrobel, M. & Creber, G., *Elsevier's dictionary of fungi and fungal plant diseases*. 400 pp., Elsevier, Amsterdam, 1998.
G.L. Douglas	[BRITISH MUSEUM, Natural History] A guide to the official archives of the Natural History Museum, London, by John C. Thackray. 174 pp., illustr., Society for the History of Natural History, London,1998.
	Foster, Paul ed., *Animals and the law, a review by Ann Datta and others* (Otter Memorial paper No. 10). 104 pp., illustr, 1 col. Chichester Inst. for Higher Education, Chichester, 1998.
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Dr J.M. Edmonds	Edmonds, J.M., *The University of Leeds herbarium*. 14 pp., col. illustr., Univ. of Leeds, Leeds, 1998.
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Book reviews

The Moths and Butterflies of Cornwall and the Isles of Scilly, by F.N.H. Smith, publ. Gem Publishing Company, Wallingford, UK. 1997, xiv+434pp., maps, colour plates (32 pp), H/B ISBN 0-906802-07-5; £44 + £3p/p (UK) or £4.50 (non-UK)

This book is a fine achievement. Entomological texts often ignore the smaller moth species (being relatively troublesome to study) but they are well represented in this book. The species are listed, with name, synonym and authority, along with dates and locations of recorded sightings. This publication, at a time when the systematic sciences are struggling for prominence, reminds us of the crucial importance of taxonomy in an ecological context. As a work of devotion this book is a great achievement and puts in the public domain a vast amount of data. In the form of a CD-ROM or an on-line searchable facility it would be without parallel.

There are some pleasant surprises and a few disappointments. Over 440 new species have been described since the great 1906 survey of James Clark. In the middle of the book, colour plates are grouped together in a single signature, doubtless in the interests of economy. Some show a variety of Cornish habitats, many of them as beautiful as the commercial pictures published as postcards. There is a haunting photograph of *Maculinea arion* (the large blue) in the wild, though this is one of only half a dozen pictures of butterflies. There is only a handful of photographs of large moths, for the bulk of the images are of the smaller moth species. I am all for their claiming a fair share of the limelight, but would have preferred to see illustrations of familiar butterflies too. Apart from the reference material, there are many accounts of lepidoptera in this

book which broaden its interest considerably. The large blue was last seen in 1973, though areas of its habitat survive to this day and Smith refers to the possibility of reintroducing the species from Scandinavia. At one time it seemed that *Mellicta athalia* (the heath fritillary) was heading for extinction in Cornwall, until the Duchy woodlands at Luckett were made available as a reserve. *Thecla betulae* (the brown hairstreak) has long since been extinct from the list, though its eggs are reported to have been found recently in Cornwall, which may herald a return. The book even relates the surprising invasion of an apple moth *Epiphyas posvittana* (the Australian tortrix) which entered Cornwall at Newquay in 1936, and is now found as far north as Yorkshire.

Strange to think that, a couple of generations ago, many of us were butterfly collectors. These days the practice is regarded as heinous (and, very likely, illegal). It is a paradox that collectors laid the groundwork for the scientific study of entomology and the documentation of species distribution, yet were also responsible for the fatal reduction in numbers of such captivating creatures as the large copper and the large blue. The serious endeavours of science can bring problems in their wake, and the examples recounted in this important work remind us that entomology can be viewed as a model of biological science in its broadest sense.

BRIAN J. FORD

The European Garden Flora: A Manual for the Identification of Plants Cultivated in Europe, both Out-of-Doors and under Glass. Vol.5, Dicotyledons (Part III), Limnanthaceae to Oleaceae, ed. J. Culler, J.C.M. Alexander, C.D. Brickell, F.R. Edmundson, P.S. Green, V.H. Heywood. Cambridge University Press, Cambridge, UK, 1997. xix + 646pp, map, line drawings. H/B ISBN 0-532-42096-2; Price £95, US$ 155.

Publication of the fifth and penultimate volume of *The European Garden Flora* proves that this ambitious and valuable undertaking will indeed be completed in a short while, and that we shall then be provided with a new and definitive Flora of garden plants. The taxonomic sequence followed (Engler & Prantl's 1964 edition) now seems out of date (an unimportant detail in this context), but in more modern terms most of the 90 families treated in the present volume (by 59 authors) complete the Rosiflorae, a superorder commenced in Volume 4. Like the latter, Volume 5 contains accounts of many important and favourite garden plants, such as Geraniaceae, Violaceae, Malvaceae, Primulaceae, Begoniaceae, Ericaceae and Myrtaceae. The largest genus treated is *Rhododendron* (304 species); *Begonia* (100), *Primula* (127) and *Euphorbia* (146) are the other very large genera.

Detailed comments and criticisms mirror those made by me with respect to Volume 4 (*Bot. J. Linn. Soc.*, 120: 283 (1996)). For the most part, the best accounts are those undertaken by acknowledged experts. Hence we are provided with excellent texts on, *inter alia*, *Geranium* (P.F. Yeo), *Primula* (A.J. Richards), *Acer* (P.C. de Jong), *Rhododendron* (J. Cullen) and *Tilia* (T.D. Piggot). Here are authoritative accounts of large, important and often difficult genera, and many (though not all) of the other accounts, written by willing (or not-so-willing) helpers, are as good.

It is not difficult to list just criticisms. To quote three contrasting examples: on p. xvii it is wrongly stated that the authority for a name sometimes "consists of two names joined together by *in*" (in such cases only the name before the *in* is the authority), the Index would be far more user-friendly if it had running headers; and in the key to *Arbutus* the flowering time is used to separate *A. unedo* (this often produces some flowers in spring, when the other species flower; how else could *A. x andrachnoides* arise?).

The biggest problem the editors have encountered is in the choice of taxa. Particularly in seldom-cultivated genera (e.g. *Combretum*), sources are constantly changing and a new source is very likely to involve a different species from any of those already grown. Among other species that I failed to find are two that are grown in English gardens and have even escaped to become part of the wild flora: *Limonium hyblaeum* and *Epilobium brunnescens.* Despite the claim on p. xviii that "commonly cultivated interspecific hybrids are, where possible, included as though they were species", this is far from the case, with the result that the garden pansy (*Viola x wittrockiana*) is merely noted in passing, and probably the most commonly grown *Primula,* the Polyanthus, is not even mentioned (neither is *Primul*a 'Wanda').

Despite such inevitable minor imperfections, *The European Garden Flora* is destined to become the standard identification manual of cultivated plants, and the final volume (covering Asteriflorae, the old Tubiflorae) is impatiently awaited. One wonders how those problematical Michaelmas Daisies and Sunflowers will fare.

C.A. STACE

Encyclopedia of Dinosaurs edited by Philip J. Curries and Kevin Padian, publ Academic Press, San Diego, Calif. USA., (1997), xxx + 869, maps, line drawings, monotones, colour plates. H/B ISBN 0-12-226810-5; Price £70.

The intention was to provide "a complete source of information on the subject of dinosaurs, contained within the covers of a single volume" for scientists and informed lay-people. Quite a task, when you see the list of 806 genera! 123 people, "including virtually all of the leading contributors to dinosaur study," have written some 275 original articles on matters pertaining to the life and times of these most popular fossil animals.

Encyclopedia format, designed to provide a concise summary of knowledge, ideas, historical background and current thinking, is ideal for a multi-author book, as each article is complete in itself yet cross-referenced to related topics – allowing us to read the material in any order we choose.

The articles fall within nine general subject areas:- Dinosaur taxa, dinosaur biology, dinosaur environments and how environmental change may have led to extinction, geographical faunas, important fossil localities, geology, research institutions, techniques and expeditions. The technical articles make heavy reading (because of unfamiliar names) but the more general sections read very well. I liked the 'Chronology', The editors are to be congratulated on assembling all this diverse information and negotiating (imposing?) an acceptably coherent system of classification (cladistic rather than Linnean) and nomenclature. Differences of opinion

amongst the contributors (for example, regarding events at the K-T boundary) are apparent and these are important because they remind the reader that opinion, even when scientific, is not fact.

Even a book of this size (and weight – don't try reading it in bed) cannot be a complete source of information but it provides an excellent, authoritative, informative 'state of the art' overview against which new discoveries and fresh interpretations can be evaluated. It has to be one of (if not THE) most useful written resource about the extinct dinosaurs.

JOHN CROTHERS

Dragonflies, 2nd Edition, Naturalists Handbook, No.7., by Peter L. Miller, publ. The Richmond Publishing Co. Ltd., Slough, England. 1995. 118pp., line drawings and colour illustr., H/B ISBN 0-85546-300-7; £16. P/B ISBN 0-85546-299-X. £8.95.

This book is aimed at anyone who has more than a superficial interest and who wishes to learn more about the Odonata. Learning is encouraged through suggesting opportunities to make valuable contributions to our knowledge of dragonflies. It would be hard to imagine that any publication of similar size could more effectively achieve its objectives and stimulate enthusiasm.

Clearly written chapters cover each stage of the dragonfly's life-cycle. Although succinct, here is considerable depth with frequent challenges to further investigation. For example, to determine the truth of whether larger dragonfly larvae can survive short periods of drought by burrowing in the mud. Or the need to establish much more detail on the very particular habitat requirements of certain species. This is currently of considerable interest regarding the white faced darter (*Leucorrhinia dubia*) at its nationally important site in Cheshire. Even the most casual observer cannot fail to marvel at the flight of Dragonflies and their visual sensitivity to movement.

These aspects are covered in depth with further study suggestions such as quantifying the ratio of time larger dragonflies spend gliding to wind beating as a means of temperature regulation on hot days. Or trying to observe the prey species taken to assess any specialization. The book continues with coverage of the fascinating areas of reproductive biology, mate guarding and egg laying. Keys to the larvae by Graham Vick and the adults by David Chelmick provide a means to a complete identification in the hand. A selection of species are illustrated in colour from plates by Dr Richard Askew.

Final chapters include comment on the vital need for conservation and recording with further suggestions of methods of study. Useful addresses, a comprehensive bibliography and an annotated checklist of British species are provided, with the latter including information on likely habitat and distribution. On this aspect alone it is stimulating to reflect on the changes in distribution of some species in the UK in the short period since the book was written. There is still much to be learned and I can think of no better primer than Peter Miller's work. I wholly recommend it.

RICHARD GABB
