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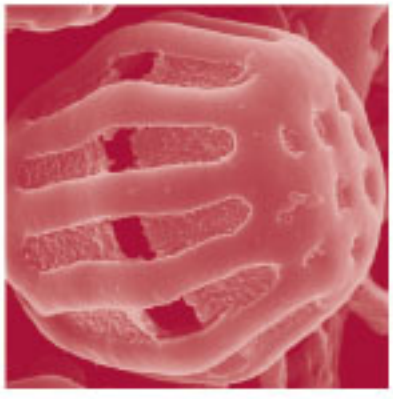

NEWSLETTER AND PROCEEDINGS OF THE LINNEAN SOCIETY OF LONDON

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A living forum for biology

THE LINNEAN SOCIETY OF LONDON

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THE LINNEAN

Newsletter and Proceedings
of the Linnean Society of London

Edited by Brian G Gardiner

THE LINNEAN SOCIETY OF LONDON

ANNIVERSARY MEETING AGENDA

Thursday, 24th May 2007 at 4.00 p.m.

1. Welcome to members and guests
2. Apologies for absence
3. Admission of Fellows
4. Minutes of the meeting held on 19th April 2007, which have been posted in the Society's Rooms
5. Third Reading of Certificate of Recommendation for a Fellow *honoris causa*
6. Appointment of three scrutineers
7. Ballots
   - (a) Ballot for Members of Council (blue)
     Names and details on separate paper
   - (b) Ballot for a Fellow *honoris causa* (*Charlie Jarvis:* pink)
   - (c) Ballot for Officers (yellow): *current Officers list*
   - (d) Ballot for Fellows and Associates (white)
8. Citations and Presentations of Medals and Awards:
   - Linnean Medal for Botany: *Phillip Cribb FLS*
   - Linnean Medal for Zoology: *Thomas Cavalier-Smith FLS*
   - H H Bloomer Award: *John Tennent FLS*
   - Bicentenary Medal for a biologist under 40: *Max Telford FLS*
   - Irene Manton Prize: *Lionel Navarro*
   - Jill Smythies Award for botanical illustration: *Jan van Os*
9. Treasurer's Report
10. Motion to Accept Accounts for 2006
11. Appointment of Auditors for 2007
12. Presidential Address
13. Vote of Thanks
14. Result of Ballots and any casting votes
    - (a) Council
    - (b) Fellow *honoris causa*
    - (c) Officers i. Treasurer ii. Zoological Secretary iii. Botanical Secretary iv. Editorial Secretary v. Collections Secretary
    - (d) Fellows and Associates
15. Names of Vice-Presidents
16. Any other valid business
17. Close

Adrian Thomas/March 2007

Nominations for Council 2007

The following members of Council will complete their three years' service and will be retiring at the Anniversary Meeting on 24th May 2007: Dr Louise Allcock, Prof John Barnett, Prof Janet Browne, Mr Aljos Farjon, Dr Michael Fay and Dr Keith Maybury. That means that there will be six vacancies and Council has nominated the following to fill them:

Dr Max Telford (2005) is Reader in Zoology, Department of Biology, University College, London. He received his D.Phil. from Oxford University in 1993 and then worked as a postdoctoral Fellow in Paris and at the Natural History Museum. From 2000-2004 he was a Wellcome Trust Career Development Fellow at Cambridge. Research in his lab at UCL concentrates on developing an accurate tree of evolutionary relationships of the animal kingdom and on experiments to determine the genotypic changes involved in morphological changes within the animals.

Dr Malcolm Scoble (1990) has a PhD from Rhodes and a DSc from London University. His career started at the Transvaal Museum, Pretoria, in 1975 and he moved to Oxford University Museum of Natural History in 1982. He joined the Entomology Department of the Natural History Museum in London in 1985 and became Keeper (Head) of Entomology in 2006. He is a Lepidoptera taxonomist and has published widely on the Order. He has a particular interest in the typification of Linnaeus's butterflies and a strong belief in the Internet as the primary medium for taxonomy.

Dr Andy Brown (2006) began his professional career in nature conservation with the Nature Conservancy Council in 1983 after gaining qualifications in zoology and freshwater ecology followed by several years lecturing in Nigeria. Between 1990 and 1996, he was Strategic Planner and Corporate Manager in English Nature. He then became Chief Officer of the Joint Nature Conservation Committee. In 1998 he returned to English Nature, first as Director responsible for all work relating to designated sites, and then, from 2002-2006, as Chief Executive.

Dr Pieter Baas (1969) was until recently the Director of the National Herbarium of the Netherlands. He studied biology at the State University of Leiden and was awarded his Doctorate *cum laude* in 1975. He is essentially a wood anatomist but has also researched and written on various other aspects of systematic anatomy and bio-history. He has published over 200 papers, and he has been involved in writing or editing twelve books. Pieter Baas has also stimulated a stream of 18 PhD students. Since 2005 he has been Chairman of the Biology Section of the Royal Netherlands Academy of Arts and Sciences.

Professor Richard Bateman (1993) recently became Head of Policy at the BioSciences Federation, and is incoming President of the Systematics Association. In1996 Richard became Head of Science at the Royal Botanic Garden Edinburgh, and he was subsequently Head of Botany and BBSRC Individual Merit Researcher at the Natural History Museum. He is currently based at the Royal Botanic Gardens Kew.

Dr John David (1992) was appointed Head of Botany at the RHS Garden, Wisley in 2004. He is developing the RHS's role as a centre of excellence in horticultural taxonomy and launched and edits the new serial publication, *Hanburyana*, dedicated

to that discipline. Dr David served on the Linnean Society Council from 1999-2002 and from 2003-2006. Recently he has revived the UK Systematics Forum Botany Specialists' Group as the Botanical Collections Managers Group, a specialist group of the Linnean Society.

Editorial

This issue contains three papers. The first concerns a crystal skull known as the skull of doom, claimed to have been used for ritualistic purposes. The second paper is on climate change and human extinction. This is most apposite since following in the wake of the Stern Report in the UK 2006, the EU recently (January 2007) warned of global climate chaos and called for an international agreement to cut greenhouse gas emissions by 30% by 2020, forecasting both a decline in global food production and the spread of infectious diseases such as malaria and dengue fever. In stepping up its campaign to lead the fight against climate change the European Commission warned that it could trigger regional conflicts with the ensuing poverty, famine and migration! It is also appropriate that it appears in this issue because those members who are able to attend Society meetings recently heard Sir David King FRS, the Government's Chief Scientific Adviser, give a lecture on the subject of climate change and the need for a global response. The third paper shows how systematic zoologists are indebted to a Fellow of the Linnean Society who ensured that the historic holotype of *Ornithorhynchus anatinus* was safeguarded. This paper also tells us how, when first described, it was likened to a species of water fowl with its bill and fore feet and might with some propriety be called the duck billed platypus (platus = broad, flat, Gk.) or Australian duck mole.

Finally, there is a *Picture Quiz* concerning William Hincks, who favoured the taxonomic schemes of Ar-P Candolle but later adopted Quinarianism. Hincks assembled a herbarium of some 3,800 sheets comprising predominantly Yorkshire material which he deposited in the Eton College Museum. Many members of the Linnean Society also contributed significant numbers of specimens to the Hincks herbarium including Richard Spruce, Dawson Turner, William Hooker and Sir James Edward Smith. I'm afraid that there is no next Quiz picture in this issue because I have run out of them. However, there may still be one or two more in the pipeline being written by other volunteers for later issues.

For quite a while now we have not had contributions to *From the Archives* so I am pleased to welcome the contribution from Professor Sam Berry who has collated all the information we have on the Hooker Lecture. This series too I hope to revive in the next few issues.

BRIAN GARDINER

Errata:

In the postscript to the previous *Picture Quiz* 22(4):12 the couplet "It is more important to know the Rock of Ages than the age of rocks" was first used by William

Jennings Bryan (not Dryden) in reply to Clarence Darrow (not Durrold) at the Scope's "Monkey Trial" in Drayton Tennessee in 1925.

I must apologise to Charles Nelson that the Greek letters in his article on "Richard Salisbury FLS and the discovery of elaiosomes in Erica" (23(1):27) did not survive through to printing. (1) In the first paragraph the sentence in brackets should read "The Greek word ελαιον, elaion, means oil, properly olive oil". The first letter of this Greek word should have an accent but that, I'm afraid has defeated me; (2) The sentence in the last paragraph on page 27, should read as follows: "A caruncle is "an excrescence at or about the hilum of certain seeds": an elaiosome is a caruncle. Salisbury's intended name for the genus comprising only *E. australis* was "Tylosporum", derived from Greek τυλος (tylos) = callus, lump or swelling; σπορα (spora) = seed." All three of these words have been corrected in the pdf on the web site.

I have learned a lot in struggling with this problem. We live and learn!

MARY MORRIS

Society News

The Linnaean Tercentenary. The Linnaean Tercentenary year has got off to a great start with a splendid opening talk by Sandy Knapp on *Linnaeus's Global Reach*, and then a brilliant (and sobering) tour of Climate Change issues by Sir David King in February. That was followed in March by a wonderfully illustrated talk by Dick Vane-Wright on eighteenth century butterfly painters and their intellectual networks.

Our season of joint meetings will start on 16th–17th April, with *Plant Genome Horizons* at Kew, and be followed by the *Dark Energy* meeting which we are organising jointly with the Geological Society on the afternoon of 23rd April. In May we shall have joint meetings with the Zoological Society of London and the Liverpool Athenaeum.

We reach the high point of the Tercentenary year in late May, when our presence at Chelsea Flower Show coincides with our own Anniversary Meeting and the launch of Charlie Jarvis's book *Order out of Chaos*. Please note that this year's Anniversary Meeting will start at 4.00 pm., which will allow a longer time to celebrate afterwards! This particular period of celebration will culminate with a visit by our Honorary Member, the Emperor of Japan, who will give a keynote address, and then see displays on what we are doing.

Immediately afterwards, on 1st June, there will be scientific meeting combining history and marine taxonomy in conjunction with the visit by the replica Swedish East Indiaman *Götheburg III* (see our website for more details). Our scientific programme will continue with the joint symposium *Unlocking the Past – Linnaean collections past, present and future* with the University of Uppsala on 11th–15th June, and the joint meeting with the Royal Society on *The Evolution of the Animals* on 18th–19th June.

The summer will also be the occasion for a number of social events, starting with a celebratory evening at Kew on 7th June. There will then be a tour and reception

at Chelsea Physic Garden on 3rd July and a special viewing of the Royal Academy Summer Exhibition on 1st August. Most of these events are listed in the enclosed brochure which gives booking details, but if you have any queries please check on the website or you are welcome to phone us. We do hope that you will be able to attend on as many occasions as possible and look forward to seeing you.

Burlington House and the Courtyard. After a year's grace following our negotiations with the Government we started to pay rent for our premises in February. One positive aspect of this is that the Courtyard Societies continue to have a common interest in working together on rent and maintenance matters. From that has sprung a desire to present a more cohesive image of Burlington House so we are experimentally introducing a programme of joint activities.

The first was a St David's Day celebration on 1st March when Dai Morgan-Evans spoke at the Geological Society on Sir Joseph Banks and his visits to Wales 1763-73. This proved to be a very popular event and tickets were much in demand. We are also considering a Burlington House presence on the web.

Grants. In the last issue of *The Linnean* we reported the launch of an important new scheme for funding systematics work – the BBSRC Collaborative Scheme for Systematics Research (CoSyst). Thanks to the hard work of the organisers, and particularly to Richard Bateman and Julie Hawkins, there was a very good response to the invitation to apply and the first of the awards have now been made.

Strategic Planning, Governance and Reviews. Despite all the Tercentenary activity our planning work continues. The strategic planning group had a second meeting on 6th March to follow up on its inaugural deliberations in November. This enabled the participants to select the key points which had come up at the earlier meeting and start to refine the main aims of the Society. These will be discussed at the Council meeting on 22nd March and we will report to you on progress.

ADRIAN THOMAS

The Swedish Launch of Linnaeus' Tercentenary in Växjö, Sweden

In late January I was invited to Växjö in southern Sweden, in my capacity as Tercentenary Coordinator, for the launch of the Swedish celebrations to mark the Tercentenary of the birth of Linnaeus.

On Saturday 26th, the McGregor Reids, my husband David and I were whisked through pristine snow-covered countryside in the county of Kronoberg, Småland to Linnaeus' birthplace in Råshult. After viewing the reconstructed cultivation areas and pathways and the Linné house and museum, we went on to Stenbrohult where he grew up and spent his summers until he was aged 21, seeing the site of the church that he attended and where his father was minister, together with his memorial stone and the reconstructed church. Later in the afternoon we attended the Annual Academic Ceremony and Banquet at the University of Växjö. Next day the celebrations included lunch with their majesties the King and Queen of Sweden in the Governor's Residence,

the opening of the exhibition "Kaos von Linné" at the Småland Museum, the launch of "System och Passion" by Helene Schmitz and Nils Uddenberg in the Cathedral, followed by an exhibition of plates from this book in the Karolinerhuset where Linnaeus completed 11 years of his education. A Press Panel with Sir David King, the Japanese Ambassador to Sweden and Ir Abraham Rammoloo, Curator of the Arboretum Kalmthout, Belgium, then followed.

Ice sculpture of the official Swedish Tercentenary emblem lit by flares.

The Linné Museum in Råshult.

The evening started with a concert in the Växjö Concert Hall and included choral, orchestral and theatrical performances, a keynote speech by Sir David King on Climate Change, and culminated with a performance of a specially commissioned piece "Linnaeus Rex". The King and Queen of Sweden attended all these celebratory events, together with the evening banquet. Numerous speeches embraced the momentous influence that Linnaeus has had on science during the last 300 years, with both dinners including performances and music in period costumes and eighteenth century fireworks. Our two immediate Past-Presidents Professor Gordon McGregor Reid (together with his wife Sally) and Sir David Smith also attended these celebrations. A Linnaean Medal for the Society was presented to Sir David Smith by the King.

The whole city and county clearly revelled in celebrating the great man and we all enjoyed very generous hospitality from our hosts making it a truly memorable event.

The reconstructed church in Stenbrohult.

JENNY EDMONDS
Tercentenary Coordinator & Vice-President

Development Report: April 2007

Exciting Society developments for the Linnaean Tercentenary Year

The Linnean Society's Tercentenary Celebrations had a memorable start to the year on January 25th with Fellows of the Society contributing to two radio programmes on Radio Four ('The Today Programme' and 'Material World') and a completely full meeting in the evening to hear Dr Sandy Knapp FLS give an excellent illustrated presentation on 'Linnaeus' Global Legacy'. The Society and the Linnean Tercentenary are receiving extensive media coverage this year, with some of the highlights including special features on Linnaeus in 'Nature' (March) and the 'National Geographic' (June).

Preparations for the Chelsea Flower Show in May are well underway where the Society will present an exhibit in the 'Lifelong Learning Section' (Great Pavilion Stand GPG/10). It is designed to explore 'Linnaeus' Legacy – 300 years of naming nature' that led to our current system of scientific naming and how this system provides us with the tools to communicate effectively about the natural world. Blackwell's, the Society's publishers, are sponsoring an accompanying booklet that will also be made available on the website and a number of our Fellows are contributing to the many elements involved in realising this project, for which the Society gives grateful thanks.

The Linnean Society is making its collections digitally available through its web site to provide global access to facilitate scholarship and research. The CARLS Programme is successfully moving ahead and we are delighted to report that the Society has signed an agreement with the University of London Computing Centre (ULCC) to create the content management system that will deliver the digitized Linnaean Collections of images and data to the world. The Centre has played a leading role in major digital archives projects and initiatives over the past ten years. With extensive facilities and resources available, ULCC will also be providing image preservation and hosting services. It is estimated that the project will be launched at the end of 2007. This has been made possible through the generous funding of the Lisbet Rausing Charitable Fund (now Arcadia) and from the Society's own resources. The digitisation programme is progressing and demand for the new digital images is increasing. The Society is currently recruiting a new Library post to manage the new web-based services it will be offering.

The Linnean Typification Project is nearing completion and on schedule. A major joint initiative with the Natural History Museum, all 9,000+ Linnaean names are now available on the project's web-site. Dr Charlie Jarvis FLS and his team are finalizing the publication 'Order out of Chaos: Linnaean Plant Names and their Types' which will be launched at the Linnean Society in May on the 300th anniversary of Linnaeus' birth. Dr Peter Raven, President of the Missouri Botanic Garden has written in the Foreword, 'For conserving plant species, understanding them, and working with them in any way, the stability of names to which this volume makes such a singular contribution is an absolute necessity.'

The Linnaeus Link Project, financially supported by the Society**,** is an international collaboration developing an interactive union catalogue devoted to the work of Carl Linnaeus, supported by web-based descriptions of significant Linnaean collections worldwide. Two of the partners in the project, The Natural History Museum and the

Linnean Society have been testing the electronic catalogue. In April, Gina Douglas and Lynda Brooks will be attending the European Botanical and Horticultural Libraries meeting in Madrid with all the partners where a 'soft launch' of the project will take place. The management of the project is moving to the Linnean Society later in the year.

At the Society the building refurbishment is continuing: the gilding is now being applied to the ceiling in the Meeting Room and work is scheduled to begin in the Library over the summer. The Rooms are in regular use for meetings – both internal and external – and for the wide programme of Tercentenary events. The website is expanding and the Society is delighted to note that usage has trebled in the past ten months. There are a number of new sections in 'Media and Events' and 'The Society' and a regular news feature is now running where items of interest to the Fellows are posted. The Society welcomes items for inclusion from the Fellowship. Blackwells have introduced new covers for the Society's three main journals to bring them in line with the updated house-style which have proved very successful.

The Fellowship will be kept fully updated on all these initiatives and ongoing Tercentenary events and we very much hope that you will be able to participate in the numerous activities scheduled for this special year in the Society's history.

ELAINE SHAUGHNESSY

The Second Systematics Debate
at The Linnaean Society of London

The Linnean Society organised its second Systematics Debate around a topical theme, namely the increasingly prevalent use of molecular (DNA-based) data in systematic research that eventually influences, or even may directly lead to, the classification of organisms. The motion put to the two speakers and the floor was: "Should future classifications be exclusively DNA-based?" The moderator, as for the first debate a year ago, was Dr Quentin Wheeler (University of Arizona) and the two speakers were Dr Alfried Vogler (Senior Lecturer, Joint Position in Molecular Systematics, The Natural History Museum, London and Imperial College, London) for the motion and Dr Kipling Will (Assistant Professor and Associate Director of the Essig Museum of Entomology at the University of California, Berkeley) against.

The Linnean Society Meeting Room was packed on the evening of Thursday, 30th November 2006 for this debate on whether future taxonomic classifications should be DNA-based. A preliminary vote was taken at the start before anything was said by either of the speakers, with the result that only 15 people agreed with the motion and 108 were against.

The audience then heard extremely cogent presentations from the two speakers. Dr Vogler proposed the motion and argued strongly that DNA-based techniques produce results that are unbiased by character interpretations and clearly define species and their relationships. The simple nature of DNA sequence data contrasts with the complexity of morphological characters which are by their nature difficult to interpret. The more we learn about the DNA of organisms, the less relevant morphology becomes to define them. He illustrated his arguments with some carefully reasoned charts, based

on the research of insect systematics carried out at the Natural History Museum. Insects are particularly ambiguous morphologically due to the often highly divergent anatomy and morphology of larvae, pupae and imagos. DNA naturally bridges these gaps.

Opposing the motion, Dr Will debunked the notion that DNA provides the 'silver bullet' to taxonomy. He pointed out that DNA is also subject to ambiguities and interpretations. Identifications of millions of species already in herbaria and museums would largely remain to be based on morphology either because extraction of their DNA is impractical or may not be congruent with taxonomies based on morphology. We cannot re-invent the identification of species of the last 250 years. In palaeontology, DNA extraction and sequencing is in nearly all cases ruled out, yet there is an intricate evolutionary link between fossil species and extant species. New and expensive DNA techniques to identify organisms can assume a fetish status and draw education and research away from the real thing: the organisms themselves. His examples, as it happened, were also drawn from entomology.

There were many lively and animated contributions from the floor. Lessons learned from the first Systematics Debate implied that Dr Wheeler gave the audience ample time for this. There was a general concern, voiced by more than one person from the audience, that a DNA-based approach, especially when used for identifications, is simplistic and will lead to many misidentifications because we will usually not know the difference between infra-specific and inter-specific variation of DNA sequences. This criticism was levelled against the notion that each species can be assumed to have a unique and easily detectable 'DNA-bar code' Others however pointed out that many small organisms can only be identified and classified effectively via their DNA as they have few morphological characters. The scale of the challenge to identify and classify millions of these (micro-)organisms has to rely on a DNA-based approach to speed up the work. It was also argued by someone that a departure from morphology as a basis for classification would deprive the science from challenging classifications which now come from different base data. A classification is always a hypothesis in need of testing. The more data from different approaches one has, the better that testing can be.

At the close of the debate a second vote was taken. This still showed a strong majority against an exclusively DNA-based approach, but the number of people voting for the motion had now almost doubled to 27, whilst the number opposing it fell to 98 (two more votes were received than at the beginning, perhaps from two late-comers). Some minds had apparently been swayed during this stimulating debate. It was interesting to note that the audience was constituted of Fellows as well as visitors and it was heartening to see that there were more than a few young biologists in the audience. The Society should certainly continue this new-born tradition; its popularity among taxonomists, both budding ones and old veterans, is a stimulating incentive to do so.

This was the second in an annual series of debates on systematics, which have been made possible by generous support from the North of England Zoological Society. The next debate will be held on Thursday, 29th November 2007 and the provisional motion is "Registration of names: boost or shackle for taxonomists?"

ALJOS FARJON & ADRIAN THOMAS

Library

During this period from early December 2006 to the end of the year, the Library had 180 visitors (2.9 visitors/day) of which 103 were Fellows (57%); loans for the same period totalled 47. During January and February 2007 we welcomed a further 168 visitors, of whom 77 were Fellows (46%). In the latter part of 2006 and early 2007 the Linnaean Collection Store has been visited by 119 people involved in curatorial or digitization work, and 47 other visitors, a visitor level of 2.75/day. We have recently had an increasing number of Swedish visitors, with 22 recorded in late January and February 2007, especially during the early Spring school break, with parents and children coming into the Society because of Swedish school projects focussing on Linnaeus.

The Reading Room was used for major displays of posters relating to the Tercentenary both for the Conversazione at the end of September and for the Tercentenary launch in December. Other displays were for meetings on Malmaison, Deep Sea worms and the Brogdale lecture in 2006 , and for Linnaeus's Global Reach, Sir Joseph Banks & Wales (including St David's day) and Butterflies: Art & Linnaean systematics this Spring.

Matthew Derrick, who has been working as part-time Library Assistant, will be leaving us at the end of March as it has been decided to make that a full time post. We thank him and welcome Rita Dockery, who will replace him from early April to the end of 2007. Our team of volunteers have taken on new tasks, now that all the manuscripts and domestic archives have been re-boxed and found new homes. These include the checking of the catalogue entries for manuscripts relating to Society Papers and adding them to the on-line catalogue. Alan Brafield and Enid Slatter are carefully checking the documentation against the manuscripts and John St Quinton is adding the electronic records. The most recent volunteer, John Sellick, has already completed the task of matching older images of the Linnaean insect collections to the boxed specimens and is now working on transcriptions of letters to Alexander McLeay and to William Swainson. A new section in the Linnean, "From the Archives", will now keep you informed of some of their more interesting findings. Jeanne Pingree has not been able to come in recently, but is finalising her listings of the Cuthbert Collingwood papers. Iris Hughes continues to catalogue boxed reprints and Val Vivekananda rejoined us recently as her family commitments lessened.

Library readers are warned that from July to late September the Reading Room and Library Annexe are both scheduled for redecoration. Estimates have been sought and plans discussed and, if and when work begins, we expect to find most of our Reading Room stock has been "plastic wrapped"! There is also likely to be scaffolding in place and we are not sure yet what access we will have to the monographs. We hope that journals in the basement stores should still be accessible.

GINA DOUGLAS

Donations

We are still working our way through the cataloguing of recent donations from the libraries of Prof. W.G. Chaloner, Dr Keith Ferguson, Prof. J.G. Hawkes, the Kermacks and Bruce Ritchie. It has not been possible to list all these, but the catalogue

entries will all have the provenance identified. Duplicate material was added to the book sale donations and the last book sale, held on the evening of 12 October added £653 to the Library funds.

Our thanks are extended, as usual, to all those who help to keep the Library stock maintained through donations of books or journals. We recently received a gift from from Prof. J.L. Cloudsley-Thompson of his run of the *Journal of Arid Land Research*. This will be a useful addition to our holdings once we have had a chance to get these moved onto the basement shelves. Dr Stephen Jury has also been able to update our holding of the *Proceedings of the Royal Society* and *Philosophical Transactions*.

Prof. R. J. Berry: Dugatkin, Lee Alan, *The altruism equation*. 188 pp., Princeton. Princeton Univ. Press, 2006, ISBN 978-691-12590-0.
Harnun Yahya *Atlas of creation*.Vol. 1 768 pp., Istanbul, Global Publications 2006.

Brooklyn Botanic Garden: Roddick, Christopher & Hanson, Beth *The tree care primer* (Handbook No. 186). 119 pp., Brooklyn, Brooklyn Botanic Garden, 2007, ISBN 978-1-889539-29-7.

Prof. H.T Clifford: Clifford, H.T. *Etymological dictionary of grasses.* 319 pp., Berlin, Springer, 2007, ISBN 978-0-9554220-0-3.

Mrs Heloise Collier: Fenner, M. *Seed Ecology*. 151 pp., illustr., figs. London, Chapman & Hall, 1985, ISBN 0-412-25930-3.
Ferris-Kaan, R. ed. *Edge Management in Woodlands.* (Forestry Commission Occasional Paper no. 28), 70 pp., illustr., Edinburgh, Forestry Commission, 1989.
Flegg, J. *The Blue Tit.* 24 pp. col. illustr., Aylesbury. Shire Natural History, 1987, ISBN 0-85263-715-0.
Good, J. *et al*. *Forestry Expansion - a study of technical, economic and ecological factors.* (Occasional Paper 40) 25 pp., Edinburgh, Forestry Commission 1991, ISBN 0-88666-5673.
Moore, G. & Jennings, S. eds. *Commercial Fishing - the wider ecological impacts.* (*BES Ecological issues series*), 66 pp., illustr., London, British Ecological Society, 2000, ISBN 0-632-05608-8.
Peterken, G.F. & Welch, R.C. eds. *Bedford Purlieus, its history, ecology and management.* (Monk's Wood Symposium no. 7) 209 pp., maps, Abbots Ripton, Institute of Terrestrial Ecology, 1975.
Taylor, I.R. *The Barn Owl.* 24 pp., illustr., some col., Aylesbury, Shire Natural History, 1989, ISBN 0-7478-0024-3.
Tree Council Forum *Trees and Lines of Communication.* 14 pp., The Tree Council, 1992.
Tree Council Forum *Alternative Commercial Uses of Woodland.* 14 pp. The Tree Council, 1992.
Tree Council Forum *Old Trees.* 14 pp., The Tree Council, 1993.
Tree Council Forum *Pressures on Urban Trees.* 9 pp., The Tree Council, 1994.
Tree Council Forum *Tree Related Subsidence - What are the Issues*. 9 pp., The Tree Council, 1996.

Gina Douglas: Dawkins, Richard *A Devil's chaplain*. 264 pp., London Weidenfeld & Nicolson, 2003, ISBN 0-297-82973-4.

Heimann, Judith M. *The most offending soul alive, Tom Harrisson & his remarkable life*. 468 pp., London, Aurum Press, 2002, ISBN 1-85410-841-7.
Maisey, John *Discovering fossil fishes* 223 pp., New York, Nevraumont, 1996, ISBN 0-8133-3807-7.
Shreeve, James *The Neandertal Enigma, solving the mystery of modern human origins.* 369 pp., New York, William Morrow, 1995 ISBN 0-670-86638-5.
Stott, Rebecca *Theatres of glass, the woman who brought the sea to the city.* 160 pp., London, Short Books, 2003, ISBN 1=90495-36-4.
Wade, David *Li, dynamic form in Nature*. 58 pp., New York, Wooden Books, 2003, ISBN 0-8027-1410-2.

Mary Dunhill: Dunhill, M.L. *A history of Highams Park and Hale End.* 168 pp., Chichester, Phillimore, 2005, ISBN 1-86077-333-8.

Dr Shoichi Fujita & Hokkaido Univ. Museum: Takahashi, Hideki & Ohara, Masahiro, eds., *Biodiversity and biogeography of the Kuril lslands & Sakhlin*, Vol. 2, 174 pp.

Gyllene Snyttet: Mollét, André, *Le Jardin de Plaisir.* (unpaged facsimile of 1651 edition), Uppsala, Gyllene Snyttet 2006, ISBN 91-631-7181-3.

Rie Hägerdal: Stjernquist, Berta, *The historical museum and archaeological research at Lund University 1805-2005.* (Papers of the Historical Museum, No. 1). 91 pp., Lund, Historical Museum, University of Lund, 2005, ISBN 91-975955-0-0.

Prof. G.F. Harris: Harris, G.F. *Te Paraiti – the 1905-1906 potato bight epidemic and its effects on Maori communities*.104 pp., illustr., some col., Lower Hutt, Open Polytechnic of New Zealand, 2006, (Working Paper 1/06) ISBN 0-909009-81-3.

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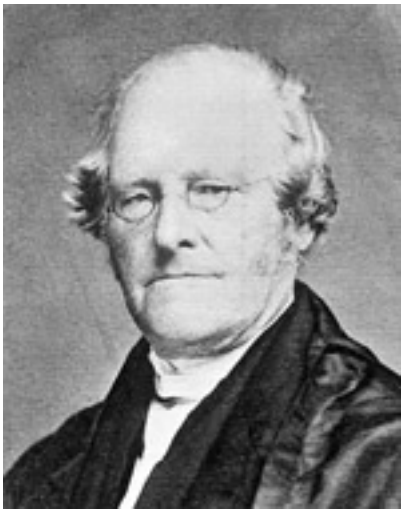
Picture Quiz

William Hincks

The January Picture Quiz featured the Reverend William Hincks FLS (1794-1871) at the age of ~60. [The National Register of Archives gives his birth date as 1784, but this is incorrect (Fussey, Sainsbury & Smith, 2006 – henceforth FSS); his morally upright father would have been only 17!]. William Hincks was son of the Reverend Thomas Dix Hincks (1767-1857), LlD Glasgow, a Presbyterian minister, botanist of distinction and member of the Royal Irish Academy. After an influential ministry in Cork, where in 1803 he founded the Royal Cork Institution and contributed a sizeable herbarium to its collections (FSS), Thomas Hicks became Professor of Oriental Languages (Hebrew and Arabic) at the Belfast Academical Institution (BAI)[1].

William Hincks was born in Cork, educated in Belfast and trained for the Unitarian ministry at Manchester College in York (1810-1815). He then exercised successive ministries at Cork (1815-1818), Exeter (1818-1822) and Liverpool (1822-1827) (Orange, 1973). He was elected a Fellow of the Linnean Society in 1826. In 1817 he married Maria Ann Yandell with whom he had five boys and three girls. Three of William's brothers became clerics, two in the Anglican Church and the other, like William, joined the Unitarian Church (FSS). The youngest brother, Francis, emigrated to Canada where he became an important politician (see below).



Clue: Anglo-Irish botanist who pipped TH Huxley to the post.

In 1827, William returned to York, somewhat reluctantly as he was later to observe, to teach natural philosophy, botany and mathematics at his *alma mater*. He also became the first Honorary Curator of Botany at the Yorkshire Philosophical Society in 1828 and added a lectureship in botany at the newly founded York School of Medicine in 1834 (Orange, 1973).

Manchester College was a 'dissenting academy' that offered a university education to men excluded by the religious tests from the universities of Oxford and Cambridge. Founded in Warrington in 1757, the college moved to Manchester in 1786, York in 1803, back to Manchester in 1840, London in 1853 and, finally, Oxford in 1889, where it remains to this day. In 1840 it had affiliated with the University of London and acquired the right to present candidates for London degrees. The Manchester curriculum in the early 19th century included science and mathematics and was more modern than anything then on offer outside London (FSS). Notable teaching staff had included Joseph Priestley, Unitarian minister and discoverer of oxygen, the Quaker chemist John Dalton, the classical scholar Francis Newman, brother of Cardinal Newman, and the Unitarian minister William Gaskell, husband of the novelist Elizabeth

Gaskell. Around this time York's reputation as a centre of scientific excellence was such that it was chosen by the British Association for the Advancement of Science (BAAS) as the venue for its inaugural meeting in 1831. William Hincks served on one of the first BAAS sectional committees (Orange, 1973).

In 1839 William Hincks left York for a Unitarian ministry in London (1839-1847), where he also tutored students in botany at University College London (UCL) and became editor of *The Inquirer*, the Unitarian newspaper. In May 1847, he embarked upon a study tour in America, which was to last until December 1848 (Coggon, 2002). Intriguingly, there are seven plants in the Eton College Natural History Museum (ECNHM) herbarium (see below) donated by the well-known American botanist John Torrey, whom Hincks had met in America. In 1849, in his mid-50s, Hincks returned to full-time academia at Queen's College, Cork (now University College Cork (UCC), sister college to the former Queen's colleges at Galway and Belfast), where he became the inaugural Professor of Natural History. In 1853, he emigrated to Canada where his distinguished younger brother Sir Francis Hincks (1807-1885) was at the time Premier (1851-1854). The coincidence of William's departure for Canada, at the age of 59, with his brother's premiership was not fortuitous as, with his brother's help, he had applied successfully for the new Chair of Natural History at the University of Toronto. First advertised in 1851, he was to hold on to this post tenaciously, though without any hint of distinction, for 18 years, until his death in 1871.

William Hincks 'favoured the memorization of outmoded and implausible taxonomic schemes', which stemmed from the French botanist A-P de Candolle (1778-1841) and 'was staunchly opposed to Darwinism'. Hincks employed a taxonomic system called 'Quinarianism' (Coggon, 2002) – a system of classifying organisms into five-member circles – which had been developed in the 1820s and 1830s at a time when biologists, and the Unitarians in particular, were seeking mathematical patterns in nature as evidence of a divine plan. That Hincks continued to the end of his life not only to use quinary taxonomy but also to teach it won him few admirers in Toronto, especially as one of the other men short-listed for the post occupied by Hincks had been none other than Thomas Henry Huxley.

TH Huxley (later known as 'Darwin's bulldog') was 26 and had recently been elected a Fellow of the Royal Society when he applied for the new Chair. His application was supported by the Foreign Secretary, Lord Stanley and by 16 letters from prominent English and French biologists, including Charles Darwin, Richard Owen, Edwin Lankester, George Busk, Edward Forbes, JE Gray, Thomas Bell, Sir John Richardson and William B Carpenter (see below), all Fellows of the Royal Society (Craigie, 1965). Despite these impressive credentials, Huxley was not appointed. In a letter to Mrs E Scott in May 1852, he averred 'I believe the chair will be given to a brother of one of the members of the Canadian ministry, who is, I hear, a candidate. Such a qualification as that is, of course, better than all the testimonies in the world' (FSS).

We are able only to speculate upon how an old herbarium of some 3800 sheets, assembled by William Hincks, that comprises predominantly early nineteenth century Yorkshire material, might have come to the ECNHM. The collection came to light during a major refurbishment of the Museum (1994-2000) when the ancient cupboards that housed it had to be cleared before demolition. There is no evidence that the

collection had ever been formally accessioned, catalogued or given the scholarly attention it clearly deserves. The existence at Eton of a botanical collection of historical significance was unknown to curators of the herbaria at the Royal Botanical Gardens, Kew (RBGK) or other places where Hincks had worked, in particular the Yorkshire Museum (YM). Hincks' contribution to the ECNHM herbarium comprises 81 sheets signed 'William Hincks' or 'WH' and a further 2188 anonymous specimens labelled in his hand; we assume that most of the latter are his since he seems readily to have acknowledged material from other sources. The geographical focus of the ~ 2269 'WH' specimens (1816-1851) is Yorkshire (VCs 61-65), since Hincks lived for five years as a student (1809-1815) and 12 years teaching at Manchester College (1827-1839). The collection also reflects Hincks' ministries in Cork, Exeter, Liverpool and London. Plants presumed to have been collected by Hincks range in Britain from Cornwall in the south to Sutherland in the north, with some from Ireland. There are also specimens from around Cork (16) and Exeter (2) collected by 'Henry Hincks', who may have been a brother or uncle, 'Mrs. Hincks', presumably his wife Ann, and the 'Reverend Thomas Hincks' (the locations suggest that William's botanist father was the donor, but it could have been his son, who shared the same name, style and dedication to natural history).

When William Hincks left York in 1839, he must have removed his personal collection, along with a further 191 specimens labelled 'YMD' (York Museum duplicates). The 'YMD' specimens, unsigned by their collectors, were probably extracted from the collections of the Rev James Dalton (1827), William Middleton (1827) and Giles Munby (1833), all of which are still housed in the YM. These collections were accessioned and integrated by Henry J Wilkinson from 1895 to 1907. Having inspected the 19th century plant collections in the YM, we are confident that no Hincks material remains there. Indeed, it seems that Hincks has left no physical trace of his 12-year reign as Curator of Botany at the YM.

There was, however, a substantial worldwide Hincks collection (1800-56) of some 17,000 specimens in the herbarium of UCC (FSS). When Professor John Parnell and Dr Wyse Jackson of Trinity College Dublin (TCD) reported on the UCC herbarium in 1984-1985, they found it 'in a terrible state…housed in domestic freezers…which admit damp' and 'has suffered various forms of insect attack as well as ongoing attack by mice' (FSS); following this report, the Hincks collection at UCC was broken up and most of it was probably destroyed; a few specimens from South Africa were transferred to TCD (John Parnell, *in litt*. to DASS).

Although the ECNHM collection was neglected, for possibly 100 years or more, and housed in a hostile environment lacking temperature or humidity control for much of that time, it is fortunate that most of the material has survived in fair condition. The Hincks botanical network comprised 134 identified individuals who contributed to his collection (see FSS for a full list); among them are many scientists and naturalists of distinction whose names comprise something of a roll-call from the golden century of natural history between the *Systema Naturae* of Linnaeus (1758) and Darwin's *Origin of Species* (1859), and include many Fellows of the Linnean Society.

Botanists who contributed a significant number (>10) specimens to the Hincks Herbarium were: Henry Baines (1793-1878), gardener at the YM and author of *Flora*

of Yorkshire (1840); James Backhouse (1794-1869), Quaker nurseryman in York; Rev Andrew Bloxam (1801-1878), naturalist and geologist on the *Blonde* (1824), co-author (with Professor Churchill Babington) of *Botany of Charnwood Forest* (FSS); William Borrer, FRS, FLS (1781-1862), cryptogamist; JE Bowman FLS; William Benjamin Carpenter MD, FRS, FLS (1813-1885), physician, physiologist, marine biologist, geologist, university administrator and philanthropist (Gardiner, 2000), brother of Dr Philip Pearsall Carpenter (1819-1877), the world-famous conchologist (Baker & Bayliss, 2003), and father of Dr Philip Herbert Carpenter FRS, FLS (1852-1891), the Eton schoolmaster and echinoderm expert (FSS); Rev James Dalton FLS (1764-1843), close friend of Sir William Jackson Hooker, first Director at RBGK and godfather to Sir Joseph Dalton Hooker (who succeeded his father at Kew); Samuel Hailstone FLS (1767-1851), a Bradford solicitor; Rev WS Hore; Roberts Leyland (1784-1847); James McNab; Oswald Allen Moore (1818-1862), a surgeon in York who succeeded Hincks as Curator of Botany at YM in 1840; Giles Munby MD (1813-1876), born in York, studied medicine in Paris and Montpellier before settling in Algeria, author of *Flora d'Algerie* (1847); Rev WN Newbold FLS; John Shepherd[1] (c. 1764-1836), curator of the Liverpool Botanic Garden (1803-36), the earliest and most substantial (110 specimens) of Hincks' donors; Richard Spruce FLS (1817-1893), mathematics teacher in York and botanist who devoted much of his life to collecting in South America; Robert Teesdale FLS (1740-1804), a founder member (1788) of the Linnean Society and gardener to the Earl of Carlisle; Dawson Turner, FRS, FLS, author of *British Fuci* (1802) and wealthy banker who belonged to a circle of cryptogamists that included William Hooker, Sir James Edward Smith, founder of the Linnean Society, Thomas Jenkinson Woodward FLS, William Borrer and Charles Lyell Snr; N Tyacke MD; Mrs Venning; James Ward; Hewitt Cottrell Watson FLS (1804-81), an early convert to Darwinism, author of *Outline of the Geographical Distribution of British Plants* (1832), *Cybele Britannica* (1847-1859) and *Topographical Botany* (1873-1874), inventor of the Watsonian vice-county recording system still in use today to (FSS).

Prominent naturalists or celebrities who were minor contributors to the ECNHM herbarium were as follows: Charles C Babington, FRS, FLS (1808-95), Regius Professor of Botany at Cambridge (1861-95); JH Balfour, FRS (1808-84), holder of Chairs of Botany at Glasgow and Edinburgh; Sir Joseph Banks, FRS, FLS (1743-1820), President of the Royal Society (1778-1819); Thomas B Bell, FRS, FLS (1792-1880), Secretary of the Royal Society and Professor of Zoology at King's College, London; George Bennett FLS (1804-93), expert on *Potamogeton*; Dr John Bowring, FLS, MP; WA Bromfield, MD, FLS; James Forbes FRS; Sir Thomas Gage (1781-1820), George Gardner FLS; R Kaye Greville, LlD FLS, author of *Flora Edinensis*; John Stevens Henslow, FLS (1796-1861), holder of Chairs in Mineralogy (1822) and Botany (1826) at Cambridge, founder (with Adam Sedgwick) of the Cambridge Philosophical Society (1819), the Cambridge Botanic Garden and the Botanical Museum (= Herbarium) (1831), Darwin's tutor, mentor and life-long friend; Sir William Jackson Hooker, FRS, FLS (1785-1865), Regius Professor of Botany at Glasgow (1820-1840), Director of the Royal Botanical Gardens, Kew (1841-1865), author of *Muscologia Britannica* (1818) and *British Jungermanniae* (1816)[2]; Edwin Lees, author of *Botany of the Malvern Hills* (1851); David Nelson (d. 1789), a gardener at Kew

who sailed with Captain James Cook on his third voyage (1776-1780) in *Discovery* and collected for Banks; Sir John Richardson MD, FRS, FLS (1787-1865); Sir George Staunton, Samuel Stevens, FLS, agent to Alfred Russel Wallace; Dr John Torrey (1796-1873); Sir Walter Calverley Trevelyan (1797-1879).

We speculate that the Rev James Dalton FLS, Rector of Croft in Teesdale (1805-42) and a close personal friend of WJ Hooker, may have facilitated links between the Yorkshire non-conformists and botanists of various affiliations elsewhere. The Dalton collection at the YM includes among its donors virtually every botanist of distinction during the years 1785-1835 (Wilkinson 1895-1907; DASS, personal observation). Furthermore, a fraternity of a dozen or more dissenting botanical pastors scattered throughout the British Isles also enhanced the geographical scope of Hincks' herbarium. The collectors represented in the Hincks Herbarium at Eton mirror many of those in the YM collection (DASS, personal observation). Exchange of botanical specimens was much facilitated by the foundation in 1836 of the Botanical Society of London. Essentially the same society underwent a succession of name changes, to London Botanical Exchange Club (1867-1879), Botanical Exchange Club of the British Isles (1880-1910), Botanical Exchange Club and Society of the British Isles (1911-1948) and, finally, the Botanical Society of the British Isles (1948 onwards). It is also possibly significant in the Yorkshire context that there was for a brief period a Thirsk Botanical Exchange Club (1857-1864). It is virtually certain that Hincks, Dalton and many of the other 134 known contributors to the Hincks herbarium would have met at intervals to enthuse over botany and exchange specimens.

Hincks' incumbency at the Renshaw Street Unitarian Chapel in Liverpool (1824-26) coincided exactly with the modal dates recorded for the 'Mr Shepherd' specimens. Around this time Liverpool merchants developed close trade links with American ports, including New York, Boston, Philadelphia and New Orleans (FSS). Botanical links were also established between the Garden and several American botanists such as Dr Francis Boott, a Cyperaceae expert, John Bradbury and Thomas Nuttall (Professor of Botany at Harvard in later life); both the latter undertook expeditions up the Missouri on behalf of the garden (John Edmondson, *in litt.*). These links account for the New England component among the 'Shepherd' grasses in the ECNHM; we have no evidence that John Shepherd actually visited America. Neither can we adduce, beyond a single specimen from York, any 'Shepherd' botanical activity in Yorkshire; for example, the YM holds no 'Shepherd' material (DASS, personal observation). There are, however, 'Shepherd' plants in the herbarium at the Liverpool Museum (John Edmondson, *in litt.*; Gina Douglas, *in litt.*). We have, therefore, circumstantial evidence that, whichever Shepherd was the ECNHM donor, he had collected in the Liverpool area, had had access to plants grown in the Liverpool Botanic Garden and had developed links with North America.

There is some evidence that Hincks' interest in botany intensified during his time in Liverpool, where he befriended an important group of botanical co-religionists that included the Rev James Yates (1787-1871) and William Roscoe (1753-1831); the latter, who had acquired the Johann Reinhold Forster herbarium in 1799, founded the Liverpool Botanic Garden in 1802 and was a friend of Sir James Edward Smith (FSS), was also a Unitarian. John Shepherd worked under the close direction of Roscoe until

1830 and would have needed permission from the Garden Committee to give plants from the Garden Herbarium to Hincks. That none of the 'Shepherd' herbarium sheets at the ECNHM is signed, and most lack precise geographical provenance, suggests that living specimens from the garden were given to Hincks who pressed and mounted them himself.

We have shown (FSS) that the non-conformist communities in York, Liverpool and elsewhere in England, made a major contribution to early 19th century botany that is strongly reflected in the principal donors to the Hincks collection at Eton, as to the contemporary herbarium at the Yorkshire Museum (Wilkinson 1895-1907). In particular, the powerful Unitarian influence on the intellectual climate of the time is summarised by Baker and Bayliss (2003):

In the nineteenth century Unitarians formed a significant grouping in most provincial cities as well as London and several of their ministers played an important role in the development of provincial scientific societies, serving the local community in civic development, in helping to raise the living standards of the poor and in education.

These issues were of fundamental importance to Unitarians, and both Hincks and Carpenter families were prime exemplars of all of them.

We speculate that social bonds, shared scientific interests and religious empathies between the Hincks and Carpenter families of clergymen naturalists, over an extended period of time (1823-1870), may explain how the Hincks plant collection ended up in an unlikely location such as the ECNHM. Philip H Carpenter's surprising appointment as a master at Eton in 1877 (Penny Hatfield, *in litt*.) suggests how a link between the Hincks-Carpenter collections and the ECNHM might have been established; it also shows that science was gaining a long overdue foothold in the Eton curriculum. Carpenter's appointment was part of Eton's reluctant and tardy response to the Public Schools Act (1868), which followed a Committee got up in 1866 by T.H. Huxley and the Reverend Frederick Farrar, a Harrow schoolmaster, to force the issue of science in public schools (FSS). A further result of the Act was the election in 1879 of Huxley as a Fellow (= governor) of Eton, representing the Royal Society (Card, 1994). Furthermore, the foundation by the Eton science masters of a Natural History Museum in 1875 confirms that natural history had been acknowledged as a suitable hobby for boys.

Feasible social links between the Hincks and Carpenter families are as follows:

1. William B. Carpenter was born in 1813 in Exeter, where his father, the Rev Dr Lant Carpenter, was a Unitarian minister. William Hincks' second Unitarian pastorate was also in Exeter from 1818 to 1822 (Orange, 1973), when he was 24-28 years old. Moreover, the earliest Hincks plants (1816-1827) in the ECNHM are from Cork (his first pastorate) and the Exeter region. Therefore, it was possibly through Exeter that William Carpenter's father and William Hincks either established the first contact between their respective families, or rekindled an old camaraderie.
2. The Rev Philip P Carpenter (1819-1877), William's conchologist brother, was educated at Manchester College in York (1837-1841), where he was taught by Hincks and with whom he established 'a bond of sympathy in his ardent love of natural history' (Baker & Bayliss, 2003). Philip graduated BA (London) First Class in

1841, after the College had moved back to Manchester. Some Philip P Carpenter shells passed through the hands of his nephew, Philip H Carpenter, to the ECNHM, which suggests the Hincks herbarium may have followed the same route.

3. William Hincks' son, the Rev Thomas Hincks FRS (1818-1899), was born a year before Philip P Carpenter; both were born in Exeter and must have known one another as small boys; they may even have been playmates. Although Thomas Hincks would have left Exeter for Liverpool with his father in 1822, he undoubtedly renewed an acquaintance with Philip when the latter joined him in York at Manchester College in 1837; both young men were trained for the Unitarian ministry and taught science by William Hincks. Indeed, it is likely that Thomas and Philip, both destined to become highly distinguished invertebrate zoologists, were friends and classmates. Thomas Hincks graduated BA (London) in 1840 (FSS).
4. The Hincks herbarium at the ECNHM includes an unattributed sub-collection of 'zoophytes' (Hydrozoa) and 'sea mats' (Bryozoa); many species of both these colonial animal groups grow as epiphytes on the holdfasts, stipes or fronds of algae and the colonies in the ECNHM collection are preserved dry attached to their algal substrate. Each of these groups of marine invertebrates, little known in the early 19th century, was the subject of a pioneering, two-volume monograph by Thomas Hincks: *A History of the British Hydroid Zoophytes* (1868) and *A History of the British Marine Polyzoa* (1880) (FSS): the presence of both Hydrozoa and Polyzoa specimens among the Hincks plants at Eton suggests they could have been collected by Thomas Hincks. Furthermore, an unknown number of the marine algae in the ECNHM, most of which have no provenance, may have been collected by the noted phycologist Miss Hannah Hincks (1798-1871), William Hincks' sister, who apparently lived all her life in Belfast. Six algae collected by her, including the holotype of *Giffordia hincksiae* Hincks 1840, survive in the herbarium of the Ulster Museum (Osborne Morton, *in litt.*).
5. We know that William Carpenter went to Belfast several times in the period 1868-70 to collaborate with Wyville Thomson in investigations of the sea-bottom fauna between Ireland and the Faeroes (Gardiner, 2000). It is possible, even likely, that Carpenter re-established contact at that time with those members of the Hincks family who had remained in Ulster (e.g. Hannah Hincks), though her father, the Rev Dr Thomas Dix Hincks, was by then long deceased.

Notes

[1]The BAI was founded in 1810 and, in federation with sister Queen's colleges at Cork and Galway, became the federal Queen's University in 1850

[2]There are two possible candidates for 'Mr Shepherd'. The first is H. Shepherd FLS (c. 1783-1858) who worked at the Liverpool Botanic Garden from 1809 until at least 1850 (John Edmondson, *in litt.*) and became Curator in 1836. H Shepherd succeeded his uncle John Shepherd (c. 1764-1836) on the latter's death; either man could have given plants to William Hincks during his third ministry in Liverpool (1822-1827). However, as the last 'Shepherd' plant is dated 1826, a year before Hincks' departure from Liverpool, and the first is 1798, which precedes by 11 years H. Shepherd's employment at the Garden, John Shepherd, who was Curator from 1803 to 1836, is the more likely donor (FSS).

[3]There are 13 letters from William Hincks to W. J. Hooker in the Kew Archives (Michele Losse, *in litt.*).

DAVID SMITH

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From the Archives

The Hooker Lectures

Sir Joseph Dalton Hooker (1817-1911) was one of the most distinguished biologists of the 19th century: Director of the Royal Botanic Gardens 1865-85, President of the Royal Society 1873-77, President of the British Association for the Advancement of Science in 1868, GCSI for his work on the flora of India, and one of the earliest recipients of the Order of Merit. He sailed as 'assistant surgeon' with Sir James Clark Ross on board H.M.S. *Erebus* on an expedition (1839-43) to find the southern magnetic pole and which was the first to confirm the existence of the Antarctic continent and to map its coastline. On his return Darwin suggested to him that he should compare the South American and European floras; he also asked him to help in classifying the plants collected from the Galapagos Islands by the *Beagle* expedition in 1835. Darwin clearly trusted him and Hooker was the first person to be confided in (in 1844) about his evolutionary ideas. It was Hooker, together with Charles Lyell, who persuaded Darwin to co-publish his theory with the paper sent from Malaysia by Alfred Russel Wallace and it was he who organized that the papers be read at the Linnean Society on 1 July 1858; the first acknowledgement of Darwin's triumph from a major scientist was by Hooker in his Introductory essay to *Flora Tasmaniae*, published in December 1859, a month after *The Origin of Species* appeared; and Hooker spoke at the end of the infamous Huxley-Wilberforce debate, claiming that it was he who had carried the

day because Huxley had been too wrought up to be understood by the audience.

Hooker's 1866 lecture to the British Association in 1866 "Insular Floras" (reprinted in *Biol. J. Linn, Soc.* **22**(1) with an introduction by Mark Williamson) was arguably the first major examination of a biological situation based on Darwinian tenets. He identified the major features of island biotas (depauperate, 'unbalanced', rich in endemics) in a way that has stood the test of time.

Hooker's main legacy as a botanist was his study of the flora of the Indian sub-continent, begun during a visit there in 1848-51, but he should be at least equally honoured as a confidant and advisor of Charles Darwin and for his own contributions to evolutionary understanding, particularly through his work in biogeography. Hooker built upon Darwin's concept of dynamic floras and faunas, and thus anticipated "the theory of island biogeography" put forward by Robert MacArthur and Edward Wilson in 1964 (*q.v.* Janet Browne, *The Secular Ark*: 131-4. Yale U.P., 1983).

The Hooker Lecture

The origins of the Hooker Lecture were described by the President of the Society (Sir David Prain) at a meeting of the Society on 7th June 1917, and published in the *Proceedings*, pp.79-81. The lecture was established by Council from a legacy of £100 from Sir Joseph Hooker, who died on 10th December 1911. The original bequest was increased by subscriptions and dedicated for 'a lecture on some subject especially associated with the name of Sir Joseph Hooker', to be delivered from time to time as might be thought fit by distinguished men, not necessarily from among the Fellows of the society. The income of the fund in hand was to be applied to the publication of the lecture, with a donation to the lecturer.

1912 D.H. Scott: The relationship of Sir Joseph Hooker to the study of fossil plants [Preceding the series proper and not formally a 'Hooker Lecture': *q.v. Proceedings Linn. Soc. for 1916-17*: 79]

1913 H.J. Elwes: The travels of Sir Joseph Hooker in the Sikkim Himalaya [Not published]

1917 F.O. Bower: The natural classification of plants [Not published]

1922 A.C. Seward: A study in contrasts: the past and present distribution of certain ferns [Not published]

1926 C. Schroeter: The Swiss National Park and scientific researches into its nature *Proc. Linn. Soc. for 1925-26*: 43-44

1929 E.J. Allen: The origin of adaptations *Proc. Linn. Soc. for 1928-29*: 119-138

1933 William Wright Smith: Some aspects of the bearing of cytology on taxonomy *Proc. Linn. Soc. for 1932-33*: 151-181

1936 F. Kingdom Ward: A sketch of the vegetation and geography of Tibet *Proc. Linn. Soc. for 1935-36*: 133-160

1939 R.L. Praeger: The relations of the flora and fauna of Ireland to those of other countries *Proc. Linn. Soc. for 1938-39*: 192-213

1943 W.H. Lang: *Pachytheca* and anomalous early plants *J. Linn. Soc.(Bot)* **52**: 535-52, 1945

1948 D.M.S. Watson: The mechanism of evolution *Proc. Linn. Soc.* **160**: 75-84, 1948.

1951 I.H. Burkill: Habits of man and the origins of the cultivated plants of the Old World *Proc. Linn. Soc.* **164**: 12-42, 1951

1958 W.B. Turrill: The evolution of the floras, with special reference to the Balkan Peninsula *J. Linn. Soc.(Bot)* **56**: 136-52, 1958 [Darwin-Wallace Centenary Volume]

1962 Th. Dobzhansky: Species in Drosophila *Proc. Linn. Soc.* **174**: 1-12, 1962

1974 C.T. Ingold: Convergent evolution in aquatic fungi *Biol. J. Linn. Soc.* **7**: 1-25, 1975

1980 J. Heslop Harrison: Glands and digestion in insectivorous plants [Not published]

1992 R.G.C. Desmond: Sir Joseph Hooker and India *The Linnean,* **9***:* 27-49

2005 H. Noltie: Robert Wright and the illustration of Indian botany *The Linnean*, special issue no 6, 34pp.

*'Not published' means that I have been unable to trace any published version.

SAM BERRY

Skullduggery 2[1]: A Tale of Two Fellows

Frederick Arthur ("Mike") Mitchell-Hedges FLS was a bit of a lad. Born 1882, son of a well-to-do stockbroker, he left school having thrown an inkwell at the headmaster who thrashed him; his despairing father sent him, aged 16, with a geological expedition to the Norwegian Arctic, where he gained his love of adventure, despite the trip occasioning three deaths from exposure. He also gained a dislike of conventional employment, such as that offered by his father. So in February 1900, Mitchell-Hedges emigrated to Canada. It was whilst on board the Canadian Pacific Steamship *Lake Manitoba* that Mitchell-Hedges found he had a gambler's instinct for playing poker - a skill that was to prove a nice little earner in his future.

Fate steered him to New York where, ironically given his contretemps with his father, he became a stockbroker working with Jules Bache – one of the richest men in America. Describing his time in the US, Mitchell-Hedges said, 'Life was thrilling, exciting, dangerous. There were handsome profits to be made and handsome losses, too.' For some months he unknowingly shared a flat with Leon Trotsky, only discovering the real name of his untidy lodger from a British diplomat 40 years later. He earned sufficient money in New York to organise an expedition to Central America, a plan aborted by the illness of his mother, which brought him back to England (his mother survived). In 1906 he married Lillian Agnes Clarke, known as 'Dolly'. Although he remained married to her for over 50 years, Mitchell-Hedges spent remarkably little

1 The first involving Piltdown Man, viz. Gardiner BG. 2003. The Piltdown forgery: a restatement of the case against Hinton. *Zoological Journal of the Linnean Society* 139 (3): 315-335.

time with her and described himself "being among one of the leading contenders for the title of 'Worst Husband In The World'". Also in 1906, he accompanied his father on a trip to France to purchase antique silver, on which he became something of an expert, and where he met a Mrs Le Guillon, with significant effects on his future.

In London before WWI, Mitchell-Hedges owned a successful stockbroking company, but again disillusioned with orthodox work, he returned to the USA and, in 1913, after working as a cowhand in Texas and a waiter in New Orleans, he eventually got into Mexico.

Once there, he was captured by bandits led by Pancho Villa, a local Robin Hood of villainous and vinous reputation. Mitchell-Hedges only escaped being shot as an American by singing 'God Save the King', which amazingly Villa recognised. Forced to join the bandits on several raids, Mitchell-Hedges was shot twice in the leg, which paradoxically may have saved his life, since when Pancho Villa unexpectedly allowed him to return to England to fight for his country in WWI, he was exempted military service because of his wounds.

Returning to America, he got a job as a salesman. With the help of two American colleagues, he looked up Mrs Le Guillon who had emigrated to Port Colborn in Canada. The trio went on regular fishing trips in the area using worms supplied by Mrs Le Guillon's young daughter Anne-Marie. When she was orphaned by her mother's death in childbirth in 1917, the two Americans persuaded Mitchell-Hedges, much against his and her better judgements, to adopt the orphan Anne-Marie, aged 10. But for breaks for schooling, she became his devoted life's companion.

As he noted in his citation for FLS his interests were "Entomology; the habits & customs of natives throughout the various little known parts of the globe I have visited; and the preservation fish in their nurseries (*sic*)". He was elected an FLS in January 1922. In the early 1920s he visited and excavated Mayan ruins in Lubaantun, Belize. Mitchell-Hedges believed that there he would find the remains of Atlantis. In 1923, he published a book about big game fishing, *Battles with Giant Fish* (dedicated to Lady Mabel Richmond Brown, below), in which he was both a participant and an authority.

It was, then, in 1920-something in Lubaantun that Mitchell-Hedges claimed to have found – or his by then 17-year old adopted daughter Anne-Marie ("Sammy") had – a crystal skull, known as The Skull of Doom, which Mitchell-Hedges indicated was 3600 years old, having been used by a high priest for ritualistic purposes. According to one authority on the genus in the 1960s, Frank Dorland, it had taken 300 years to fabricate, somewhat longer than Mitchell-Hedges' own stories. Mitchell-Hedges described how he had used it to will death, although he did not personalise the claim. He described it as "the embodiment of all evil"[2]. Anna (as she prefers to be known) Mitchell-Hedges has embellished the tale, saying that the skull originated in outer space and was kept in Atlantis before being brought to Belize. Now in her nineties, she still has the skull in Canada, complete with detachable jaw which she apparently found separately, but has become rather reclusive about the whole business. Notably, Mitchell-Hedges, a bit of a showman and generally not slow to put himself forward, did not divulge the discovery of the skull until 1943. Subsequent research has shown that

2 His belief is strange considering his general antiauthoritarianism and agnosticism.

Mitchell-Hedges purchased the skull at auction in Sotheby's in 1943 for £400, and that it had belonged to a Sidney Burney, to whom the Lubaantun story was unknown. None of those present at the dig in Lubaantun remembered the discovery of the skull. As a fisherman, Mitchell-Hedges would, of course, have been used to some elasticity with the truth. In his autobiography *Danger My Ally* he is very coy about the skull.

A report suggests that there were originally just 13 crystal skulls in antiquity, capable of some sort of magical arrangement, a circle of 12 with one in the middle, and they continue to attract cult followings. The Mitchell-Hedges' skull is no exception. There seems little doubt that whoever made it – 5¼ in deep, weighing 11 lb – used considerable ingenuity. Whether Mitchell-Hedges intended it for scrying – seeing objects within the skull, such as UFOs, unicorns and mermaids – or for the adept, that it emitted sounds and light, is not known. Dorland has remarked that (the skull) "stimulates an unknown part of the brain, opening a psychic door to the absolute".

Left: A picture of Mitchell-Hedges taken from the Mitchell-Hedges website.
Right: This skull is on display at the British Museum. The picture is reproduced with permission from the Museum's web site: www.thebritishmuseum .ac.uk/COMPASS

Right on, man! It is unclear whether the brain in question was within the skull or outside it. Yet another adept has written that "Crystal Skulls are a form of computer which are able to record energy and vibration that occur around them…i.e. they contain the history of our world". Yeah, yeah! And there's the usual hocus pocus about accumulated magnetism, psychic healing, auric fields in the brain and crystal resonance. And telepathy, telekinesis and teleportation. On occasion, visitors to the British Museum have been found prostrated in front of its crystal skull (above). Such mysticism has survived the unmasking of Mitchell-Hedges as an economist with the truth; even those who believed in the magical properties of the Mitchell-Hedges skull cautioned against some of Mitchell-Hedges' claims; Dorland noted his lack of credibility. But, "Only believe," wrote the hymnist, "and thou shalt see!" A recent (1996) British Museum study has concluded that "the only magic in these skulls was in keeping their fraudulent origins a secret". All seem to have been made in Germany in the 1880s; observations made at the Smithsonian in 1992 and subsequently confirmed by the Britsih Museum,

have shown that they have been machine-polished and fabricated with tools not believed available in ancient civilisations on Planet Earth. Not that this puts the mystics off! To them, this simply means that we have seriously underestimated the capabilities of our forbears. This information, and much more, is available by punching crystal+skulls into the Google search engine. Care needs to be exercised in sorting sites by believers (most) and sceptics (few). Mitchell-Hedges is also revealing if used in a Google search.

Lady Lilian Alice Mabel ("Mabs") Richmond Brown FLS (née Roussel) was born in 1883. A wealthy and attractive sybarite, she had married the 3rd Baronet, Sir Melville Richmond Brown, in 1906 and divorced him in 1931. Estranged from her anecdotally mad husband by the 1920s, Lady Brown bankrolled expeditions from 1923-1927, having become reacquainted with Mitchell-Hedges on Waterloo Station! Only one condition she made – that she came along, too. It seems that she was a bit of a girl (there are 18 photographic portraits of her in her late 20s in the National Portrait Gallery), perhaps needing a spot of adventure (and more?) to liven up an existence which had become staid and inconsequential. Mitchell-Hedges described her as "a damned good sportswoman" in the dedication of his *Battles with Giant Fish*. For her first expedition with Mitchell-Hedges, against medical advice she rose from her sick bed after a serious operation – all surgical interventions at that time were serious – but seems to have been none the worse for it; although she had been told that she had but little time to live she survived until 1946! She became an FLS in June 1923, sharing two of her three supporters with Mitchell-Hedges; the third was Mitchell-Hedges himself. Her interests were described as "Deep sea Research work and Entomology (sic)". Both she and Mitchell-Hedges were also FZS and FRGS.

In 1925 she, too, published a book, *Unknown Tribes, Uncharted Seas*, a travelogue dedicated to Mitchell-Hedges, in which his fishing and her privations in the Caribbean are chronicled. I have placed a copy of this in the Society's Library. She and Mitchell-Hedges found that it was useful to take a good stock of western medicaments on their travels, since most natives suffered badly from a variety of illnesses, and had no knowledge of how to treat or ameliorate them. The pair's ability in first aid – it was little more – gave them the status with the locals (as did dressing up as the Queen of Sheba) and prevented them being butchered. Their books were hardly masterpieces of literature, natural history or anthropology, yet the first editions of *Unknown Tribes, Uncharted Seas* and *Battles with Giant Fish* were popular with a public reared on *Argosy, John Bull, Titbits* and *Wide World*, and were reprinted within months. Doubtless encouraged, Mitchell-Hedges published *Land of Wonder and Fear* in 1927, *The White Tiger* in 1931, *Battles With Sea Monsters* in 1929, *Pancho Villa's Prisoner* in 1947. Of *Land of Wonder and Fear*, one knowledgeable critic, the prominent Maya archeologist J Eric S Thompson has remarked "to me the wonder was how he could write such nonsense and the fear how much taller the next yarn would be". Mabs' name now survives in water polo events in her native Hampshire, where they still have the Lady Richmond Brown Trophy.

Back in the UK before WWII, Mitchell-Hedges undertook various semi-official missions to the USA to encourage those with influence to back the war in Europe. He seems to have had plenty of money at this time – his father, who died in 1936, cut him out of his will – which we must assume he earned from writing and lecturing, the

latter mainly in the USA where he proved a considerable draw, and from the sale of artefacts shrewdly collected throughout his life.

In 1954, Mitchell-Hedges published his autobiography, *Danger My Ally* from which the picture is taken. All seven books have been described by critics as somewhat over-dramatised accounts of Caribbean adventures, or simply tall tales. Thus, at one point Mitchell-Hedges claimed to have studied at Cambridge. He also claimed to have discovered a hitherto unknown Indian tribe in Central America. In fact, Nuñez de Balboa (1475-1517) had discovered the Indian tribe some 400 years earlier (and was, incidently, the actual person who in 1513 stood observing the Pacific Ocean "…in a wild surmise/ Silent, on a peak in Darien" (Keats), six years before "stout Cortès" arrived in Mexico, by which time Balbao had been executed[3]).

In 1953, Mitchell-Hedges purchased a substantial estate in Berkshire, Farley Castle, where he lived with his long-suffering Dolly and his adopted companion, Anna. He died of a stroke in 1959 and is buried at sea. Had he had a tombstone, his epitaph might have been his own advice "Follow your star to the bitter end". He certainly tried to do that in his Biggles-like way, tackling tasks that, in his view, were there to be done, and attaching considerable significance to his modest discoveries, real and imaginary. And he was bitter about the reception that his "discoveries" received.

Certainly he was right to believe that huge fish were to be had for sport in the Caribbean, and he developed the technology to catch them. But his theories relating to his own and others' anthropological discoveries in Central America were marred by, amongst other things, the absence of accurate dating which came three-quarters of a century later, and by his own lack of formal education which he acknowledges in his autobiography. Few of his claims would be recognised today, including that old chestnut that his New World Atlantis was the result of the biblical flood.

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I am grateful to Gina Douglas for drawing my attention to Mitchell-Hedges and Richmond Brown; to Leslie Overstreet for providing me with the report of the Smithsonian's researches on crystal skulls by Jane Maclaren Walsh, which I have placed in the Society's Library; to Andrew Burnett for showing me the British Museum's crystal skull and the permission to reproduce its www image.

JOHN MARSDEN

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3 Hemming J. 1978. *The Search for Eldorado*. London: Michael Joseph.

Thoughts on Climatic Change and Human Extinction

J.L. Cloudsley-Thompson

Introduction

The world is experiencing its sixth major biological extinction. Similar events have occurred at the end of the Ordovician Period (*c* 440 mya), Devonian (*c* 350 mya), Permian (*c* 250 mya), Triassic (*c* 250 mya) and the Cretaceous (*c* 70 mya) when the dinosaurs – apart from birds – finally disappeared. Numerous hypotheses have been proposed to account for each of these – some gradualist, others catastrophic, many a combination of both (Benton, 2003; Cloudsley-Thompson, 2005). The current extinction differs from all others in that it has been engendered by the activities of a single species of animal (*Homo sapiens*) and is taking place with catastrophic abruptness (Boulter, 2002; Erlich & Erlich, 1970). Mankind first began tampering with the environment some 10,000 years ago, and the rate has accelerated rapidly since the Industrial Revolution (Wilson, 2002). Human beings have already not only drastically reduced the diversity of plants and animals throughout the planet (Diamond, 1997; Erlich & Erlich, 1970; Kaufman & Mallory, 1986; Wilson 2002; Ziswiler, 1967) but, in the long run, will I believe almost certainly be responsible for their own extinction. My reasons for this conclusion are outlined below.

Quaternary Extinctions

The sixth major biological extinction now taking place began at or near the end of the Pleistocene, and the question as to whether this is the result of a natural major climate change or of human activities is still widely discussed (Martin & Klein, 1984). Either way, *H. sapiens* seems to have played a major part in it. The large mammals and birds of Australia and New Guinea became extinct *ca* 40,000 years ago. In contrast, most of the big mammals of Africa and Eurasia have survived until modern times because they coevolved with proto-humans for hundred of thousands or even millions of years. As Diamond (1997) wrote, 'They thereby enjoyed ample time to evolve a fear of humans, as our ancestors' initially poor hunting skills slowly improved'. Alaska was not colonised across the Bering Straits from Siberia until about 14,000 years ago. Shortly afterwards, a North-South ice-free corridor opened in the Canadian ice sheet. America's rich and varied fauna of large mammals was thereupon wiped out by the flint-headed spears of the so-called Clovis peoples who reached Patagonia, 8,000 miles South of USA, in less than 1,000 years.

When ecosystems collapse, whatever the cause, the first animals to disappear are large species such as elephants and rhinos, and large predators at the top of the pyramid of numbers (Elton, 1927), including lions (Fig. 1) and tigers, cheetahs (Fig. 2) and leopards, pumas or cougars, jaguars, and bears. Ziswilwer (1965) published a graph which shows a close correlation between the increase in the human population over the past 300 years and the number of mammalian and bird forms eliminated during the same period.

He also pointed out that uncurbed increase can lead to the ultimate destruction of an animal species. For example, all the carnivores – pumas, coyotes and wolves – on the Kaibab Plateau in Northern Arizona were slaughtered to provide the mule-deer there with complete protection. Consequently, the deer population increased to such an extent that the plants upon which they browsed were damaged almost beyond recovery. From a few thousand in 1906 the mule-deer reached nearly 100,000 in 1925; but only 15 years later the population was well-nigh as low again as it had been before the predators were exterminated. Is there a lesson here for *H. sapiens*?

Limits to Population Growth

During the years before and after WW II, ecologists paid considerable attention to the factors that limit populations when the aysymptotes of their sigmoid or logistic population growth curves have been reached. These factors include food shortage, environmental 'conditioning', and the various consequences of density - including increased predation and parasitism (Allee *et al*., 1949). More recently, the subject has been reviewed in considerable detail by Ricklefs (1990) among others.

Numerous examples appear in the literature of the application of logistic curves to the human populations of demographic units such as countries, cities, states and even of the whole world. In 1936, Pearl & Gould fitted a logistic curve to known census data for the world from the 17th Century to 1931-32. They calculated a lower asymptote of about 445,500,000 in 1650 and an asymptote of some 2.65 billion individuals by the end of the 21st century. The fit between points and curve was, however, only moderate. In the event, the world population reached about 2.5 billion in 1950 (Fig. 3), and numbers some 6.5 billion today (McDougall, 2006). Like it or not, there will be no possibility of feeding the growing billions of the future without genetic engineering of food crops. Selection for suitable mutations and gene combinations would take far too long!

When population increases culminate, not in levelling off but in a precipitous decline in numbers, as in the case of the Kaibab mule-deer, the growth curves are referred to as being J-shaped rather than S-shaped. Mathematicians are still calculating and re-calculating the future asymptote for the human population of the world, assuming that the curve will be S-shaped. If it turns out to be J-shaped, however, the future for

Figure 1. Male Lion (Okavango)

mankind will be unenviable, to say the least (Cloudsley-Thompson, 1998). A classic example of a J-shaped curve is afforded by the population of Easter Island, famous for its 30 tonne stone statues. First inhabited by a few Polynesian people about 400 AD who, over the centuries, cut down their trees, Easter Island had a population of over 10,000 by the end of the 18th century. Then the population collapsed leaving little more than 100 individuals living in abject poverty (Diamond, 2005). 'World population is expected to reach 9.1 billion by 2050, adding another 2.5 billion people to an already environmentally stressed planet' (McDougall, 2006).

The only possible solution to the problem of overpopulation lies in universal family planning and birth control. This is notoriously difficult to achieve, as experiences in India and China have shown: despite laws and restrictions, the current rate of population growth in China is reported to be still some 9 per cent per annum (see Diamond, 2005). Moreover, the estimation that an asymptote will have been reached by 2050 is based on the fact that reproductive rates decline when living standards improve. There is little evidence, however, to suggest that the well-nourished societies of the First World are prepared to share their vast wealth with those of the Third World.

Figure 2. Cheetah (Zambia)

Food chains are almost invariably based upon plant life, and usually contain from three to five major links. As the food chain is ascended, predators become progressively larger and their numbers decrease. Furthermore, there is usually an optimum size for a predator in relation to that of its prey and an optimum, too, for the herbivorous species that form the prey. An animal must be large enough to migrate from one feeding ground to another. On the other hand, a greater number of small creatures can exploit a limited area much more thoroughly than can a smaller number of larger individuals. Man is the *only* animal capable of dealing with food materials of all sizes from grain to cattle, and to this he owes much of his success. Ziswiler (1965) concluded that Man 'will not be successful in maintaining a purely artificial balance with nothing but cultivated plants and domesticated animals …… the continued existence of many natural biocoenoses is necessary …' and Jablonski (1986) emphasised that 'the very species that provide a rich harvest of medicines, foods, fuels, raw materials, and even climatic regulation are being driven into extinction, forever beyond our reach'.

To make matters worse, human beings are disturbingly wasteful. London alone produces 17m tonnes of waste each year. Much is taken for granted in the developed world, and consumed without thought as to its real cost in terms of the exploitation or depletion of human, animal and global resources. This subject has been addressed effectively by North (1986).

Global Warming

Global warming, accompanied by depletion of the ozone layer, is currently the greatest threat to the biosphere. Carbon dioxide levels are at their highest for 400,000 years. Before the Industrial Revolution, atmospheric CO_2 was 270-280 ppm. The figure

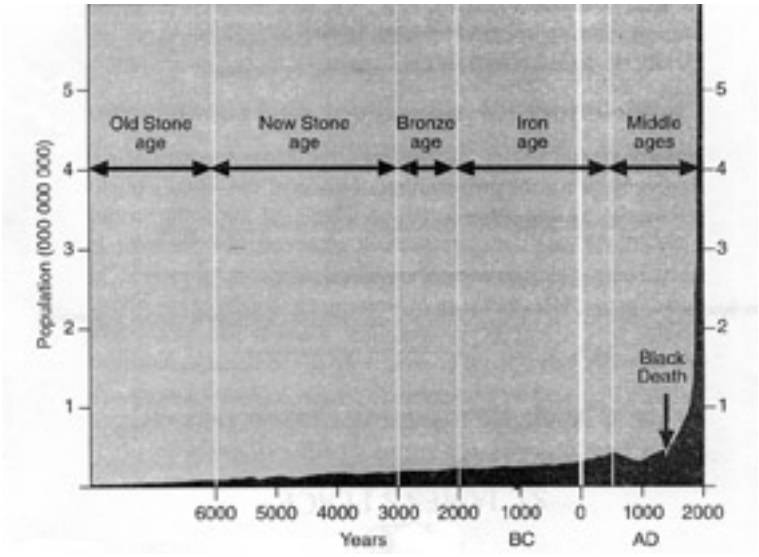

Figure 3. The Human Population of the World

is now about 380 ppm! Correlated with this and almost certainly caused by it, is the *El Niño* Southern Oscillation (ENSO) during which the surface waters of the tropical oceans are alternately cooled – *El Niño* phase and warmed – *La Niña* phase (Ricklefs 1990; Wilson, 2002). During *El Niño* phases there are storms and heavy rain in arid countries like Peru and California, while desert conditions prevail in places such as Queensland, Australia and South East Asia that are not normally arid (Cloudsley-Thompson, 1998; Diamond, 2005). The cost of *El Niño* events to natural environments already damaged by human activities can be absolutely devastating. For instance, it is now generally accepted that *El Niño* was responsible for the disappearance of the advanced Moche civilisation of South America.

Not only will the melting of the Polar ice caps engender the demise of many Arctic and Antarctic plants and animals, but the rising sea level will undoubtedly cause widespread flooding, slowly drowning the world's largest cities such as New York, London and Amsterdam. In addition, it will reduce the amount of land available for agriculture. Furthermore, if the flow of the Gulf Stream were to be halted by fresh water from the melting North Polar ice cap, the British Isles and much of northern Europe might well experience a return of the Ice Ages – somewhat surprisingly as a direct result of global warming (Boulter, 2002). Moreover rising sea-water temperatures could well release methane clathrate from the oceans, greatly increasing the amounts of yet another important 'greenhouse' gas in the atmosphere. Global warming is certainly responsible for more frequent lightning strikes causing even more forest

fires than before. Finally, at the present rate of logging, coupled with more frequent ENSO effects, it is calculated that the Amazon rainforest will have disappeared by the end of the present century. As this rainforest is a major force in reducing atmospheric CO_2, global warming will increase even more rapidly than before. The stable period of benign warmth experienced over the past 10,000 years (inferred from ice cores) is quite exceptional. Should human beings not have caused global warming, it must be the consequence of natural causes not yet properly understood (Cairns, 1997; Polunin & Burnett, 1993). If, as seems more probable, they have and are still causing it, there is little if any time left for us to mend our ways.

Horsemen of the Apocalypse

Only a few years ago, fears were being expressed that the world might well be threatened with a 'nuclear winter' following the exchange of intercontinental ballistic missiles with multiple re-entry atomic warheads. With the end of the 'cold war', however, this threat has receded. It is not surprising, nevertheless, that the first predictions of imminent global warming – due to the excessive emission of 'greenhouse' gases – which appeared soon after the 'nuclear winter' scare – were received by many with a degree of scepticism. It is not really my intention to discuss the effects of climatic change, however distressing they may be for mankind, but to consider the extent to which they could portend the extinction of the human species.

Four or five decades ago, food shortage – engendered by inappropriate land use, waste, pollution and a rapidly increasing human population – appeared to be the environmental factor most threatening to human survival (Cloudsley-Thompson, 1965). Although still a vast and growing problem, desertification (Fig. 4), exhaustion of soil nutrients and the destruction of forest on a global scale are today seldom in the forefront of media hyperbole. Nor, for that matter, is water shortage – although it looms behind the political agenda of all Middle Eastern nations. In many desert countries, such as Libya and Tunisia, underground 'fossil water' sometimes dating from Pleistocene times, is being exploited with extravagant wastefulness.

Although both war and famine will no doubt limit the asymptote of a logistic human population curve, neither of these by itself seems likely to result in its becoming J-shaped – although the population certainly cannot continue to increase for much longer at its present rate. Thirty years ago, Dawkins (1976) pointed out that the population of Latin America was around 300 million people, and already many of them were under-nourished. If, however, the population were to continue to increase at the present rate, it would take less than 500 years from then for standing room to be filled up. In 1,000 years people would be standing more than a million deep on each other's shoulders and by 2,000 years the mountain of humanity, travelling outwards at the speed of light, would have reached the edge of the present universe.

Long before this, of course, the population explosion would have been checked by war, famine or disease. The 20th Century saw a great deal of mass starvation and was by far the bloodiest in history, yet the population increased more quickly than ever before. Even if these factors alone could eventually impose a ceiling on the asymptote – possibly delayed by universal birth control if achievable – it seems to me rather more likely that the curve will become J-shaped.

This could well be caused by a combination of disease, coupled with the effects of global warming which will undoubtedly reduce the area of land available for agriculture, and also have adverse effects on productivity – both terrestrial and in the seas. The only hope of achieving an S-shaped logistic curve, as already mentioned, lies in stabilising the population and then gradually reducing it, with regular reviews to take into account any advances in green technology and other factors that affect sustainability (McDougall, 2005). For this to take place, women world wide must be accorded equality with men and religious views of all denominations need to be reconciled.

Paul and Anne Erlich (1970) pointed out that, if numbers were to be reduced sufficiently, the small groups of survivors would undoubtedly face genetic problems since each would contain only a small part of mankind's total genetic variability. They would suffer further loss through inbreeding, making them even less able to adapt to a degraded environment. So it would not be necessary for every man, woman and child to die at roughly the same time. The extinction of *Homo sapiens* would be inevitable after a sufficient decline in population had taken place. Several examples of this phenomenon are known among bird populations, where extinction is much more common on small than in large islands.

Thirty years ago, I wrote that mankind's first and last ecodisaster may already have begun in the form of a steady decline in the standard of living nearly everywhere, coupled with massive pollution and widespread malnutrition in the underdeveloped countries of the world. This will persist unless and until the world population eventually becomes adjusted to sustainable environmental resources (Cloudsley-Thompson, 1977).

Figure 4. Desertification in Progress (Sudan)

Disease

The effects of disease are greatly enhanced by the fact that they are density-dependent. You cannot have an epidemic of malaria or sleeping-sickness, for example, if the human population is not sufficiently dense for the pathogen – *Plasmodium* or *Trypanosoma* – to be transmitted efficiently between one vertebrate host and another by the insect vectors, *Anopheles* and *Glossina* respectively. At the same time, the situation is complicated by the fact that the quality of life is initially usually higher where people live together in larger numbers. And when populations are dense in towns and cities, the environment is often unsuited to the invertebrate hosts, as in the case of *Trypanosoma*. Moreover, when the standard of living is higher, people can afford to buy mosquito netting and, if they are infected, they are taken to hospitals from which mosquitoes can be excluded.

It is difficult for a biologist to conceive anything more threatening to the survival of a mammalian species than for its members to be crowded into densely packed groups throughout the world, as human beings are, and then for pathogens to be continuously introduced from one group to another by means of rapid air transport. Fortunately, many of the major epidemic killing diseases of today and yesterday, such as plague, malaria, smallpox, tuberculosis, cholera and dysentery, are controllable thanks to our understanding of the modes of their transmission (Busvine, 1976; Cheng, 1986; Cloudsley-Thompson, 1976). The organisms responsible are Monera, and Protista. Viruses, prions, etc (Cloudsley-Thompson, 1998) present a much greater problem, mainly because they reproduce and mutate so rapidly.

With the benefit of hindsight, one could say that AIDS might well have been foreseen. The females of most higher animal species, and certainly most tetrapods, tend not to be promiscuous. From an evolutionary standpoint, this behaviour has been accorded a number of functions, not least that it inhibits the transfer of parasites from one host to another. Following the sexual liberation afforded to mankind by the development of the contraceptive 'pill', and the ability to cure previously incurable venereal diseases using antibiotics, there has been a marked change in sexual behaviour since the 1960s. Promiscuity of various kinds has increased greatly. In many parts of Africa and elsewhere, promiscuity has always been rife, it is now accompanied by the spread of HIV, until recently a death sentence almost everywhere. Nevertheless, some poverty-stricken women in sub-Saharan Africa not receiving antiviral therapy are protected by HLA-B genes which they pass onto their children. An effective vaccine for HIV has not yet been produced, largely because its variants or 'escape mutants' constantly arise and thus do not evolve protective immune responses (Melton, 2006). The existence of a menstrual rather than a seasonal reproductive cycle in Man naturally adds to and accelerates the problems caused by venereal diseases.

The lethal myxomatosis virus became benign to rabbits surprisingly quickly through the co-evolution of viral and rabbit populations (Ricklefs, 1990). The same could well be taking place in the case of HIV, although the latter is more complex because it attacks the defences of the host. The deadliest plague in history was the pandemic of 'Spanish flu' which swept the world in 1918-19, claiming over 40 million human lives – more than three times the number of people who were killed during the Great War '(Table 1)'.

Table 1

1889	Russian flu	1 million deaths
1918	Spanish flu	40-50 million deaths
1957	Asian flu	2 million deaths
1968	Hong Kong flu	1 million deaths.

Avian influenza, which threatens the world today, is caused by a different strain of virus than that responsible for the Hong Kong epidemic. Migrating wildfowl are not immune to its effect and several species of mammals are also susceptible. This or some more lethal virus could – in combination with the effects of global warming – conceivably be responsible for the extinction of mankind.

Conclusion

However much the human population of the world may be reduced by food shortage, war, environmental degradation (accelerated by over-exploitation of mineral resources, water and energy), there seems to be little doubt that the final coup de grâce will be administered by viral infection. Indeed, as long ago as 1982 I suggested that 'Man will not become extinct until he has lost the ability to reproduce and maintain himself; that is, until social co-operation or intellect - or both - have been destroyed'. It is believed that the entire human population of the world is descended from a single extended family group. The same evolutionary process almost certainly could not take place a second time for the genetic reasons outlined above. If human activity were curtailed to the level of intelligence found in other animals, Man would again become subject to the natural forces from which he has escaped through the exercise of his brain-power. His subhuman but still big-headed descendants would then be vulnerable, in the manner of every other species of animal, to any deleterious environmental changes that occurred faster than evolutionary adaptation could take place to counter them. Twenty-five years later, I think much the same. The only question is, *when* will human extinction take place? EO Wilson (2002) was to some extent optimistic that the human population explosion could be countered. The same year, Michael Boulton (2002) reached a very different conclusion.

In a series of articles published by *The Times* of London during 1972, John Maddox (Editor of *Nature*), Wilfred Beckerman, Kenneth Mellanby and others, criticised the 'false prophets of calamity', the ecologists whose arguments, they said, were flawed by ignoring the successes of technology. Thirty years on, it seems even more likely that these same ecologists were correct in their assessments.

'Just as HG Wells foresaw the destruction of invaders from outer space by infection from the tiniest terrestrial organisms to which they had no immunity, so too might Man eventually be defeated by viral DNA molecules that insidiously destroyed his mental capacity to devise methods of combating them' (Cloudsley-Thompson, 1982). Alternatively, the agent of extermination might be a virus that mutates so rapidly that countermeasures cannot be taken in time. Either way, it seems probable that a virus of some kind will be responsible for the extinction of *H. sapiens*, and this might be sooner than we think!

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A note on Richard Latham, FLS: donor of the Holotype of *Ornithorhynchus anatinus* (Shaw, 1799) to the British Museum.

Richard Latham (1799-1846) was one of the seven Fellows of the Linnean Society who, in April 1822, suggested the promising young James Edward Gray (1800-1874) for election to a Fellowship (*The Linnean*, 1994, 10(3), pp. 9-11). However, it was blackballed by influential supporters of the President, Sir James Edward Smith, (1759-1828). James Gray went on to become an outstanding Keeper of Zoology at the British Museum (Natural History), holding this office for thirty-four years. He was eventually elected FLS in 1857.

Who was Richard Latham? He was a wealthy businessman with, like many of his professional contemporaries, an amateur interest in chemistry, geology, botany, conchology and ornithology. Born on 18th October 1770 he was educated at Christ's Hospital between January 1778 and November 1785, his father being one John Latham, 'Citizen & Tobacco Pipe Maker' according to the admission registers (Guildhall Ms 12828/11). Addresses in poorer districts of the City are recorded for his parents on these dates. After joining the brewery firm of Sir Henry Meux as a clerk, probably immediately after leaving Christ's Hospital, he eventually became a senior partner and died, a wealthy man with an estate valued at £30,000, on 24th January, 1846, at his residence 65, Queen's Road, Bayswater. A supporter of numerous local charities he donated the first £400 made in business to his old school where his son also became a scholar. An obituary was published in *Proceedings of the Linnean Society*, 1, 1849, 302.

A letter from Liverpool dated 1819 to W Swainson (Linn. Soc. *Swainson Corresp.* vol III) details the annual productions of sugar, cotton and tobacco traded between 1813 and 1818 at Bahia. The provenance of some donations to the British Museum (Demerara and Cape of Good Hope) also indicate extensive travels. Richard Latham was elected FLS in 1821, proposed by A McLeay [*Librarian*], E Barnard and C Konig. He was also a member of the Horticultural Society.

The manuscript *Book of Presents* held in the British Museum (CE30, Vols. 1-2, 1756-1836, p. 118) lists material presented by him in 1818, 1819, 1832 and 1834. The gift of 12th May 1832 comprised 'the first specimen of the Ornithorhynchus Paradoxus ever brought to Europe'. No information other than the name of the donor ('Richard Latham Esqr') is recorded. It also records that earlier, 'Sir Everard Home, Bart.' (1756-1832), FRS, author of a series of studies on the anatomy of *Ornithorhynchus* published in *Philosophical Transactions of the Royal Society* between 1800 and 1819, presented 'Two specimens in Spirits of Ornithorhynchus Paradoxus' on 4th July, 1829, which perhaps prompted Richard Latham to acquire the historic specimen for the institution which employed the young man he had unsuccessfully sponsored ten years ago.

The literature about this particular specimen (George Shaw (1799): *The Naturalist's Miscellany* and *General Zoology*, 10, and James Anderson (1802): *Recreations in Agriculture, Natural History, Arts etc.* 2 (2nd series), pp. 562-565) mentions a Mr Dobson, and that when it was illustrated and described it was 'in the possession of a Dr Buchan of Store Street, Bedford Square'. 'Dr Buchan' was Alexander

Peter Buchan, who qualified MD in Leiden in 1793 after studying at Edinburgh, and then in London with John Hunter. Dr Buchan was elected FLS 1801 and served on Council 1808-9, and his address is recorded in Society records as being Store Street, Bedford Row, London. Dr Buchan died in 1824, aged sixty. Eight years later, Richard Latham gave the specimen to the British Museum. Their periods of membership overlapped between 1821 and 1824.

Plate 1, dated June 1799 K.P. Nodder. This image is from *The Naturalist's Miscellany*, by George Shaw, volume X, 1800, one of 24 volumes printed by Nodder & Co in London 1789-1813. Shaw used the same figures, but uncoloured, in his (1800) *General Zoology* Vol 1 part 1, pp 228-232, published by G Kearsley in London. (Reproduced with the help of the Balfour & Newton Libraries, University of Cambridge, Department of Zoology which is gratefully acknowledged)

James Edward Gray initiated a system of recording and cataloguing accessions and organised the British Museum's collections of biological material so that they became to be recognised as world-class. His (manuscript) *Catalogue of Mammalia* ***V*** *Ungulates*, of 1843, p110, lists the Latham specimen giving a provenance of New Holland. It was later listed (as *Ornithorhynchus anatinus*) by Oldfield Thomas in 1888 (*Catalogues of the Marsupalia and Monotremata in the Collection of the British Museum (Natural History) London*: p. 390) who noted it was an immature male, lacked the complete skull, and was the type for the species. *The History of the Collections contained in the Natural History Departments of the British Museum*, Vol II. 5 (1906) gave the donor of *Ornithorhynchus anatinus* as 'Dr' Latham – clearly a confusion with the (Dr) John Latham (1740-1837), the 'Father of Australian ornithology', and noted that it had been described by Shaw in 1799. It was recatalogued as the Holotype in 1979 as BMNH1979.2184 and is listed by Paulina D. Jenkins and Lingard Knutson (1983) in *A Catalogue of the type specimens of Monotremata and Marsupalia in the British Museum (Natural History)*, p7. This entry assumes that the Latham specimen BMNH1979.2184 is the same as the one which Shaw described in 1799, and it notes 'skin in fair condition but spur removed'. Photographs of the skin with its labels were recently posted on the website <http:piclib.nhm.ac.uk> of the British Museum Natural History.

The Shaw/Latham specimen was not the first to reach Europe, however. It was preceded, albeit by a few weeks, by one dispatched to the Literary and Philosophical

Society of Newcastle-on Tyne by the (second) Governor of New South Wales, John Hunter, FRS, (1737-1821), where it arrived, eviscerated and preserved in spirit, during August/September 1798. After it reached Newcastle Thomas Bewick (1753-1828) made an unconvincing woodcut based on a drawing Hunter made of the freshly-caught animal. Together with a short account derived from information in Hunter's letter, it was included in the appendix to the fourth (1800) edition of *General History of Quadrupeds*. As JA Mahoney and Barry J Richardson observed recently (*Australian Biological Resources Study*: <http://www.deh.gov.au/cgi-bin/abrs/fauna/details>), this specimen, had it survived, with an established provenance, it would have been the type for the species. It appears to have been lost after being listed by George Townshend Fox in 1827 in his Synopsis of the Newcastle Museum, pp. 250-51.

Two of the detailed illustrations from Nodder's 2nd plate in *The Naturalist's Miscellany* by George Shaw.

However, shortly after FP Nodder prepared the figures for Shaw's (1799) account, the same specimen was illustrated by an ex-pupil of Thomas Bewick's, John Anderson (1775-1807). John was a younger son of Dr James Anderson of Cobbinshaw, LLD (1739-1808), a minor figure of the Scottish Enlightenment and prolific writer on many agricultural and other topics. Dr Anderson had two other sons, Alexander (1769-1850) (who in 1812 changed his surname by deed-poll to 'Seton' [of Mounie]) and George (1773-1817), who were elected FLS in 1808 and 1800 respectively. Dr Anderson, by then residing in West Ham (Essex), in the sixth (and final) issue (1802) of his periodical *Recreations in Agriculture, Natural History, Arts etc.* included an additional (7th) fasicule containing a description of Shaw's platypus, illustrated by a frontispiece of three woodcuts based on newly-drawn figures of the actual specimen. I give Dr Anderson's account, written for a non-scientific readership (pp. 562-65) as it contains information about its provenance not found in Shaw's description:

'Notices of a singular Animal,
lately discovered in New South Wales, with a figure.

'I am happy in being able, by the obliging kindness of Dr. Buchan, to favour my readers with an account of an animal of a very uncommon kind, that is as yet but very little known in Europe, that will, I doubt not, prove satisfactory to every reader. The figures were drawn and engraved by John Anderson. It seems to be one of those links in the chain of nature that are so universally

found to connect different classes together, so as to prevent the possibility of pointing out the precise boundaries that separate the one from the other. It is evidently of the order of quadrupeds, approaches nearly to the class of the amphibiae, with an approximation in the head especially to one species of water foul [*sic*]. In its bill and fore-feet the resemblance to those of a duck is singularly conspicuous. But as its feet are evidently intended not only to be employed in the water as an oar, but as an implement for digging, as occasion may require, the web, which, when it is used as an oar, is strengthened by the claws, by being connected with these claws for little more than one-third of their length, is evidently susceptible of being contracted at pleasure so as not to prove an obstruction to the toes when they are employed in digging; a conformation, in as far as I know, peculiar to the animal. As its conformation and habits seem more nearly to resemble those of the mole, than any other animal, perhaps it might with some propriety be called the *duck-billed* or the marsh mole.

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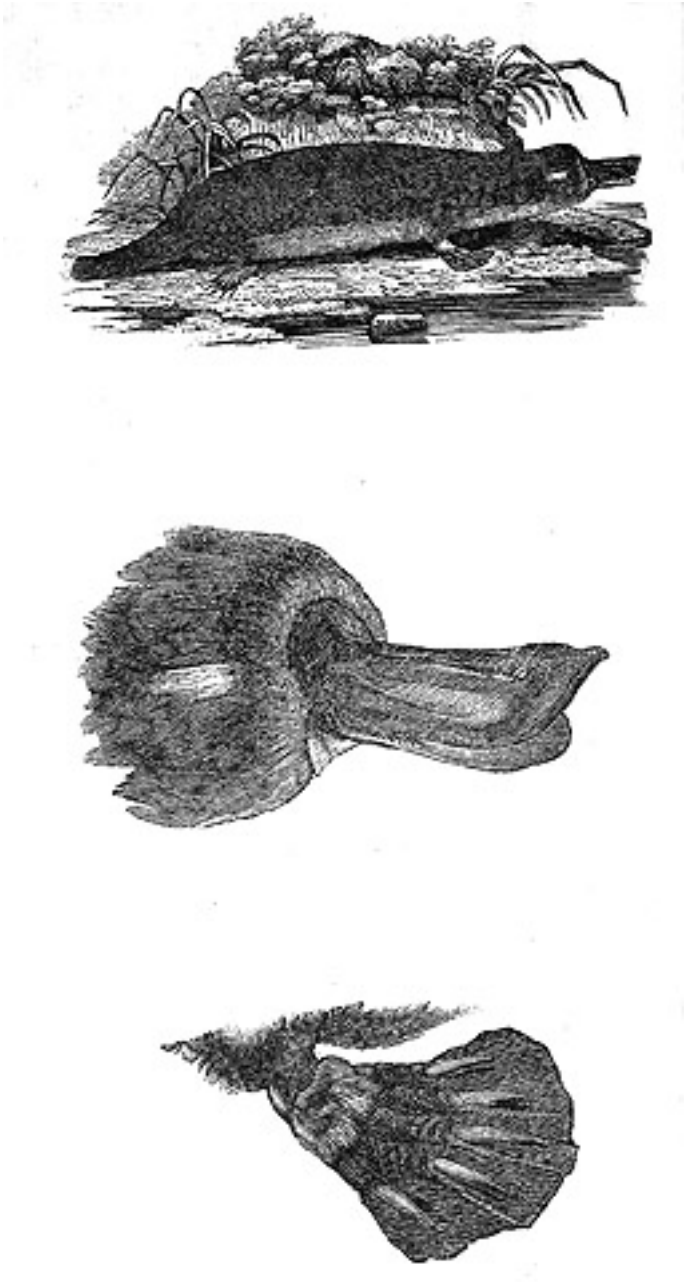
'The representation of this animal, whose appearance has given it a just title to the appellation of *extraordinary*, is taken from the first specimen that reached this country [*no, the Newcastle specimen preceded it*]. It was brought by an officer of the Ceres Indiaman which ship arrived here October 1798. He bought it, together with some other articles of natural history, at Canton, from an officer of the *Britannia*, which had sailed from England with convicts for Botany bay, and had just arrived in China. The only account he could give of it was, that he had it from a serjeant who brought it with some other articles from the interior part of the country [*data absent from Shaw's account*]. Two years elapsed before any other specimen found its way to Europe. Later accounts speak of it as the inhabitant of some inland lake.

'From this specimen Dr. Shaw took his description (vide General Zoology, vol. i, p. 66). He has there named it PLATYPUS ANATINUS. His account of it, to which we refer such of our readers as cultivate natural history as a science, is in general accurate, excepting that he has mentioned the eyes as being below the patch of light-coloured hairs on each side of the head, whereas their real situation is exactly above the upper line, on the anterior part of that spot [*proof that Anderson saw the specimen*]. It is probable that, when alive, they are not more visible than the same organ of the common mole of this country, to which this animal in many respects bears a close analogy.

'By professor Blumenbach this animal has received the perhaps more appropriate name of *Ornithorhynchus Paradoxus*. Under this title the anatomy of the head has been investigated with much accuracy by Mr. Everard Home, in the Philosophical Transactions [*of the Royal Society where Home's first article was published in 1800*]. He has there proved, that the striking resemblance to the bill of the duck is only an external feature, the apparent



This plate gives Anderson's figures from my own copy of his Recreations, vol 2 (2). (This is the volume's designation as per its flyleaf.)

beak being, in fact, an extension of the bones of both the upper and under jaw, covered with a thick skin terminating in a kind of lip. The extension of the bone of the upper jaw gives room also for an enlarged structure of the organ of smell, which in this animal is very complicated, and probably subservient to its peculiar mode of life.

‘The structure of this animal is sufficiently marked to enable us to form some probable conjectures relative to its modes of existence. Its food is most likely worms, and the larvae of insects existing among mud, as the common mole is known to subsist on the same matters which it finds among the roots of plants. the membrane extending beyond the claws of the fore feet, which it probably possesses some power of occasionally retracting, is evidently calculated to facilitate its progress through water; and the singular shield that extends from the root of the bill appears to be formed in order to prevent the fine fur of that part from being injured, when forcibly thrust into sand or gravel in pursuit of its prey. The fur has a peculiar oily appearance on its surface, probably repulsive of water.

‘In common with the other animals of New South Wales, which, as well as the plants, are distinguished by some peculiarities of structure, differing from those of every other part of the world, this creature has a singular strength of tail, which, like that of the kangaroo, appears rather an extension of the spine than an appendage to the body. This peculiarity appears to have induced Dr. Blumenbach to class it with the otter, but in all other habits it closely resembles the mole.

‘No appearance of mammae having been discovered in any specimen hitherto brought to this country, has induced some naturalists to conjecture that it resembles the feathered race in being oviparous, as well as in the formation of the bill. But it is more probable that the parents employ this organ in the same manner as birds, to supply their young with the food requisite in the earlier stage of their existence.

‘The various specimens of this animal, which have reached this country, being of different sizes, render it impossible at present to determine its natural magnitude. The individual, from which this cut is taken, is eighteen inches long, but we have seen some exceeding two feet. We have no hesitation in saying, that this representation is the most faithful that has yet been published in this country. Although it be taken from the same specimen that Doctor Shaw’s print is engraved from, it was at that time little better than a dried skin, which has since, by the ingenious exertions of Mr. Dobson [*also mentioned by Shaw: his identity is a mystery*], an amateur of Natural History, been extended [*his procedures apparently added 5" to its length*], its various parts brought out and prepared so as to resemble life. In this state it is now in the possession of Dr. Buchan, of Store Street, Bedford Square.

‘It is almost needless to add, how well the art of engraving on wood, in its present improved state, is calculated for giving a faithful representation of such subjects.’

In 1991 Jacob W Gruber published an historical survey of the early specimens in *Archives of Natural History*. 18(1), pp. 51-123 but he was apparently, in common with other investigators such as Harry Burrell author of *The Platypus* (1907), unaware of Dr Anderson’s account and its illustrations by his son.

One can speculate as to whether Dr Anderson and his son John's interest in and access to the Shaw specimen came about through George Anderson's membership of the Linnean Society, George's membership overlapping with that of Dr Buchan who was its original owner. Students of the systematic Zoology of the Monotremes are indebted to a Fellow of the Society who ensured that the future of an historic specimen was safeguarded.

VM VAN DER LANDE,
Nottingham

Reviews and all that

Until recently it was generally reckoned that 3.5 billion years was quite enough time for life to have evolved to the present biosphere. The same view holds that the prevailing life form has been unicellular and that multicellularity has been around for perhaps a quarter of those 3.5 billion years. Few have questioned the assumption that there has been enough time for the accumulation of those little variations, beloved of Darwin, which lead to the foundation of new species, and ultimately to the World that we now have. Until now, that is. Creationists, attempting to persuade others of their belief that our World is a mere 6000 years old, have demanded scientific proof of that assumption. It's a tough assignment. A shrug, mutterings about 3.5 billion years being a long time (and virtually anything could have happened within it) are hardly an answer.

Recently I was asked to review (for the Galton Institute) *The Plausibility of Life: Resolving Darwin's Dilemma*[1] which *inter alia* seeks to answer this challenge. As I have noted elsewhere in these pages, many biological books designed for a general readership tend to disclose all that is worth knowing in the opening chapters, the remainder being "merely corroborative detail, intended to give …. verisimilitude to an otherwise bald and unconvincing narrative," as Pooh-Bah noted in *The Mikado.* But the exception proves the rule. Here in just over 300 pages is a remarkable work of biology, seeking to show that it is not unreasonable to suppose that our present biosphere might indeed have arisen in 3.5 billion years, by the selection of small variations, which we now know to be the result of mutation. There are some flourishes on the Darwinian theme; the authors, Marc Kirschner and John Gerhart, two blue-chip US biologists, suggest that animal evolution has involved five distinct stages, life's origin, the development of the cell – nucleus, structured cytoplasm, etc. – multicellularity, body plans and, finally, for animals, the development of limbs (appendages in insects). They bring forward the thesis of *facilitated evolution*, not exactly a new concept. Its forerunner was Herbert Spencer's *cultural evolution*, whereby learning gives succeeding generations more accumulated knowledge, and "a better chance in life", a theme popular in Victorian times. We now know that learning is common to a wide range of species, not just *Homo sapiens.* This was given a different and more scientific slant by James Mark Baldwin[2], a psychologist in the late nineteenth century. Baldwin called his theory *social heredity* whereby behaviour could, e.g. enhance life span, and therefore allow an individual to accumulate more variations, which might then be passed down to offspring. Baldwin's ideas were not part of the 1950's Modern

Synthesis, indeed, they were generally frowned on at that time. His work has thus been largely ignored but repays perusal. The key papers[3] are in the Society's Library. What the authors of *The Plausibility of Life* are at pains to point out is that their theory, and Baldwin on his before them, in no wise contradict Darwin's fundamental idea that variation arises in an essentially random way. Social heredity/facilitated evolution are merely facets of natural selection.

Additionally, what Kirschner and Gerhart opine is that the distinct phases of animal evolution correspond to the development of *conserved core processes*. We can see this in the way that certain biochemical pathways and physiological systems are common to wide ranges of organisms. It is possible to trace these processes from phenotypes, from embryology, witness Haeckel[4], and, of course, from comparing complete gene sequences which are now available for over 200 species. Such a phased evolution does, of course, chime particularly well with Eldredge and Gould's *punctuated equilibrium*, which Zeeman has shown in these pages[5] to be part, with Darwin's accumulation of small variations, of a mathematical continuum of evolutionary theory.

We know that the control of even simple biochemical and physiological processes is complex, involving many *effectors*, small molecules, e.g. peptides, sugars and small RNA molecules, which control the way that DNA is expressed. These effectors are themselves, directly or indirectly, the product of genes. The number of different effectors guarantees that the outcome of the development of an organism is tightly controlled, such that each organism is a member of a recognisable species. But precisely because there are so many fail-safe mechanisms built into development, the odd one can, as a result of variation, develop differently and may, rarely, confer advantages on the organism possessing it.

As the book points out, the number of phyla is actually quite small, and it is within one, or sometimes several, phyla, that the conservation of biochemistry and physiology is most marked. The tricarboxylic acid cycle, for instance, is of such universal occurrence in eukaryotes, that it must have arisen early in animal evolution as a virtually unchallenged provider of cellular energy. Much the same thing can be said of photosynthesis in plants. This is not to say that other energy transducing mechanisms do not exist, but that they have evolved subsequently to provide a new capability, like the flight of insects, or particular features of plant metabolism. Special processes have led to skeletal materials as varied as chitin (arthropods), cellulose (plants) and bone (vertebrates).

What is postulated here is that there is considerable economy of design in living systems. This reduces the number of variations required to provide our evolutionary history. It does not, of course, answer the question posed by creationists at the beginning of this article. Shall we ever be in a position to provide unequivocal evidence that there *is* sufficient variation about to get us to where we are? I believe so. Firstly, the gene sequences now being turned out for an ever-increasing number of species might provide a quantitative measure of evolutionary change over the eons of life. And an increasing number of observations indicate that evolution itself does not proceed at quite the snail's pace envisaged by Darwin. Examples include the cichlid fishes of African lakes[6]. Coupled with Kirschner and Gerhart's theories in *The Plausibility of*

Life, we can see that we are better placed to answer the creationists, not that they are interested.

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JOHN MARSDEN

Programme

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11-15th June		UNLOCKING THE PAST – LINNEAN COLLECTIONS PAST, PRESENT AND FUTURE † Jenny Edmonds FLS/ Sandy Knapp FLS Joint symposium with University of Uppsala (11-12th June in London, 14-15th June in Uppsala) followed by Gotland Tour.
18-19th June	Mon./Tues.	THE EVOLUTION OF THE ANIMALS: A TERCENTENARY CELEBRATION A two-day joint meeting with the Royal Society at 6-9 Carlton House Terrace Tim Littlewood FLS and Max Telford FLS
21st June	Thurs 6.00pm	THE MYSTERIES OF STONEHENGE Burlington House Lecture at the Geological Society. Free tickets available from Jayne Phenton, Society of Antiquaries (020 7479 7087 or jphenton@sal.org.uk)
28th June	Thurs.	KING OF THE NEW WORLD: THE ADAPTIVE REPERTORY OF THE MONARCH BUTTERFLY Lincoln Pierson Brower FLS
3rd July	Tues. 6.30pm	CHELSEA PHYSIC GARDEN TOUR AND RECEPTION † Jenny Edmonds FLS At Chelsea Physic Garden
12th July	Thurs.	ECOLOGY AND BIOGEOGRAPHY OF THE SMALLER INDIAN OCEAN ISLANDS Robert Prys-Jones/ Julian Hume Presenting the results of the Percy Sladen Trust Centenary Expedition.

The Linnean Society
Programme

There is a plethora of events this summer as part of our Tercentenary celebrations, and lots of opportunities to explore new ideas and places. Please note the need to book for most of the social events and day meetings – see the enclosed leaflet and form, and keep an eye on the website. If in doubt do telephone us on 020 7434 4479. We shall look forward to seeing you at the events. *Adrian Thomas, Executive Secretary*

23rd April	Mon. 2.00pm	DARK ENERGY AND THE HISTORY OF CHEMOSYNTHETIC LIFE IN THE DEEP SEA Joint afternoon meeting at the Geological Society – followed by an evening reception at the Linnean Society † Brian Rosen FLS and Paul Henderson DLS
8th May	Tues. 6.00pm	A CELEBRATION OF THE TERCENTENARY OF THE BIRTH OF CARL LINNAEUS Joint evening meeting at the Zoological Society of London followed by a dinner. † Vaughan Southgate
11th May	Fri.	OLD WINE, NEW BOTTLES: THE CONTINUING IMPORTANCE OF HISTORIC COLLECTIONS TO CONTEMPORARY GEOLOGY, BOTANY AND ZOOLOGY Prof. Parick Boylan Formal dinner (6pm for 7.00) followed by lecture (at 9.00pm) at Liverpool Athenaeum
21–26th May		CHELSEA FLOWER SHOW – Society stand in the *Life Long Learning* section
24th May*	Thurs. 4.00pm	ANNIVERSARY MEETING and launch of book "Order out of Chaos" David Cutler FLS
25th May	Fri. 2.00pm	ANGLO-SWEDISH GARDENS SEMINAR: A TRIBUTE TO LINNAEUS AND HIS LEGACY Joint seminar in connection with the Swedish Garden at Chelsea Flower Show (invitation only) † Jenny Edmonds FLS
1st June	Fri.	IN LINNAEUS'S WAKE: 300 YEARS OF MARINE DISCOVERY. Full day meeting and reception in conjunction with visit by replica Swedish East Indiaman *Götheburg III*
7th June	Thurs.	CELEBRATORY EVENING at the Jodrell Laboratory, Royal Botanic Gardens, Kew † Jenny Edmonds FLS

continued inside back cover † organiser * Election of new Fellows

Unless stated otherwise, all meetings are held in the Society's Rooms. Evening meetings start at 6 pm with tea available in the library from 5.30. For further details please contact the Society office or consult the website – address inside the front cover.

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