THE LINNEAN

Newsletter and Proceedings of
THE LINNEAN SOCIETY OF LONDON
Burlington House, Piccadilly, London W1J 0BF

VOLUME 20 • NUMBER 3 • JULY 2004

THE LINNEAN SOCIETY OF LONDON

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THE LINNEAN

Newsletter and Proceedings
of the Linnean Society of London

Edited by B. G. Gardiner

Editorial 1
Society News 3
Library 6
Picture Quiz 9
Correspondence 14
The National Botanic Garden of Wales 19
Beringer's iconoliths: palaeontological fraud in the early 18th century 21
Book Reviews 32

Editorial

This issue contains an article by Paul Taylor on Beringer's figured stones or 'iconoliths' which he described in a scientific treatise, *Lithographiae Wirceburgensis* in 1726. These objects, referred to by Stephen Jay Gould in one of his natural history essays (2000) as *The Lying Stones of Marrakesh* were, however, destined never to mislead science because they were exposed within a few months of publication, in 1727. The author writes that the perpetrators of the deception are not in any doubt and that the fraud has not spawned the countless 'whodunnit' theories associated with Piltdown.

Paul Taylor is quite correct in his assumption that the Piltdown forgery (*circa* 1911) was in a different league to Berringer's 'iconoliths'; there can be no doubt that the former was the greatest hoax ever perpetrated against the scientific establishment. However, to this day uncertainty remains both as to the hoaxer and his reasons for the hoax. If we conclude the hoaxer was Martin Hinton, was it because he had a grudge against Arthur Smith Woodward, or was it because both he and his good friend Oldfield Thomas together wished to get even with the autocratic and unbending Keeper of Geology? Both Hinton and Oldfield Thomas believed in Lamarkian inheritance and it is quite plausible that Oldfield Thomas gave an orang lower jaw to Hinton to plant at Piltdown, thereby providing Smith Woodward, the Darwinian, with a phoney missing link; in other words, an elaborate practical joke.

Hinton also salted the Piltdown pit with eoliths to reinforce his own pet theory that eoliths attested to the presence of Pliocene/ Pleistocene man in Britain. He then added Chellean flint implements, as well as two distinct faunal assemblages. With the eoliths went *Mastodon* and *Stegodon* (both Pliocene), but with the Chellean flint implements he added a second assemblage comprising *Hippopotamus*, red deer, horse and beaver (all indicative of the Pleistocene). Dawson and Woodward, however, lumped the two assemblages together, failing to differentiate the Recent from the Pliocene. Be that as it may, it is my contention that only Hinton, with his intimate knowledge of the plateau gravels, could have arranged such an elaborate hoax. Hinton certainly had the geological knowledge and his own collections would have provided the materials for the two faunal assemblages.

Then, in 1914, Dawson uncovered a chunk of elephant bone which had been whittled down to form a club-like implement which became known as the 'cricket bat'. When Smith Woodward saw it he pronounced that this was incontrovertible proof that Piltdown Man used tools, in particular the Chellean hand axes which had already been found in the pit by Dawson and Teihard de Chardin as long ago as 1912. Subsequent analysis by the flame atomic absorption method revealed that material found in 1976, in a cabin trunk of Hinton's in an attic above his old room in the Natural History Museum, and the chunk of elephant bone were not only identically stained but also several of the pieces from the trunk had been whittled in a similar manner to the 'cricket bat'. The analyses strongly support the case that it was Hinton who planted the 'cricket bat', and that the material in his trunk was what he had practiced on.

Additional proof that Hinton was in fact the hoaxer came from his executor who discovered eight human teeth, varyingly stained, in a tobacco tin of Hinton's. Analysis revealed that Hinton had been using two quite separate methods for staining his material. The intial method he used changed the apatite of the bone into gypsum and, at the same time, brought about decalcification and produced a chocolate colouration. This change, which has been demonstrated by the use of X-ray crystallography (see Weiner *et al* 1955, *Bulletin of the British Museum of Natural History, Geology* 2(6): 225-257) had taken place in every one of the skull bones, with the exception of the orang mandible (see below). Tests on the eight human teeth, by diffractometer and the atomic absorption method, showed two of the lower canines had been decalcified and the apatite converted into gypsum. Significantly, one of the lower canines had been painted with something like Van Dyke brown and resembled the painted, isolated orang canine found by Teihard de Chardin. The second of the two methods Hinton used dispensed with decalcification while maintaining iron oxide as the principle staining agent. This method he used on the cricket bat, the orang mandible and six other mammalian remains, including two *Mastodon* molars, a *Cervus* antler, a *Rhinoceros* premolar and all the material in the trunk (none of which showed any evidence of decalcification). All of this material had been stained a chocolate brown colour. I therefore conclude from the complexity of the two staining processes that the Piltdown hoaxer was Martin Alistair Campbell Hinton (1883–1961) and that he worked alone, choosing Charles Dawson as the fall guy because of his intimate association with Smith Woodward.

It has long been suggested, however, that it was Dawson rather than Hinton who was the hoaxer. We know that Dawson was a plagerist and that he was responsible for several archeological fabrications. Nevertheless, I cannot believe that he had either the resources or the knowledge to have stained all the human (20 or more bones) and mammalian material (18 assorted teeth and bones) and several hand axes. As Hinton wrote perceptively to Le Gros Clark, 29th December 1953, Dawson had neither the aptitude to do such a thing or the necessary knowledge.

Much of the above information has been extracted from my paper entitled "The Piltdown forgery: a re-statement of the case against Hinton", *Zoological Journal of the Linnean Society*, 2003, 139: 315–335. This can be downloaded from the internet at:

http://www.blackwell-synergy.com/links/doi/10.1046/j.1096-3642.2003.00079.x/full/

BRIAN GARDINER

Apology: By some strange means, which I cannot now fathom, a paragraph from Brian Gardiner's Picture Quiz article on Edward Jenner was inserted into the letter from David Mabberley, concerning Mungo Park, on page 17 in the April issue of *The Linnean.* My sincere apologies to both Dr Mabberley and Prof. Gardiner. *Mary Morris*.

Society News

New Executive Secretary

The Society has appointed **Adrian Thomas** to succeed John Marsden, who retired on 31st May 2004. Adrian graduated in PPE at Oxford in 1967 and spent much of his career working in the British Council in Sierra Leone, Iran, Malaysia, Nigeria, Sudan and, finally, India, where he was Director of the East India branch, retiring from the Council in 1999. Whilst in the Sudan, he was granted an Honorary PhD at the University of Gezira. He spent four years in London (1980–84) as Assistant, then Deputy Director, Technical Cooperation Training. Since 2000 he has worked for the Royal Asiatic Society and obtained an MA in Asian History at SOAS (University of London). In wishing Adrian every success in his new post, we must also hope that he survived running in the London Marathon, which forms a part of his "other interests".

* * *

The moving finger writes….

"ODPM and the Learned Societies had a very constructive meeting on 16 March which envisages the continued presence of the Learned Societies at Burlington House. Discussions are continuing with a view to formalising the arrangement on a basis which is acceptable to all parties."

This is an agreed statement issued after mediation called for by the judge, HH Mr. Peter Smith. At the time of writing the issue is still *sub judice.*

* * *

Dichotomous keys, the backbone of biological identification for the last 300 years, have now been brought into the 21st century.

Geoff Norton gave a paper at the Society a couple of years ago. His group at The University of Queensland Australia, CBIT (Centre for Biological Information Technology) has created cutting edge software to deploy dichotomous identification keys (or pathway or branching keys) on the web. Most significantly, this software allows key developers to import existing hard copy keys that have been scanned and then to easily make these keys available on the Internet through a distributable applet. Whilst other computer-based identification tools have been around for a while this is the first tool that allows rapid importation and web deployment of existing keys, of which there are hundreds of thousands in existence. This software makes dichotomous keys more available and easier to use than ever. You can view some example keys on-line or download the demonstration key 'builder' from *www. lucidcentral.org/phoenix*. Don't forget you need the (free) Java Virtual Machine 1.4 or greater installed to view them.

* * *

The Oregon Museum of Science and Industry, in Portland, has hired Robert Sprackland FLS as Science Director. Robert, an evolutionary zoologist whose areas of expertise include biology, zoology & palaeontology will oversee the accuracy of OMSI's

science content. His staff of 17 manages exhibit choice, content, scope and evaluation.

Robert earned his PhD in evolutionary zoology at University College London and completed Post-Doctoral work at the National Museums of Scotland, Department of Vertebrate Zoology. He holds an MA from San Jose State University in biology, an MS from the University of Kansas in science education and a BA from the University of Kansas in zoology and palaeontology.

In 1998, Robert co-founded the non-profit, Internet-based Virtual Museum of Natural History at *curator.org*. As director of VMNH, Robert works to carry out the museum's mission of conducting biodiversity surveys of high biodiversity/poorly studied areas and to publish the results to attract attention to biological hotspots for further study. Recently, Robert was engaged in biodiversity research in Papua New Guinea and Australia, and was featured on an episode of Animal Planet's " O'Shea's Big Adventure". He is the author of several books on reptiles and fishes, such as *Giant Lizards* and *A Key to Sharks and Rays of the World* (on CD-ROM), as well as dozens of scientific articles and journal papers on various aspects of zoology.

Current biological projects being conducted by Robert and the VMNH include Biodiversity of Fitzroy Island, Queensland; Herpetofaunal Diversity of Western Province, Papua New Guinea; and the Physiology of Long-Necked Dinosaurs.

JOHN MARSDEN

Postscript

At the Anniversary Meeting held on 24th May four new Council members were elected to replace those retiring after their four year term of office. Those elected were: Dr L Allcock (Z), Prof JR Barnett (B), Prof J Browne (Z) and Mrs S Gove (Z). Their cvs were given in the previous issue of *The Linnean*. His Highness Sheikh Zayed bin Sultan Al Nahyan, the Ruler of Abu Dhabi was elected to Honorary Membership of the Linnean Society of London in recognition of his pioneering of, and continuing support for, the most revolutionary environmental policy of any nation to date. In addition, three new Fellows *Honoris causa* were elected without dissent. They were Elis Wyn Knight-Jones FLS, Alan James Southward FLS and Clive Anthony Stace FLS.

Later in the meeting the Treasurer presented an update of the negotiations which have been taking place with the Office of the Deputy Prime Minister regarding the tenure of the learned societies in Burlington House. In summary, the situation is more satisfactory that had been feared. For a reasonable rent and rolling ten-year lease, the Society can stay in the rooms at Burlington House and the spectre of eviction has been removed. The ODPM also agreed to carry out £1.75 m worth of overdue repairs to the fabric of the buildings of the various societies, and to defer rental payment for two years whilst this work is undertaken.

Additional Society Evening Meetings in 2004

Irène Manton FLS FRS (1904–1988). First Female President of the Linnean Society of London. A Centenary Biography

Barry Leadbeater

This talk on Thursday, 28th October at 6pm (tea at 5.30) launches another of the Special Issues of *The Linnean* on this distinguished and formidable former President and benefactor of the Society.

* * *

Is *Homo sapiens* just another animal – or does he live up to his name?

Steve Jones FLS

A talk at the Royal Institution, Albemarle Street, on Wednesday, 3rd November 2004 at 7.00pm (bar beforehand from 6.15pm).
To book tickets visit *www.rigb.org* or phone 020 7670 2985.

This is a Joint Meeting with the RI for which there is a £5 ticket charge for Fellows (£8 for non-Fellows). It is on the Society's theme for the Tercentenary of Linnaeus in 2007: What's in a Name?

* * *

Botanical Exploration of Kamchatka, Russia

a talk on Thursday, 18th November 2004 at 6pm (tea at 5.30)

Aljos Farjon FLS

who writes:
In July 2003 I led a "general botanical collecting expedition" from RBG Kew, with participation of five botanists from Kew and one from the Komarov Institute in St. Petersburg, to the Kamchatka Peninsula in the far east of Russia. This was the first expedition to that region to be organised by British botanists [it does not matter that I'm not British]. Kamchatka is a volcanic peninsula roughly the size of Great Britain and virtually unpopulated (ca. 300,000 inhabitants). Its remoteness and military status in Soviet time have contributed to the preservation of much pristine wilderness. Its populations of bears, eagles and salmon are famous, as are the numerous active volcanoes. We travelled to many areas ranging from coasts to high volcanoes and collected numerous specimens for the herbarium. The talk will show not only the natural beauty and flora of Kamchatka, but also what is involved in a botanical collecting trip in such a difficult region with little infrastructure. The talk touches on scientific aspects as well as more anecdotal experiences of a group of enthusiastic botanists.

Library

During the period from January to the end of April the Library was open for 85 days during which 253 visitors (133 FLS) were recorded. Visitors now average out at nearly 3 per day, and the proportion of Fellows using the library is also slightly higher (53%). Loans during this period were 56 and the records tell us that 50 readers consulted 123 books and 71 journals. These are records for items not borrowed but consulted in the Reading Room. Users of manuscripts numbered 20, including visitors from Australia, USA and Sweden. E-mail enquiries for the same period total 314 and incoming telephone call enquiries 81.

General Library use included displays for Society general meetings including *Seaside pleasures* (Gosse), *Darwin and the barnacle, Cephalopods, Natural history collection databases, The Linnean Society and the National Trust, Laughter in paradise: Herbert Spencer's will* and *Squamate evolution.* The Burlington House court case involvement was recognised by a small display on Burlington House, including documents relating to the various previous Homes of the Society.

A number of visiting groups made pre-booked tours of the Collections. This can be done by prior arrangement so as to avoid days when the Rooms are in use for meetings and to ensure that staff are available. There is usually a pre-tour talk to give a brief history of the Society, the Collections and their use.

Donations received in March and April 2004 are listed here, with a few earlier ones which missed being included previously. Totals for donations and purchases are given below. These exclude substantial numbers of items brought in by Prof W.G. Chaloner for the "book sale" but kept for the Library as they proved to be useful gap-fillers. Professor Lucas has also recently given us a number of conservation-related publications and a large number of reports have been received from the Program for the Conservation of the Arctic Flora and Fauna. None of these are listed here in detail.

Donations 20; Purchases 4; TOTAL 24

Recent efforts have been made by Lynn and Matthew to catch up with some of the older accessions awaiting cataloguing and books from Professor Chaloner (23) and Professor J. G. Hawkes (40), and bequests from David McClintock (61) are now all in the catalogue, together with most of the remaining B.E. Smythies bequest. The Library catalogue now has 347 new records since February 2004 and a further 1177 entries have been edited. The catalogue is now also online. You can find it by going to the Society's web page *www.linnean.org* then go to that for the Library, click on the yellow CARLS text at the top and then scroll down to "here" and you will find the Library catalogue online. It should now be working properly but if you have a problem please let us know by e-mailing *library@linnean.org* and we can see if it can be solved. We do have a limit to the number of people who can access it at one time and it will log off after about five minutes. We need to know how it is working so do get in touch.

Cathy Broad is continuing to work on the Linnaeus Link project based at the Natural History Museum.

We are still grateful for continuing help given by volunteers. Apart from those listed previously, we have some new volunteers entering material into the electronic catalogue. These include Professor Arthur Bell FLS and Ms Leyla Seyfullah. One of the problems arising from this is that we have to assign them days when there is access to a free computer terminal.

Readers are warned that the usual summer task force of students will be around from 19 July to 27 August. Books may be in temporary locations, the Reading Room in disarray and finding things may take a bit longer than usual.

GINA DOUGLAS

Donations

C.J. Clegg FLS	Clegg, C.J., *Green plants, the inside story.* 92 pp., col.illustr., London, John Murray, 2003. ISBN 0 7195 7553 2.
Bruce Coleman	Ronald, K., Hanly, L.M., Healey, P. J. & Selley, L.J., *An annotated bibliography of the Pinnipedia*. 785 pp., Charlottenlund, ICES, 1976. Ronald, K. (and others), *An annotated bibliography of the Pinnipedia Supplement 1*. 346 pp., Copenhagen, ICES, 1983. Ronald, K. (and others), *An annotated bibliography of seals, sea lions and walrus, Supplement 2*. 801 pp., Copenhagen, ICES, 1991.
Cooper Hewitt, National Design Museum	Whiteway, Michael, ed., *Shock of the old: Christopher Dresser's design revolution*. 240 pp., col.illustr., New York, Cooper-Hewitt, National Design Museum, 2004. ISBN 0-8109-6660-3.
The Drawing Center	Armstrong, Carol & de Zeghner, Catherine, eds., *Ocean flowers, impressions from nature (catalogue of an exhibition).* 288 pp., illustr., some col., Princeton, Princeton University Press, 2004.
Dr Y. Heslop Harrison	Harmand, J., *Description des différents formes du genre Rubus ... Merthe–et-Moselle*. 68 pp., illustr., Auch, G. Foix, 1887. (unbound) Sudre, H., *Bréviare du Batologue.* 90 pp., illustr., Paris, Lhomme, 1913.
Kungl. Skytteanska Samfundet	Linnaeus, Carl, *Iter Lapponicum, Lappländska resan 1732 II Kommentardel*, by Ingegerd Fries and Sigurd Fries, edited by Roger Jacobsson. 531 pp., illustr. some col., Umeå, 2003. ISBN 9189438 247.
Nils-Erik Landell	Landell, Nils-Erik, *Läkeren Linné, Medicinens dubbla nickel*. 319 pp., illustr. some col., Stockholm, Carlssons, 2004. ISBN 91-7203-93-5.
Mariette Manktelow	Manktelow, Mariette & Svanberg, Ingvar, *Vâxter i Linnés Landskap.* 147 pp., illustr., Uppsala, Swedish Science Press, 2004. ISBN 91-5241-00-8.

Stories from the collections – Calling all Fellows

The Society aims to give fellows and the public **C**omputer **A**ccess to the **R**ecords of the **L**innean **S**ociety as part of the Tercentenary Celebrations in 2007. The **CARLS** taskforce set up by joint meetings of the Collections and Library Committees has been convened to address all aspects of information management involved with the provision of online access to the collections,

Digitised images of the type specimens will be created and we would like to bring some of these images alive by recording how they have helped you in your studies or work. Do you know their importance in your specialist area? Have you examined them or needed to use any other library resources to aid your search? What do the collections mean to you? How do they relate to other materials elsewhere? What do you know about the specimens that is interesting?

Can you help by writing down or recording your story? A prize of the Tercentenary Wedgewood Medallion will be presented to the fellow submitting the best, most interesting story judged by the taskforce in the autumn. There is no closing date as we hope that once you have started other stories will spring to mind.

You can send your stories to me, any other officer of the Society, one of the curators at the Natural History Museum – Mike Fitton (insects), Charlie Jarvis (plants), Kathie Way (zoology) or the Librarian, Gina Douglas. Any of us would be happy to discuss the project with you.

SUSAN GOVE – Collections Secretary
Email s.gove@sghms.ac.uk

Karin Martinsson	Martinsson, Karin, *Linnés Blomsterur.* 124 pp., col. illustr., Stockholm, Prisma, 2003. ISBN 91-518-4169-x.
Dr P. Morris	Morris P.A., *Mr Potter's museum of curiosities.* 16 pp., col. illustr., Jersey, Five Star Management, 1995. ISBN 0 9526 121 0 0.
Natural History Museum	Snell, Susan & Tucker, Polly, eds., *Life through a lens, photographs from the Natural History Museum 1880–1950.* 112 pp., illustr., London, Nat. Hist. Mus., 2003. ISBN 0 565 09186 7.
Dr Karen Reeds	Reeds, Karen Meier, *Botany in Mediaeval and Renaissance universities.* 274 pp., illustr., New York, Garland Press, 1991.
Teresa Sapieha	Sapieha, Teresa, *Wayside flowers of East Africa.* 168 pp., col. illustr., [Nairobi] privately, 2000.
Dr Larry Schaaf	Schaaf, Larry, *Sun pictures, Talbot and photogravure, Catalogue 12.* 80 pp., illustr., New York, Hans P. Krause, 2003. ISBN 1-892535-1-4.
Dr Paul Schullery	Verley, John D. & Schullery, Paul, *Yellowstone fishes, ecology, history and angling in the park.* 154 pp., illustr. some col.

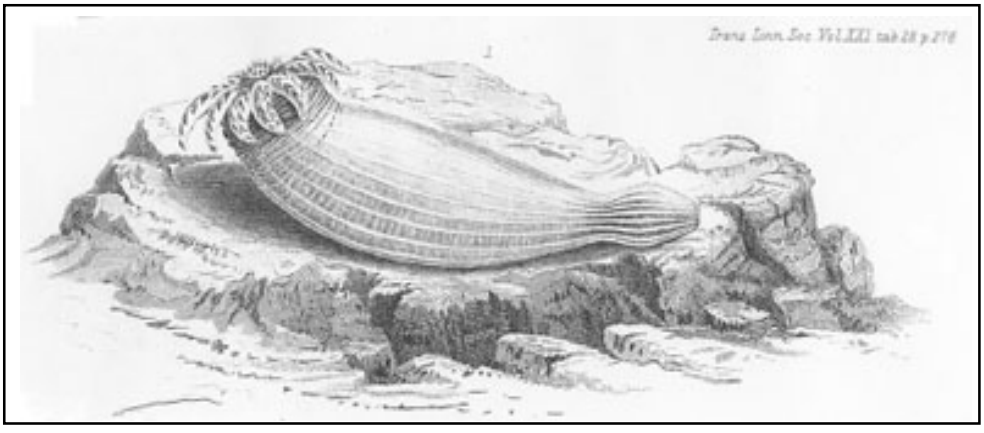
	Mechanicsburg PA., Stackpole Books, 1998. ISBN 0 8117 2777 7. Yellowstone National Park, *Yellowstone's Northern Range, complexity and change in a wildland ecosystem.*148 pp., illustr. some col., maps, Mammoth Hot Springs, National Park Service, 1992.
Swedish NGO Secretariat on Acid Rain	Elvingson, Per & Ågren, Christer, *Air and the environment.* 174 pp., illustr., maps, Göteborg, Swedish NGO Secretariat on Acid Rain, 2004. ISBN 91-973691-7-9.
Trans-World Publishers	Campbell-Culver, Maggie, *The origin of plants* (paperback edition). 477 pp., illustr. some col., London, Trans-World/ Eden project books, 2004. ISBN 1903 919 401.
Daphne Vivian-Neal	[Drewitt , Caroline Mary] *Littleton, Thomas, Lord Lilford, Memoir by his sister*. 290 pp. illustr., London, Smith Elder & Co. 1900.

Picture Quiz

Philip Henry Gosse (1810–1888)

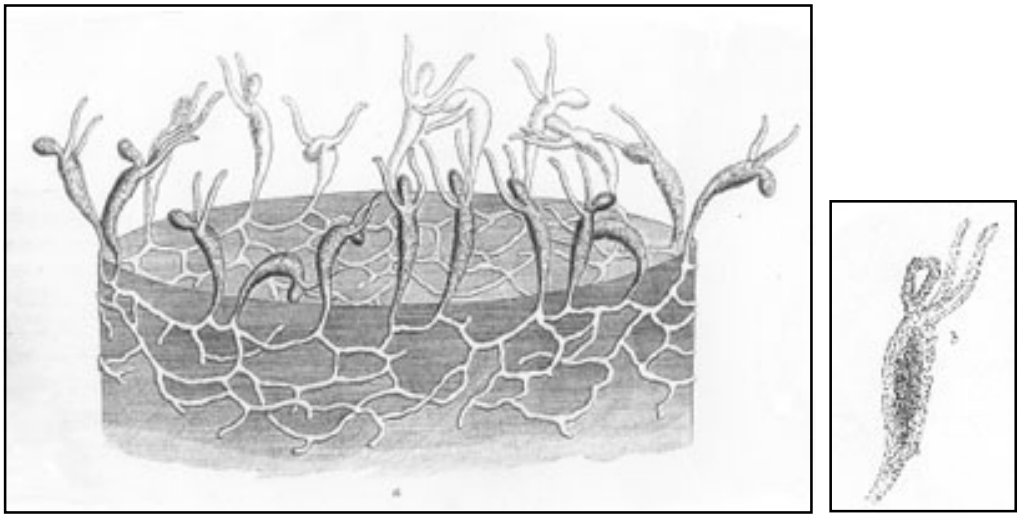
Philip Henry Gosse was born at Worcester on 6th April 1810, the second son of Thomas Gosse and Hannah Best. His father was a skilful miniature painter who also wrote copiously, both poems and 'emblematic essays'. His mother had been a lady's maid. The family moved to Poole in Dorset. After an initial education at Sell's school Phillip, aged 13, was sent to board at Blandford Grammar School from which he was expelled a year later. After a brief sojourn at a local school in Poole he finally left on his 15th birthday, to start work as a clerk in the Poole Counting House of merchants trading with Newfoundland. Unfortunately this job only lasted a year, for in 1826 he was made redundant. Throughout this period, however, encouraged by his aunt (the mother of Professor Thomas Bell) he scoured the rock pools around Poole harbour collecting and naming the various invertebrates. It was also his aunt who gave him details of insect metamorphosis, which later persuaded him to devote his attentions to the study of entomology. Finally he decided that, like his brother William, he would start a new life in Newfoundland. To this end, aged 17, he embarked on the brig *Carbonear*, named after the remote port where he would spend the next eight years of his life.

His background in the Poole Counting House stood him in good stead for he soon obtained a clerkship in a counting house in Carbonear, Newfoundland and



Peachia hastata [Plate XXI *Trans Linn Soc.*, 1855]

signed indentures for six years. During this period he took advantage of his light workload to develop his skills as a naturalist, originally inculcated by his aunt. This was supplemented by a copy of Adam's *Essays on the Microscope*, with its thirty-two folio plates, which he bought in a local auction for 10/-. It was this book that "focussed the wandering rays of science that was kindling in my mind." It was now (1832) that Gosse began the study of systematic zoology and to collect insects (one of the main subjects of Adam's essays being insects). Gosse's systematic collecting of insects eventually formed the basis for his *Entomologia Terrae Novae* which was never published (manuscript in Canadian Museum of Nature, Ottawa). In it he described and illustrated over 232 insects, mainly Coleoptera and Lepidoptera. After a brief spell of farming in Canada (Compton)[1] in 1838 he moved south, first to Philadelphia and then to Alabama, where he had his first



The extremity of the tube of *Sabella vesiculosa* occupied by a colony of *Lar sabellarum* (close up right) [Plate XXI Trans. Linn. Soc., 1855]

contact with slavery. Here he took up the position of a local schoolmaster at Belvoir on the boundary between Lowndes and Dallas counties, just south of the Alabama River. Whilst there he found time to continue his entomological pursuits completing a series of paintings of Lepidoptera, Coleoptera, Hymenoptera, Odonata, Orthoptera etc., for his *Entomologia Alabamensis* (unpub. mss. in British Library, dated 1838).

The following year he returned to the UK. On the voyage home he wrote *The Canadian Naturalist* (published 1840) which was warmly received. Realising that he needed a job he found a school for sale in London Lane, near to where he was lodging in Hackney. This he bought and advertised the intended curriculum in the local shops of the surrounding area. Three years of the drudgery of teaching finally came to an end in 1843 with the publication of his *Introduction to Zoology* when, encouraged by Professor Bell, he decided that he could as easily earn his living as a natural history writer as a teacher.

This second book was so successful that, in 1844, the Trustees of the British Museum recommended that he might undertake the collection and identification of both the birds and insects of Jamaica. The birds he shot and skinned, the insects he pinned, the arachnids and myriopods he preserved in alcohol. In this manner be brought back to the British Museum 1510 birds, arthropods numbering about 7,500 and around 5,000 dried plants. He also supplied Hugh Cumming, the dealer in conchological specimens, with some 400 shells, for which he was reimbursed. On Cumming's death these also finished up in the NHM. Gosse eventually left Jamaica for the UK in the summer of 1846. The following year saw the publication of his *Birds of Jamaica* (together with a splendid folio volume of hand coloured plates). In 1848 he produced a guide to the British Museum's Egyptian antiquities entitled: *Monuments of Ancient Egypt*. At the same time he produced the *Natural History of the Mammalia* which, together with four further titles, [Birds, Reptiles, Fishes and Mollusca] eventually formed the basis of *Gosse's Natural History*. In the autumn of 1848 he married Emily Bowes in Tottenham and in the following year dedicated to her his *Popular British Ornithology* which included 70 colour plates drawn by himself.

In the summer of 1849 his son was born and he acquired a new microscope and commenced work in London on the "wheel-bearers" or Rotifera. Realising that the greatest authority on infusoria was Christian Gottfried Ehrenberg (1795–1876)[2] he and his wife began translating both the papers and books written by Ehrenberg, including *Die Infusionsthierchen* of 1838. The manuscript notebooks in which Gosse eventually wrote up The *Infusoria of Great Britain* are all in the Zoology Library of the NHM. Finding Ehrenberg's classification unsatisfactory Gosse assisted C.T. Hudson in the two volume publication of *The Rotifera* in 1886. Gosse's final publication, however, was an abstruse monograph on the Lepidoptera which was entitled: On the clasping organs ancillary to generation in certain groups of Lepidoptera *(Trans. Linn. Soc*. 1883).

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[1] At this time Newfoundland was not part of Canada: Compton was in the province of Quebec.

[2] See *The Linnean*, Special Issue No.1, 1998 on the cover of which Ehrenberg's name is incorrectly spelled.

A Punch cartoon of octopus and aquarium.
Original source: "Drawing room aquaria" as illustrated by John Swain in Punch, 1860. London.

In 1849 Gosse was elected an Associate of the Linnean Society. He had been proposed by his cousin Thomas Bell: his supporters included E. Doubleday, A. White, E. Forster and John Gould. Being an Associate rather than a Fellow let him off the heavy subscription. Meanwhile, in 1852 he compiled the *Antiquities of Assyria* and his *History of the Jews, from the Christian Era to the Dawn of the Reformation*. The following year saw the publication of *A Naturalist's Rambles on the Devonshire Coast* and *Seaside Pleasures*, both with coloured plates. In the appendix to *A Naturalist's Rambles*, he introduced the invention of his marine aquarium, noting that he had already kept many marine animals alive for over 11 months. 1854 also saw the publication of *The Aquarium* while, to meet the needs of the public, he issued his two volume *Manual of Marine Zoology* (1855–1856) containing some 700 woodcuts which he himself had drawn.

Needing to pay for his move from London to Devon, he published an anonymous guide entitled: *Wandering through the Conservatories at Kew*, which was quickly followed by *Omphalos*[3]. Gosse hoped that this publication would finally settle once and for all the conflict between science and religion. In it he clings tenaciously to his belief in the fixity of species, maintaining that species were divinely created and immutable, proposing the law of prochronism [the false estimate of time]. God had planted fossils in the rocks not to test the faithful nor to fool the scientists but simply because at the dramatic moment of creation "the world presented, instantly, the structural appearance of a planet on which life had long existed".

[3] The Greek word for navel; after all Man could not have been a Man without a Navel! Gosse believed that God created Adam and Eve, each with a navel.

Clue: Held one of the first chairs in Oceanography.

Gosse was a member of the Brethren (Church of Christ) a group of fundamentalists who thought that the Second Coming was imminent and that he [Jesus] might take up his citizenship any day. Accordingly, Gosse spent his Sundays preaching this message, first in North America, then Jamaica and finally England.

During the period 1857–1860 he published over 30 papers, zoological and theological, as well as four books including *The Romance of Natural History* (1860) and a history of the British coelenterates: *Actinologia Britannica*. As Stephen Jay Gould remarked, "In spite of his spectacular nonsense (viz. *Omphalos*) he was the finest descriptive naturalist of his day". All told, he published some 80+ zoological papers in journals as varied as the *Canadian Naturalist*, the *Gardener's Chronicle* and *Urban Symbolae Antilanae*. He published several papers in our *Transactions*, including on *Peachia hastata* on 20 March 1855, and the same year he established the genus *Sargartia*. *The Romance of Natural History*, however, contains what is perhaps his most famous theory of the sea-serpent as a surviving *Plesiosaurus* (Shades of Loch Ness!). There is a volume of cuttings and original drawings in the NHM on orchids[4], while some of his correspondence is filed at Kew.

BRIAN GARDINER

[4] Interestingly, Darwin and Gosse exchanged several letters on orchid fertilisation, in particular *Stanhopea* and the musk orchid *Herminium monarchis.*

Correspondence

11 January 2004 Maidstone, Kent ME17 2AP

Dear Professor Gardiner

It was a pleasure to read Hugh Loxdale's Commentary in the *Linnean* 19(3) about Arts versus Science, even though I do not agree with much of what he says.

For a start, 'versus' and then his conclusion that 'art and science are merely aspects of the same spectrum'. In reality they are different in the way they see the world. Art and Science use different sides of the brain, being intuitive and logical respectively. This does not mean that these are exclusive to each of them but rather that you can not be a good artist unless you are initially intuitive and you can not be a good scientist unless you are grounded in the logic of scientific method and the transparency and accountability that flow from it.

These are not antagonistic opposites and we do not have to choose to live our lives by one or the other. We train our skills in our chosen expertise, or maybe both of them, but have to use the appropriate way to see the world when working as an artist or as a scientist.

The founders of the Royal Society, the Linnean Society and the Royal Academy of Arts had no problems with this. They embraced art and science together as essential to a decent and progressive society. How right they were. They recognised that they should not confuse the two and that did not stop anybody from being both an artist and a scientist. You just have to get in touch with your logical or emotional side as the starting point.

Great art and great science are linked by creativity, that indefinable ability to see something new in the world around us and make new connections between apparently separate things. An interesting link was made by Sir John Meurig Thomas on the radio on 4 January when he suggested that physical scientists and most artists have a 'dialogue with nature' while mathematicians and composers 'pluck it from the ether'.

My own experience comes from being brought up in an artists' household (my father was a member of the Royal Academy, behind the Linnean Society) and rebelling by wanting to be a scientist (rebellion is not only wanting to be an artist) and taking a botany degree with the aim of doing plant breeding. I decided I wanted to do more environmental work so I took a landscape design course, which enabled me to work across what were then regarded as boundaries. Design sits somewhere between art and science in its methods and it is also 'creative'.

My own experience in ecology and nature conservation leads me to be very concerned about any dilution of the quality of seeing the world through science. I see the 'politicisation' of nature conservation all the time in my work and a lack of an appreciation or understanding of scientific method and facts. The exclusion of Vavilov in favour of the unscientific views of Lysenko is a dramatic example of what can happen if the integrity of science is undermined.

In my own field, many people regard the National Vegetation Classification as an essentially unscientific basis for deciding the future management of landscapes for nature conservation. What is the point of descriptions in this way of ecosystems that are entirely dependent on human management and only at a particular time in their history? A scientific approach would look at processes and survival strategies as the basis for decision making. While the uses of science are clearly social and political, when the science itself is compromised the results can be serious.

The risk of blending art and science is that it leads to people believing that science can be understood by any other than scientific method. This is wonderfully expressed by Sokal and Bricmont in *Intellectual Impostures* (profile Books, 1998). They look at the attempts by post-modern philosophers to put a new spin on understanding their area of work, nuclear physics. To paraphrase the post-modern philosophers outlook, they say 'I think therefore I am a nuclear physicist'. Sokal and Bricmont write very well on what science is, what its limits are and the relationship between science and society.

To me, the danger of confusing the unique aspects of art and science risks undermining both of them. We live in a world of increasing specialisms but there is no problem with that if we remember the humanity we have in common. The left and right side are still parts of the same person's brain.

Yours sincerely, TOM LA DELL FLS

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6 January 2004 Brighton BN1 5ND

Dear Brian

A Biography of Percy Sladen enclosed with the last Linnean is most interesting. The photograph of The Sladen Gallery on page 16 shows the magnificent woodwork of the cabinets. However, the Biography does not mention that Percy Sladen was the designer of the most famous cabinets known. They were in two sizes, being changed from the original to the latest pattern after some years.

These cabinets were designed to have fitted drawers at half-inch increments. The drawers were from one and a half inches to four inches in depth. They could be used for articles as thin as coins to objects up to four inches thick. For collectors, coins, fossils, insects, birds' eggs and all articles of natural history could be accommodated in the cabinets. Nearly all museums are familiar with them. Each had a pedestal (plinth) and a well-designed top. They could also be stacked upon each other, usually to three cabinets high. They were made in either oak or mahogony and highly polished.

I have such a cabinet in which my Ascalaphids are housed. In the last thirty years or so these cabinets became known as Hill's cabinets, as they were manufactured solely by that firm. However, they were the Sladen pattern.

Best wishes, MICHAEL DAWSON FLS

To the Editor, The Linnean London W12 0LN

I was fascinated by the *Biography of Percy Sladen* in your *Special Issue* No.4. All I had known about him was that, back in 1950, the Oxford University Expedition to Persia had happily received fifty pounds from the Percy Sladen Memorial Fund. This money helped four of us to work there during that year's long vacation, with my particular intent being a discovery of cave fish.

Specimens allegedly existed in the qanats – subterranean water adits – of southern Persia, this tale boosted by a Briton who wrote in 1935 that such fish were good to eat. My Oxford professor, Alister Hardy, excitedly demanded that all captives should go to science rather than the frying pan, and science 'would honour us'. Africa and America were already known to possess truly cavernicolous fish species, these without eyes or pigment, but nothing of the sort had been found in all Eurasia. Science rarely honours mere undergraduates, and we were delighted at the prospect.

Unfortunately we discovered nothing of the sort, the qanat's fishes being a standard surface variety, *Capoeta bushei*, but that failed to stop me entitling a book about the expedition – *Blind White Fish in Persia*. This work made no mention of a Danish paper, published after our return to Oxford, describing *Iranocypris typhlops* a true cave fish – Eurasia's first – encountered within Iran's Zagros mountains in 1937. (The war had hindered publication.)

Failure number two then surfaced from Iraq. A British engineer, oil-man by trade and speleologist by inclination, had read my book before writing to me, most disarmingly:

> "I happened to be down a sink-hole 300 feet deep the other day when I discovered some of the fish you were looking for. I fed them on corn flakes, one each every other day. Yours, A.G. Widdowson. P.S. They are now dead."

The fish section of the British Museum (Natural History) and I quickly replied to him:

> "Should you happen to be down that hole again could you refrain from food in general and corn flakes in particular before placing any captured specimens in the enclosed tubes of ethyl alcohol. Thank you."

Before long *Typhlogarra widdowsoni* was being added to the scientific list.

In 1976, on my first repeat visit to Iran, I was able to visit the location of the Danish discovery, this deep within the Zagros mountains and inaccessible by road. The 1950 paper had described 'six fish swimming lethargically around in a well-like outlet'. On reaching this spot, accompanied by the valley's entire population of children, I was astonished to observe six fish swimming lethargically around before I was immediately dismayed when every child leaped into that pool. This misery turned to joy when three of the minute fish were held for me to see before their transfer to someone's screw-top jar.

They were certainly odd fish, being not so much blind and white as quite devoid of eyes and blood-pink from their lack of pigment. One of them would graze the water's surface when upside-down, another would rest with most of its body above the water-

line, and the third – being the largest at 5 cms – was proudly retained by a government official who had been helpful. Amazingly my pair survived the journey back to Tehran, the flight to London, and immediate transit to the B.M. There the grazer was declared to be *I. typhlops* the Danish find, while its companion, so disdainful of water, proved to be the world's first cave loach. Humphry Greenwood, one-time president of our society, described the find and called it *Nemacheilus smithi*.

More followed. The fact of two species occupying the same habitat was itself a rarity, and the B.B.C. made a film about this Zagros story. An Iraqi, having seen that programme when in England, wondered if two kinds might also inhabit Widdowson's location 300 feet down a sink-hole near Haditha. Surprisingly, for a continent possessing nothing of the sort so very recently, yet another species of blind carp was found to be partnering *T. widdowsoni*. A similar sink-hole in Oman then proved to be the home of yet another eye-less cyprinid, and Chinese scientists were soon describing a blind, pink loach as distant companion for *N. smithi*.

Percy Sladen's posthumous donation of fifty pounds undoubtedly helped much of this story to occur. Finding new vertebrate species at roughly ten pounds a time must, in my prejudiced opinion, be money well spent. It was therefore with much gratitude, and excitement, that I read the Percy Sladen story, and of the beneficial endowment set up by his widow which has now assisted aspiring scientists for exactly a century.

ANTHONY SMITH

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10 Battishill Street, Islington, London N1 1TE

Dear Brian

The debate over Evolution and Special Creation

In my opinion John Burton *(The Linnean* **19** (3) 13–14) is correct. I do not intend to imply that everything about religion is mythical, but the fact of evolution and the contradictory myths of Christianity are incompatible, as Charles Darwin knew all too well. The tragic death of his own daughter must have shaken any faith that remained to him as to the effectiveness of prayer for divine intervention. (The lack of any statistical correlation between the two was established, I believe, well over a century ago.)

As a child, I received a fairly orthodox C of E upbringing. My paternal grandfather, Rev Dr G. A. Thompson was, for many years, Headmaster of Horsham Grammar School. However, before I was ten, my father, A.G.G.Thompson MD (Cantab) had told me not only about Paley's 'watch' but also about evolution and natural selection. So I used to wonder about the concept of hereditary 'souls'. At what point in the evolution of mankind had God introduced them? It seemed to me rather unfair that some people should have been denied them when their own children had not been so deprived. Moreover, it would be very sad for those children, I thought, to find when they got to heaven, that they did not have any parents up there. I also wondered at what stage in their development

human embryos became imbued with souls. If a 4-celled embryo could have a soul, why not a multicellular earthworm or even a jelly-fish? As I grew older and learned more about the fossil record, the idea of living for a million years, let alone 'for ever and ever' became unimaginable. It was quite out of proportion to the length of human life on earth. A lifetime seemed like 'for ever'. One might become bored after a thousand years! And were the souls of Egyptian mummies still living in heaven, I wondered. R.J. Berry (1996 *God and the Biologist*. Leicester: Apollos) goes some way to answering a few problems about the soul, but he does not address the difficulty of understanding eternity.

Remembering the horrified reaction of my wife's Italian aunt when, many years ago, I put her umbrella on the bed, I once remarked to Carl Pantin that I was not superstitious. 'Oh yes, you are,' he replied. Knowing then what to look out for, I soon began to realise how right he had been. Like most people, I form habits easily. This has the great advantage that one can think about more interesting matters when, for example, carrying out simple domestic tasks. But habits do not stop there! Before long, it makes one feel quite uncomfortable to break them. Most people seem to react in a similar way: we are naturally conformist. It is not difficult to realise that an extended human family or group would experience a selective advantage if it were united in mutual support. This co-operation would undoubtedly be enhanced by worshipping an idol, a totem pole, or some other object or idea. Could this account for the prevalence of religious beliefs throughout human evolution? And could group as well as kin selection have been involved?

String theory may, to some extent, unite the behaviour of subatomic particles with gravity and relativity, but it cannot explain free will – should this actually exist beyond the constraints of DNA and nuture. Or can it? Professor Berry emphasises the objections to a Grand Unified Theory. I look forward to reading his forthcoming article, although I shall almost certainly remain a hopeful agnostic. If God does exist, it would be most discourteous not to believe in him/her.

My first biology teacher at Marlborough in 1935, the renowned A.G. Lowndes, was a sincere Christian. He had been awarded a choral scholarship to King's College, Cambridge, where he studied Natural Sciences. When some boy plucked up the courage to ask him how he could reconcile religion with the evolution of life, he is said to have replied: 'every effect that I have experienced has had a cause'. Sam Berry, too, discusses a 'First Cause' in relation to 'Evolution and Purpose'.

JOHN CLOUDSLEY-THOMPSON FLS

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24 December 2003 43 Eugene Gardens, Nottingham NG2 3LF

Sir

I wonder if I am alone amongst the readers of *The Linnean* in finding R.J. Berry's lengthy letter rather more curious than informative (*The Linnean*, 20: 8-14, 2003)? He introduces the word 'God' several times, yet failed to define exactly what he means by

the term, a somewhat unscientific approach, but presumably he assumes there to be general agreement as to its meaning. However, an examination of various works in which the term, with or without a capital letter, is employed will soon show that this is anything but the case. Indeed, it would even be difficult to formulate an agreed definition using just the bible. It would, I think be better all roound, if as far as science is concerned Laplace's stance was adopted, for asked why he failed to mention god, he responded by saying, 'God is an unnecessary hypothesis'.

As for creationism, the fundamentalists to whom Professor Berry refers somewhat distdainfully, seem to have grasped what he fails to, namely that if a literal biblical creation is dismissed then it also demolishes the case for a literal fall, and if there was no fall then Christianity itself becomes 'an unnecessary hypothesis'. However, if he cannot rid his thought processes of primitve superstitions, he might find it of value to consider an alternative form of creationism, perhaps that advocated by the deist Thomas Paine in his, *The Age of Reason*.

Yours truly
ROBERT MORRELL FLS

The National Botanic Garden of Wales

The National Botanic Garden of Wales opened in 2000 as a Millennium project dedicated to the tradition of botanic gardens; furthering the progression of science and also emphasising and educating people about plants, the natural world and the importance of conservation. We were employed to help with the interpretation of the NBGW's newly renovated double walled garden. The double walled garden was originally built as a kitchen garden in the early 1800's but fell into disuse over the last century. The NBGW has used the space in an innovative way and created a systematics garden, with an evolutionary twist and a very aesthetically pleasing layout.

The inner double walled garden is a rectangular garden split into four quadrants, one containing a kitchen garden and the other three devoted to the systematics beds. The systematics quadrants will, like traditional order beds, contain areas devoted to particular plant families and orders. The quadrant containing the monocots, the ANITA group and the eumagnoliids has been fully planted; the remaining two quadrants will be devoted to the eudicots and will hopefully be completed for summer 2005. However, as well as systematics, there is an extra component to the design; it has been arranged so that plants considered basal in evolutionary terms are situated in the centre of the garden with the plants radiating out to the more derived on the edges. Another objective of the design was to make the garden horticulturaly interesting and a pretty place to stroll around to attract visitors who initially may not be interested in the scientific aspect – in order to later educate them by stealth!

Our main responsibility was to take tours of this garden, explaining the science behind

the design. The tours included information about taxonomy and the history of systematics gardens and from there moved on to other areas of plant science to which systematics greatly contribute. We included stories about evolution, conservation, genetics, plant-animal interactions, plant nomenclature and the environment. There was a great range of people taking part in the tours, of many different age groups, nationality and botanical knowledge. Many of the people who came on the tours had an interest in horticulture and were visiting primarily to see new plant species as well as more familiar varieties, and to get ideas for their own gardens. One of the most rewarding things about showing these people the garden and explaining the layout was introducing them to a scientific approach to plants that often they had never considered before. Many of them were fascinated and eager to learn more about botany and we got frequent requests for more information and recommendations of ways to learn more about systematics.

The NBGW is a wonderful place for a family visit, with lots of space for running around and activities and displays especially aimed at a young audience. To bring families into the double walled garden too, we devised a children's activity that we ran every day over the summer holidays. There was a short talk about the history of the garden emphasising the importance of a kitchen garden as a food source in the past and then a competition to collect tokens for food-producing plants in the walled garden with the idea of introducing children to these plants and their significance.

Another tool we used to introduce plant science to visitors was 'Close Encounters with Plants'. This was a display set up in the Great Glasshouse where visitors could use microscopes to further investigate plant anatomy and also some of the unique adaptations to a mediterranean climate shown by the plants growing in the glasshouse. This was with the intention of reinforcing the ideas about pollination and evolution we discussed in our tours. Giving visitors the opportunity to investigate the plants themselves using the

microscopes, which many had never used before, hopefully made science, as an activity, more accessible.

We both found this placement very enjoyable and immensely rewarding, not only did we have the satisfaction of kindling people's enthusiasm for botany, we benefitted greatly from working with the experienced, energetic and highly knowledgeable staff at the gardens. We also learnt a lot from the people on our tours who often had a wealth of plant knowledge in areas we have rarely touched on in our studies. Having to explain the systematics to others deepened our own understanding of the subject and working in the monocot quadrant certainly increased our taxonomic knowledge.

Thanks to the help of the Linnean Society we had a fabulous summer having the opportunity to open people's eyes to systematics, to learn more about plants ourselves and to gain knowledge and skills we can utilise in our future careers. The gardens themselves provided a beautiful and striking working environment and the rewarding work made the whole experience truly worthwhile.

CAROLINE DAVIS
ERICA HOOPER

The Trustees of the National Botanic Garden of Wales are extremely grateful to the President and officers of the Linnean Society for the award of five bursaries (2003–2005). The general public were very appreciative of their guides who are now both embarking on Masters courses in taxonomy – very satisfactory outcomes for all. The Garden is gradually recovering from its financial problems – come and see what we have achieved! *Dianne Edwards*

Beringer's iconoliths: palaeontological fraud in the early 18th century

Two extraordinary books were published in 1726. *Travels into Several Remote Nations of the World* recounted Captain Gulliver's voyages to Lilliput, Brobdingnag and other fictitious lands. In the same year that Jonathan Swift published his famously imaginative novel, Johann Beringer brought out a scientific treatise – *Lithographiae Wirceburgensis* – equally fantastical in its own way. Beringer's book described some remarkable 'figured stones' or 'iconoliths' reputed to have been dug out of the ground at a place called Eivelstadt (now known as Eibelstadt) near Würzburg in Bavaria, southern Germany. These objects, the Lügensteine or Lying Stones of Beringer as they came to be known, achieved notoreity as a palaeontological fraud second only to Piltdown. Stephen Jay Gould's (2000) penultimate collection of essays taken from *Natural History* borrowed its title – *The Lying Stones of Marrakech* – from the Beringer fraud. Unlike the Piltdown remains, however, Beringer's iconoliths never misled science – the fraud was exposed within a few months of publication. The perpetrators of the deception are not in any doubt and the fraud has therefore not spawned the countless 'whodunnit' theories

associated with Piltdown. Nevertheless, the story of Beringer's iconoliths is worth repeating in view of the popular misconceptions that surround the tale, and the insights that it offers into how fossils were viewed by naturalists during the early 18th Century. Melvin Jahn and Daniel Woolf (1963) performed a great service to science by translating *Lithographiae Wirceburgensis* from the Latin and assembling documentation about the fraud. Their work, entitled *The Lying Stones of Dr. Johann Bartholomew Beringer being his Lithographiae Wirceburgensis*, is the principal source for the following article, the quotations being taken from their translation and cited according to their page numbers.

Johann Bartholomew Adam Beringer (1667–1740) was the son of Professor Johann Ludwig Beringer. The life of the younger Beringer is scarcely known and there is no surviving portrait, despite the fact that he served as Chief Physician to the Prince Bishop of Würzburg and Duke of Franconia (Christoph Franz von Hutten) and to the Julian Hospital, and was Dean of the Faculty of Medicine at the University of Würzburg. He was described as being active and scholarly. While 'lithology' (the study of rocks) constituted only a small part of his interest in the natural sciences, it is clear that Beringer had a high regard for the study of how stones formed because, like the celestial bodies in the heavens, they were testaments to the majesty of God the creator. Like many learned men of his time, Beringer assembled a cabinet of natural curiosities containing specimens gathered from around Europe by friends and benefactors. Beringer's cabinet is known to have contained some two hundred ammonites (Jahn and Woolf 1963, p. 105) and likely also included other true fossils, such as belemnites and glossopterae (sharks' teeth), along with minerals and concretions. In 1725, however, a torrent of new and unique objects were added to Beringer's collection. These iconoliths were the subject of *Lithographiae Wirceburgensis*.

The book

Prior to Jahn and Woolf's (1963) translation, two editions existed of *Lithographiae Wirceburgensis*. The first edition of 1726 contains Beringer's treatise inserted between a dedication to the Prince Bishop of Würzburg and fifty medical corollaries both written by his student Georg Ludwig Hueberg who probably paid for the publication as a condition of obtaining his Doctorate of Medicine. Hueberg's corollaries bear no direct relationship to Beringer's text on the iconoliths and instead concern the effects of human temperament and behaviour on health: "The living human body… would grow ill more rarely were there less of moral causes and lesions. The truth of this assertion is borne out by the simple observation… that attacks of sickness are much more frequent in man than in brute animals" (Jahn and Woolf 1963, p. 155). A second edition of *Lithographiae Wirceburgensis* published in 1767, twenty seven years after Beringer's death, is furnished with a new title page, omits Hueberg's corollaries, and seems to have been an attempt by Beringer's heirs to capitalize financially on the notoreity that the first edition had achieved by this time.

The centrepiece of *Lithographiae Wirceburgensis* is undoubtedly the twenty-one engraved plates depicting the iconoliths. Examples of Beringer's plates are reproduced

here in Figures 1–6, kindly scanned by Professor J.W. Schopf (UCLA) from his own copy of the rare 1726 edition (see Schopf 1999, Chapter 11). Although over two hundred individual iconoliths are figured in Beringer's plates, they represent only about one-tenth of the total number in Beringer's collection. Remarkably, some 2000 iconoliths were acquired by Beringer between June and November of the year 1725. Approximately 450 of these specimens survive today, including 183 in the Institute of Geology at Würzburg University, 134 in the Mainfränkisches Museum in Würzburg, and even two in the University Museum, Oxford (Edmonds and Powell 1974). In the words of Beringer, as translated by Jahn and Woolf (1963, p. 21):

FIGURE 1: Plate V from Beringer's *Lithographiae Wirceburgensis* (1726) showing some iconoliths that may be genuine fossil molluscs along with carved frogs, one sitting inside a bivalve shell (centre left). Both of the ammonites have been modified, that at the top of the plate being inscribed with symbols and the one at the bottom with a head and eye recalling a snakestone of folklore.

> "Here, representing all the kingdoms of Nature, but especially those of animals and plants, are small birds with wings either spread or folded, butterflies, pearls and small coins, beetles in flight and at rest, bees and wasps (some clinging to flowers, others in their nests), hornets, flies, tortoises from sea and stream, fishes of all sorts, worms, snakes, leeches from the sea and swamp, lice, oysters, marine crabs, pungers, frogs, toads, lizards, cankerworms, scorpions, spiders, crickets, ants, locusts, snails, shell-bearing fishes, and countless rare and exotic figures of insects obviously from other regions. Here are nautili, ammonites, starfish of very different and very delightful species, shells, spiral snails, winding shells, scallops, and heretofore unknown species. Here were leaves, flowers, plants, and whole herbs, some with and some without roots and flowers. Here were clear depictions of the sun and the moon, of stars, and of comets with their fiery tails. And lastly, as the supreme prodigy commanding the reverent admiration of myself and of my fellow examiners, were magnificent tablets engraved in Latin, Arabic, and Hebrew characters with the ineffable name of Jehovah."

Beringer refrained from describing each iconolith in detail, neither did he name them

or erect a taxonomy. A small minority of the iconoliths appear to be ammonites and bivalve molluscs (Figure 1), albeit modified to varying degrees, and would not look out of place among the illustrations of fossils published by contemporary naturalists. However, the majority of Beringer's iconoliths are quite unlike true fossils. They include, for example, 'spiders' perched on crudely-constructed webs (Figure 2), 'birds' with associated eggs (Figure 3), 'plants' with roots, stems, leaves and flowers all intact and in one case being visited by an insect (Figure 4), 'snails' with not only the shell preserved but also the foot and head, 'frogs' and 'insects' both caught in the act of mating, and bizarre crustacean-like animals, one with a carapace resembling a tortoise shell and another with a peculiar triple pincer. Most of the iconoliths show full preservation of the soft parts, although one shows the skeleton of a lizard-like animal and another of an apparent bird (Figure 3). A few iconoliths comprise assemblages of up to a dozen different species arranged neatly over the surface of the stone.

In addition to these apparent animals and plants, one of Beringer's plates (Figure 5) depicts iconoliths in the form of miniature celestial bodies (comets, sun, moon and stars), and another (Figure 6) iconoliths (including possibly fossil shells) covered by symbols. The latter were accorded great importance by Beringer who interpreted the symbols as imperfect Hebrew script which, in some of the iconoliths, spelled out the name Jehovah. He showed the iconoliths to "a Jewish Rabbi of scholarly distinction who, upon seeing two of these stones, was struck with holy fear, and after a long silence, avowed that he did reverence to the ineffable Name of God expressed in this wondrous work of Nature." (Jahn and Woolf 1963, p. 78)

All of Beringer's iconoliths came from Mount Eivelstadt, a rugged and barren hill dissected by ravines and strewn with rocks. This is now known to be an outcrop of Muschelkalk, a Triassic formation of marine limestones which yields true fossils of shelled invertebrates including

FIGURE 2: Spider iconoliths from Plate X of *Lithographiae Wirceburgensis* (1726). Two of the spiders sit on webs, while the spider at the bottom left has captured an insect.

FIGURE 3: Iconoliths of birds shown in Plate IV of *Lithographiae Wirceburgensis* (1726). Note the egg associated with the bird at the bottom right, and the skeletal preservation of the bird in the middle left.

FIGURE 4: Plate VI of *Lithographiae Wirceburgensis* (1726) showing iconoliths of plants, including a flower being visited by an insect (top centre) and acorns (bottom centre).

ceratite ammonoids and bivalve molluscs. The frontispiece of *Lithographiae Wirceburgensis* shows the hill as a monument-capped pile of iconoliths on which recline several classical figures.

Beringer recognized that the Eivelstadt iconoliths differed from all other figured stones in various ways. He observed that:

1. The iconoliths had coarse undersides whereas the upper sides bearing the figures themselves were smooth “as though they had been highly polished with pumice.” (Jahn and Woolf 1963, p. 35)
2. “The figures expressed on these stones, especially those of insects, are so exactly fitted to the dimensions of the stones, that one would swear that they are the work of a very meticulous sculptor.” (Jahn and Woolf 1963, p. 35)
3. Very few of the figures show any sign of compaction. “Rather, they are raised on the tablets in a kind of carved and polished relief, but so obviously a continuation of the

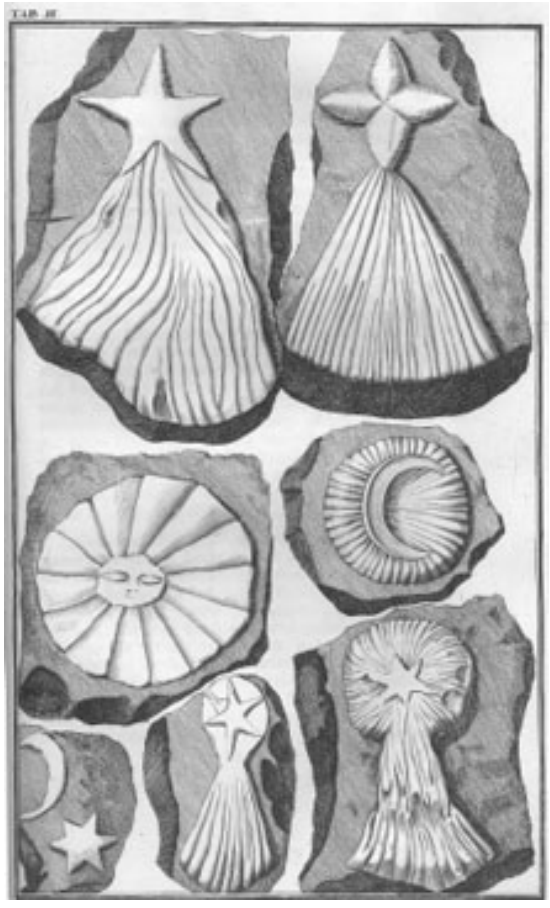

FIGURE 5: Iconoliths of celestial objects – mostly comets, but also the sun, the moon and a star – depicted in Plate III of *Lithographiae Wirceburgensis* (1726).

rest of the stone that they cannot possibly be said to be affixed or superimposed by an extrinsic agent." (Jahn & Woolf 1963, p. 36)

4. The animals and plants "contain nothing of the natural color, matter, covering, or armor which might be described as congenital to them… Rather, they bear the exact consistency, material, and color of the stones in which they lie and to which they owe their origin." (Jahn and Woolf 1963, p. 36)
5. "All of the small beasts and insects are found in that proper posture which Mistress Nature desires for them, very rarely on their back or side. The order with which their members are disposed is so striking.. and their parts so perfectly formed that they elicit the most enthusiastic admiration of all who see them." (Jahn and Woolf 1963, p. 36)

These observations, together with the peculiar nature of many of the iconoliths, ought to have raised suspicions in Beringer's mind about the legitimacy of the material at his

disposal. However, any such doubts were at the time untenable to Beringer. In the Introduction to *Lithographiae Wirceburgensis* he wrote:

> "… in vine-covered and rugged mountains and in quarries there has been gathered so prodigious a collection of ammonites, of petrified shells from the sea and the rivers, that entire walls constructed of rocks densely encrusted with shells turned to stone take the place of the customary hedges surrounding the vineyards. However, since these are so common to many lands and have been amply publicized at the expense and by the efforts of many writers who have had easy access to them, I have considered them unworthy of further research and study. …. by a singular stroke of Divine Providence, which I thank and adore on my knees, a mountain which I had frequented and examined in the past but had never scrutinized very closely, revealed a treasure…" (Jahn and Woolf 1963, p. 20)

This passage implies Beringer's support for the theory that normal fossils – "petrified shells from the sea and the rivers" – represent the remains of formerly living creatures as, of course, is nowadays known to be true. The same explanation could not, however, account for the Eivelstadt iconoliths which were so very different from previously described fossils. Much of the *Lithographiae Wirceburgensis* comprises a discourse on alternative explanations for the origin of the iconoliths, some based on contemporary theories about how fossils originated, others on suggestions made to him by colleagues about the iconoliths. He discussed iconolith formation through the Spermatick Principle, fabrications of the light, the Great Flood, and 'sports of nature', and also as artefacts made by pagans or recent fraudsters.

The Spermatick Principle, championed by the Oxford scholar Edward Lhwyd (1660–1709), held that fossils grew in rocks from the airborne seeds of marine creatures. This theory did not appeal to Beringer, not least because the Eivelstadt iconoliths were found far from the sea. Furthermore, the theory could not explain iconoliths bearing images of comets or other celestial bodies (Figure 5) or those with Hebrew script (Figure 6). An iconolith shown in plate 5 of *Lithographiae Wirceburgensis* consists of a toad-like animal in a shell. Beringer questioned how this might have originated according to the Spermatick Principle: "What sort of vapor could bear to the mountain of Franconia the seed of a toad, that in one parturition a clay or limestone rock would give birth to a well-formed toad enclosed in a scallop shell?" (Jahn and Woolf 1963, p. 62) (see Figure 1).

Fabrication of the iconoliths through the action of light was suggested to Beringer by a friend in conversation. Beringer considered light to be a flow of minute solar bodies which could take on and carry the form of all that it illuminated.

> "Now, since it is admitted that light possesses the very marvelous faculty of painting, representing, and forming such corporeal images as it acquires in its diffusion, is it not further possible that it is endowed with a kind of active plastic power of impressing these images on properly disposed matter? We know the force of solar rays acting upon the earth. We know that the atmosphere is impregnated with the dregs of countless elemental atoms having a certain efficacy. These atoms, operating in conjunction with the forces of light, would have impressed upon soft mud, or clay, or sandy stones the figures of insects, plants, and even of stars…" (Jahn and Woolf 1963, p. 44)

This hypothesis won some support from the former existence of a Jewish cemetery close to the site of discovery of the iconoliths – light may somehow have 'absorbed' the Hebrew characters from the gravestones and transferred them to the iconoliths of Mount Eivelstadt.

Although Beringer was generally in sympathy with the diluvial hypothesis explaining fossils as products of the Great Flood, he did not believe this to be true for the Eivelstadt iconoliths. The sea during the biblical cataclysm would have been far too violent and turbulent to preserve fragile insects and plants so perfectly, let alone the gossamer webs of spiders (Figure 2) which even a breeze would have destroyed. Furthermore, the timing of the Great Flood, which was thought to have occurred in the spring, probably May, did not tally with the occurrence among the Eivelstadt iconoliths of a ripe apricot and a mature acorn (Figure 4).

Beringer pondered, but rejected without reservation, the possibility that his iconoliths were 'sports of nature', shapes coincidentally resembling natural objects, perhaps sculpted by the flow of water through the rocks. He felt that the Eivelstadt iconoliths were too perfectly expressed to be explained in this way and yet lacked the colouring often associated with, for example, chance shapes observed in marble.

> "Was Nature jesting when it brought forth an apricot, absolutely perfect and fully ripened, but petrified? Or again, when it fashioned a colt's foot herb in a leaf, a ranunculus and a small plantain, waxing with leaf, stem, and roots? Or when it enticed a wasp to the nectar of a blooming chrysanthemum or white daisy? When it appended acorns to the oak twig? Why did it neglect to color these, while elsewhere in marble, agate, and dendrite it so carefully mixed and applied the colors?" (Jahn and Woolf 1963, p. 75)

FIGURE 6: Script-bearing iconoliths shown in Plate VII of *Lithographiae Wirceburgensis* (1726). In two instances, the writing seems to have been carved onto a fossil bivalve shell.

It was suggested to Beringer that the iconoliths were relics of superstitious pagans, an idea he

thought unlikely to be true because they did not resemble any known pagan objects. Furthermore, he could not understand how objects made of a relatively soft stone could have survived intact for up to a millennium on a mountainside subject to erosive forces. Neither did it seem credible that heathens would have used Hebrew characters, nor Jews animal imagery in their art. Beringer could not conceive of the reason why ancient people would have produced such a large number of artefacts: "Were they to be adornments of some citadels or military bases or palaces?" (Jahn and Woolf 1963, p. 85).

That Beringer was unsure whether the iconoliths were natural or man-made objects is clear from the opening paragraph of Chapter 11 of *Lithographiae Wirceburgensis*. He notes here the existence of weighty arguments favouring both alternatives and remarks: "In this chapter I shall present both contentions, withholding my own opinion, though I shall not hesitate to declare my stand when, in due time, the diggers will have penetrated more deeply into the mountain, and will have uncovered more lucid evidence to resolve the doubt in one direction or the other." (Jahn and Woolf 1963, p. 83). He went on to mention that the iconoliths have:

> ".. a smoothness suggesting the polished effect of applied pumice… One would swear that he discerned on many of them the strokes of a knife gone awry, and superfluous gouges in several directions… the reproduction of exotic and marine animals in many cases most beautifully imitates the images of the living prototypes, and thus hints at the skill of the artist. By contrast, Nature's art works are for the most part incomplete and defective." (Jahn and Woolf 1963, pp. 83-84).

While Beringer was unable to dismiss convincingly a man-made origin for the iconoliths, he was totally damning in his rejection of the idea that they were the products of a recent fraudster. This idea had reached Beringer as a rumour when he had almost finished writing *Lithographiae Wirceburgensis*. The authors of the rumour, two un-named colleagues in the Würzburg Academic Society, claimed that the iconoliths had been recently sculpted by hand and then sold to the unsuspecting Beringer who became caught up in the 'blind greed of curiosity'. (Jahn and Woolf 1963, p. 94). Beringer described some attempts by these colleagues to discredit him:

> "A few weeks ago, when for very good reasons I had closed off the mountain, I nevertheless permitted one of these two men to enter it, obviously in good faith and in a friendly spirit. Unbeknownst to me, he proceeded to throw it open to the public, though he must have, or at least should have, known that I would have objected strenuously. Then with a great hue and cry, he appointed a number of diggers, and, in the presence of the townspeople indulging in drink, he mockingly condemned the unearthed stones as false and superstitious imposters. A short time later, the other of this pair, employing the skill which he possibly learned in his father's shop, and the knife which the Hebrews use for circumcision, carved into some of the more impressionable stones Hebrew characters, the figures of a winged dragon, a mouse, a lion, a pomegranate, etc. Several of these he inserted in various protri\uberances of the mountain; one or two of them he handed over to a stonecutter's helper, and hired him to sell them to me. The lad subsequently returned to him and exhibited the price he had got for selling me this fraud; whereupon he was

roundly applauded and generously rewarded for carrying off the affair so adroitly." (Jahn and Woolf 1963, p. 95).

Beringer conceded that some of the iconoliths may have been fraudulent but he maintained that the great majority were genuine. After all, Beringer noted, faking of such valuable objects might be expected, just as Roman coins and statues were commonly counterfeited by unscrupulous persons. Furthermore, the iconoliths shown in the plates of *Lithographiae Wirceburgensis* had all been drawn and consigned to the engraver long before his two colleagues began challenging the authenticity of the discoveries.

The fraud exposed

By April 1726, less than a year after the first iconoliths had come to the attention of Beringer and within a few months of the publication of *Lithographiae Wirceburgensis*, it is evident that Beringer had accepted that the Eivelstadt iconoliths were fraudulent. The reason why Beringer changed his mind is not known. It is sometimes said that this happened when he was given an iconolith inscribed with his name. However, no such iconolith is known to exist and there is no documentary evidence supporting this idea. Given Beringer's inclination to interpret at least some of the later iconoliths as fakes, he would surely have regarded an iconolith bearing his name as a fake and of no relevance to the authenticity of the earlier discoveries. It is more likely that someone in authority whose opinion he respected or which could not be easily ignored, persuaded Beringer that he had been the victim of a fraud on a grand scale. According to Jahn and Woolf (1963, p. 130) it may even have been the Prince Bishop of Würzburg, a learned man and promoter of the sciences, who finally put an end to the folly.

The apocryphal story of the iconolith bearing the name of Beringer generally describes the fraud as a student prank. The true fraudsters were, however, J. Ignatz Roderick and Georg von Eckhart, probably the two un-named colleagues from the Würzburg Academic Society mentioned above. Roderick was Professor of Geography, Algebra and Analysis at the University of Würzburg, von Eckhart Privy Councillor and Librarian to the Court and University. Both men regarded Beringer as arrogant and set out to ruin him. Transcripts of judicial proceedings brought by Beringer in April–June 1726 against Roderick and von Eckhart were discovered in the Würzburg State Archives in 1935. It seems that for an unknown length of time Beringer had employed three youths – Christian Zänger, Niklaus Hehn and Valentin Hehn – to collect fossils for him. On the fateful last day of May 1725, they delivered the first three of the 2000 iconoliths to him. These iconoliths had been carved at least in part by Roderick and finished-off by Zänger who polished the limestone. Some were apparently taken directly to Beringer, others hidden on Mount Eivelstadt to be discovered by the Hehn brothers and subsequently delivered to Beringer. It has been suggested that Roderick used published illustrations from 16th and 17th century works of natural history on which to model his carvings (Pfannkuch 2000).

The exact outcomes of the judicial proceedings brought by Beringer are unknown. However, Roderick left Würzburg soon afterwards and von Eckhart was dead within

four years. Contrary to popular myth, Beringer himself did not die a broken man but went on to live for another 14 years and continued to publish, although never again on fossils.

Conclusion

Through the unfortunate saga of the lying stones, the hapless Beringer has achieved notoriety in palaeontology. The usual question elicited by his sad story is how could anyone have been so naïve and gullible to have believed that such obviously carved objects were fossils? Charges of naivety and gullibility are reinforced by Beringer's own observations of features suggesting that the iconoliths had been carved, along with his dismissal of the not inconsiderable attempts by the perpetrators to alert him to the fraud before he published *Lithographiae Wirceburgensis*. Beringer's writing is at times pompous and his belief that he alone was chosen by divine providence to describe the iconoliths does nothing to foster any sympathy for him.

On the other hand, Beringer's work must be viewed in the context of its time. There was an imperfect understanding among contemporary naturalists firstly of what exactly constituted a fossil, and secondly of the way (or ways) in which fossils came to be formed. Classifying tablets bearing written script as fossils is in keeping with the old definition of a fossil as being anything dug out of the ground. The text of *Lithographiae Wirceburgensis* demonstrates that Beringer was familiar with debates raging about the origin of fossils and was able to test the applicability of different theories to his iconoliths. Furthermore, he recognized that the Eivelstadt iconoliths were very different from other fossils – they constituted a new and distinct type of fossil demanding a special explanation for their origin. The idea appealed to Beringer that the iconoliths were somehow produced by light transmitting 'images' of natural objects into the rocks, a process he likened to the action of a camera obscura. However, he took into account various other possibilities and left the issue to be resolved by future investigators. Their findings could hardly have been more unwelcome.

REFERENCES

BERINGER, J.B.A., 1726. *Lithographiae Wirceburgensis*. Fuggart, Würzburg, 96 pp.

EDMONDS, J.M., POWELL, H.P., 1974. Beringer 'Luugensteine' at Oxford. *Proceedings of the Geologists' Association* 85: 549-554.

GOULD, S.J., 2000. *The Lying Stones of Marrakech*. Jonathan Cape, London, 372 pp.

JAHN, M.E., WOOLF, D.J., 1963. *The Lying Stones of Dr. Johann Bartholemew Adam Beringer being his Lithographiae Wirceburgensis*. University of California Press, Berkeley and Los Angeles, 221 pp.

PFANNKUCH, H.O., 2000. Dr. Beringer's panoply, or what conclusions can be squeezed out of figured stones? *Geological Society of America Abstracts with Programs* **32** (7): 88.

SCHOPF, J.W., 1999. *Cradle of Life. The Discovery of Earth's Earliest Fossils*. Princeton University Press, Princeton, 367 pp.

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Book Reviews

When Mr. Darwin Met "Mr. Arthrobalanus"

Darwin and the Barnacle: The Story of One Tiny Creature and History's Most Spectacular Breakthrough, by Rebecca Stott. W. W. Norton & Co., 2003. ISBN 0-393-05745-3.

Charles Dickens wrote in the 1850s that "wherever there was a square yard of ground in British occupation under the sun or moon, with a public post upon it, sticking to that post was a Barnacle".[1] Cambridge English professor Rebecca Stott begins her entrancing barnacle book by recalling childhood visits to the seashore, where she first encountered rocks encrusted with cone-shaped shells, each containing a "bizarre inhabitant, a cream-colored shrimp-like creature, upside down, glued to the rock by its head, fishing for plankton through the hole in its cone with its feathery feet".[2] On pieces of driftwood, she found another type – the stalked barnacles – which some consider a seafood delicacy. Ever since those halcyon days on the beach, Stott had wondered about the nature of these mysterious organisms.

For at least six centuries, barnacles were so utterly misunderstood that there was a widespread belief, even among learned authors, that they were the early developmental stages of the northern black goose, or brent. In 13th century writings, the word barnacle refers to the goose, not to the marine invertebrate. (The barnacle goose, *Branta leucopsis*, still owes its common name to that egregious misreading of nature.)

The notion that this bird begins life as a barnacle was based on the early observation that it "does not breed in Britain, and yet suddenly appears in large numbers in large flocks, in districts where barnacles attached to rotting timber are often drifted to the shore".[3] No one had ever witnessed the birds breeding because they reproduce only in remote Arctic latitudes, then migrate as adults to more temperate climes. The "barnacle to goose" story had been dismissed as nonsense by some even in its earliest heyday (one Roger Bacon discounted it in the thirteenth century) yet it proved to be remarkably persistent. In 1661, the Royal Society's first president, Sir Robert Moray "read a paper at one of the earliest meetings of the society, in which he described the bird-like creature which he had observed within the shell of the common ship's barnacle".[4]

The fleshy peduncles by which barnacles attach themselves to rocks and driftwood were confounded with a goose's long, flexible neck, and the feathery cirri within their shells were thought to be the nascent plumage of baby birds. By the nineteenth century, however, zoologists had long since concluded that the shells really contained some kind of mollusc, that the "feathery" feet had nothing to do with feathers, and that the "barnacles into geese" story was literally an old canard (from the disdainful French expression "l'histoire du canard" – a "duck story" – traceable to the same source).[5]

How many species of barnacles, or cirripeds, are there, and how do they reproduce? Where did they come from? How far back can one trace their ancestry? In 1830, when

twenty-two-year-old Charles Darwin set sail as untried naturalist on HMS *Beagle*, no one knew – and the taxonomy literature on the Cirripedes was in hopeless disarray.

Young Darwin initially had no special interest in barnacles, but he was, as his uncle once described him, "a man of enlarged curiosity".[6] On a Chilean beach, in 1835, he collected a conch shell on which he noticed hundreds of tiny holes, which interested him more than the species of the shell itself. He suspected that some little creature had made them, although he could see none. Later, under a magnifying lens, he poked out the culprit, a soft, miniscule inhabitant that was cemented into the hole by its head, waving six pairs of jointed legs in the air. It looked like the body of an acorn barnacle, a creature that was supposed to build its own shell. Darwin had discovered a rare burrowing barnacle, as yet unknown to science. The questions it raised would occupy him for years. As Stott unfolds the story:

> "Darwin will carry this Chilean barnacle on a journey around the world, from the South American beach back to London, preserved in a jar of wine spirits. When he has finished finding homes for all the 1,529 species he has collected and preserved in spirits on the *Beagle*, he will return to the puzzle that the creature's strange anatomy presents; and then he will write this Chilean barnacle's evolutionary biography – a puzzle that will take him eight years to think through."

Eight years (1846–54) devoted entirely to barnacles. Why? Darwin had already sketched out his theory of evolution by natural selection in 1844, then squirreled it away until 1858. What was so interesting and important about barnacles that caused him to place his life – and *The Origin of Species* on hold?

Hundreds of books have retold Darwin's encounters with Fuegian tribes and Galapagos finches, his elucidation of coral reefs, orchid pollination, sexual selection, and the evolution of emotional expression. Barnacle anatomy and classification, however, is an arcane technical field that most Darwin scholars have treated only superficially. Now, at last, Rebecca Stott, a nonspecialist in barnacles, has had the courage and tenacity to make Darwin's barnacles – and their significance – accessible to the rest of us. She has done so with style and charm in this comely book.

Prior to Darwin's work, these seemingly insignificant invertebrates were as little known to Victorian science as the Fuegian tribes he had seen. They were pests that sailors cursed as they scraped them off ship's hulls and dock pilings. Stott chronicles the naturalist's quiet excitement as he explores the barnacle's world on his tabletop, peering through a microscope day after day, his large hands manipulating tiny pins, tearing apart pickled creatures "about the size of a pin's head", as he put it, "and daily see some more beautiful structure".[8] She also weaves some major personal traumas into the narrative, including the heartbreaking loss of Darwin's beloved 10-year-old daughter, Annie, to tuberculosis, and his battles with a mysterious malady while under the care of a medical quack – all during the barnacle years. So protracted was the barnacle study that his children accepted it as a father's normal occupation. When one of Darwin's young sons visited a friend's home, he asked, "Where does he [your father] do his barnacles?"[9]

Charles's grandfather, Erasmus, whom many consider the first European naturalist to publish a theory of evolution – had believed that all living things descended from microscopic sea creatures. He even designed a Darwin family crest with the motto "Ex Omnia conchis" – "All from shells". Combining science and art, Erasmus's "Temple of Nature," (1802) was a long poem about the Earth's creation and the rise of life from microscopic "filaments" in the seas, evolving into every twig on the great tree of life, including man.

> Then, whilst the sea, at their coeval birth
> Surge over surge, involv'd the shoreless earth;
> Nurs'd by warm sun-beams in primeval caves,
> Organic Life began beneath the waves.
>
> First forms minute, unseen by spheric glass,
> Move on the mud, or pierce the watery mass;
> These, as successive generations bloom,
> New powers acquire, and larger limbs assume;
> Whence countless groups of vegetation spring,
> And breathing realms of fin, and feet, and wing.
>
> In countless swarms an insect-myriad moves
> From sea-fan gardens, and from coral groves;
> Leaves the cold caverns of the deep, and creeps
> On shelving shores, or climbs on rocky steeps
> Cold gills aquatic, for respiring lungs,
> And sound aerial flow from slimy tongues.[10]

Charles could not escape his grandfather's influence, though he later tended to deny it. Certainly, Erasmus would have delighted in Charles's four volumes on barnacles and their ancestral affinities, which won him the Medal of the Royal Society in 1854. Charles not only described thousands of living barnacles, but had compared them with fossil specimens as well. The result was an evolutionary classification – published well before the *Origin of Species* – showing how hundreds of variously adapted species had branched out, over millions of years, from common ancestors. Grandfather Erasmus would have been pleased.

In the 1830s and 40s, marine invertebrates were enjoying a scientific vogue, and papers about them dominated the Zoology Section at meetings of the British Association for the Advancement of Science. Among the leading lights, Darwin's good friend Thomas Huxley had devoted himself to crayfish, squid, and jellyfish, while Edward Forbes (another frequent visitor to Down House) worked on starfish and medusae. Always in the back of their minds was the riddle of the origin of life and the similarities of some marine invertebrates to the early stages of vertebrate embryos. Stott imagines that "hushed parlour conversations" with the young zoologists' wives and sweethearts "about undersea reproduction, the slime and tentacles of marine courtship, were doubtless piquant, grotesque, and erotic".[11]

Hand-coloured plate from Darwin's book (courtesy of AMNH Library).

Only recently, the zoologists had learned that adult barnacles, which spend their lives fastened to one spot, develop from free-swimming young – more like crustaceans than molluscs, as had been previously thought. Forbes showed that medusae reproduce not only by spewing eggs, but also by asexual budding, which he found absolutely marvelous to behold:

> "What strange and wondrous changes! Fancy an elephant with a number of little elephants sprouting from his shoulders and thighs, bunches of tusked monsters hanging epaulette- fashion from his flanks in every stage of advancement. It is true that [Medusae] are minute, but wonders are not the less wonderful for being packed into small compass."[12]

Barnacles are hermaphroditic, sporting both male and female organs, but cannot fertilize themselves. They do pass genes to their neighbours, using the largest penis in the animal kingdom proportionate to size. "The probosciformed penis [in the minute *Cryptophialus* males]," Darwin wrote, "is wonderfully developed... when fully extended, it must equal between eight and nine times the entire length of the animal! [Yet] there is no mouth, no stomach, no thorax, no abdomen, and no appendages or limbs of any kind..."[13]

Darwin's Chilean burrowers (a species he at first affectionately called "Mr. Arthrobalanus"),[14] seemed to consist entirely of males, while the genus *Ibla* seemed to be all females. On the *Ibla* bodies, however, he soon discovered several tiny males – little more than tubes containing sperm – which he had at first mistaken for parasites. Although males are free-swimming as juveniles, "at the instant they cease being locomotive larvae [they] become parasitic within the sack of the female, & thus fixed & half embedded in the flesh of their wives they pass their whole lives & can never move again", Darwin wrote.[15] There were also barnacles with separate sexes, which led him to believe he could demonstrate a series of transitions from hermaphrodite to two sexes. What he had

seen among sea creatures was so bizarre and improbable, he wondered whether anyone would believe him, and had once warned a botanist friend, "You will think me a Baron Munchausen amongst Naturalists".[16]

Since beginning his species notebooks in 1837 in an attempt "to discover the laws of life",[17] Darwin had been aware that the creationist doctrine of fixed species would crumble if only he could find extreme mutability within one species. "Once grant that species [of] one genus may pass into each other", he wrote, "& whole fabric [of fixed species] totters & falls".[18] As it happened, the first genus he had chosen to study, *Arthrobalanus* (the group that included his burrowing barnacle) would turn out to be the very epitome of mutability, revealing the astounding variability of organisms in nature.

Darwin's friend, the botanist Joseph Hooker, had warned him that "no one has the right to examine the question of species who has not minutely described many".[19] The barnacles won him that right, as he developed an extensive network of scientific correspondents, who would later greet the *Origin* with respectful attention. Classifying the barnacles gave Darwin new skills as a dissector, microscopist, observer, classifier, and theoretician. Moreover, he had satisfied himself that nature produced no sharp lines between varieties and species.

"My life goes on like Clockwork", he wrote to his old captain, Robert FitzRoy, during the barnacle years, "and I am fixed on the spot where I shall end it". [20] Stott sums up his forty years at Down House, his country estate in Kent: "The larval Darwin has metamorphosed. He has found his rock. Anchored to it, he will stay here like the adult barnacle, for the rest of his days, reproducing himself, fishing with his feet as the tide comes and goes. And his life... [is] as regular as the tides."[21]

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REFERENCES

1 DICKENS, C. 1855-57. 'A shoal of barnacles', *Little Dorrit*. Cited in STOTT, R. 2003. Darwin and the barnacle: the story of one tiny creature and history's most spectacular scientific breakthrough. W,W, Norton, New York. p. 112.
2 STOTT, R. *Ibid.* p. xvii.
3 LANKESTER, E.R. 1925. Some diversions of a naturalist. Methuen, London. P. 118.
4 LANKESTER, E.R. *Ibid.* p. 117.
5 LANKESTER, *E.R.lbid.* p. 119.
6 Josiah Wedgwood to Robert Darwin, 31 August 1831, *Correspondence* 1: 133-34.
7 STOTT, R. *Ibid.* p. 63.
8 C.D. to Robert FitzRoy, 28 October 1846, *Correspondence* 3: 359.
9 BRENT, P. 1981. Charles Darwin: a man of enlarged curiosity. Harper & Row, NY. p. 376.
10 DARWIN, E. 1804. The temple of nature, or the origin of society. (First American edition.) Butler, Bonsai, & Niles. pp. 36-40.
11 STOTT, R. *Ibid.* p. 90.

12 FORBES, E. 1848. A monograph of the British naked-eye medusae. London: Ray Society. p. 60, Cited in STOTT, R. *Ibid.* pp. 89-90.
13 DARWIN, C. A monograph of the sub-class of Cirripedia, Vol II: The Balanidae. Vol. 12 of BARRET, P. and P. FREEMAN. 1988. The complete works of Charles Darwin. London: William Pickering. p. 26. Cited in STOTT, R. *Ibid.,* p. 220.
14 STOTT, R. *Ibid.* p. 72.
15 C. D. to J. S. Henslow, 1 April 1848, *Correspondence* 4: 128. Cited in STOTT, R. *Ibid.* p. 101.
16 C.D. to J.S. Henslow, 23 July 1832, Correspondence 1: p 257, cited in Stott, Ibid., p 51.
17 DARWIN, C. Notebook, 1836-1844. BARRET, P., GAUTREY, P., KOHN, D., *et al.* British Museum (Natural History), Cornell University Press, Ithaca, New York, 1983, p. 228: "The Grand Question, which every naturalist ought to have before him, when dissecting a whale, or classifying a mite, a fungus, or an infusorian, is, What are the laws of life?"
18 DARWIN, C. Notebook C. pp. 76-77. Cited in STOTT, R. *Ibid.* p. 82.
19 Joseph Hooker to C.D., 1845. Cited in STOTT, R. *Ibid.* p. p. 243.
20 C.D. to Robert FitzRoy, 1 October 1846, *Correspondence* 3:345, cited in STOTT, R. *Ibid.* p. 70.
21 STOTT, R. *Ibid*. p. 70.

Hunting the Wild Potato in the South American Andes: Memories of the British Empire Potato Collecting Expedition to South America 1938-1939. by J.G. Hawkes. Botanical and Experimental Garden, University of Nijmegen. 224 pages in softback 17 x 24 cm. ISBN 90-9018021- 4. Price £17.50.

In 1938–39, Jack Hawkes undertook the collection of potatoes (and ornamental plants) in South America as part of his PhD studies. To prepare, he went to Russia to learn from the great potato collectors and taxonomists there, coincidentally meeting Vavilov, who inspired him with the fundamentals of conservation and utilisation of plant genetic resources, which underpinned much of Jack's subsequent work, and for which he is fondly remembered by scores of students during his professorship at Birmingham University. During his 8- month collecting expedition he kept detailed diaries, and from these he has drawn a vivid portrait of the arduous journeys through the Andes from Argentina to Colombia. This immediately pre-war expedition is illustrated by more than 40 photographs, including two of the young Jack in expedition gear. Jack's line drawings of two species of potato, *Solanum ballsii* and *S. gourlayii*, named after his expedition partners, are included. Extensive excerpts from his first and fourth publications, and a complete list of all 241 of his publications are given in appendices, together with a brief *curriculum vitae*, and a portrait photograph of Jack when he was about 60 years old.

As a special offer, and in recognition of Jack's services to the Society over the years – he was elected a Fellow in 1945, and was President 1991–1994 – a limited number of copies of this book may be purchased personally from the office of the Society at a cost of £10 each. Enquiries for mail orders at £17.50 should be sent to *gerardw@sci.kun.nl*, or visit the website *http://www.bgard.sci. kun.nl/bgard/.*

JOHN MARSDEN

The Linnean Society
Programme

2004

12–16 July		INTERNATIONAL PTERIDOPHYTE SYMPOSIUM – FERNS FOR THE 21ST CENTURY † Mary Gibby FLS (at The Royal Botanic Gardens Edinburgh)
10th Sept.		SUBVERSION OF THE HOST IMMUNE CELL SIGNALLING † Bill Harnett (joint day meeting with the British Society of Parasitology)
13th Sept.	all day	EVOLUTION OF PROTOZOA AND OTHER PROTISTS † Terry Preston FLS and Alan Warren (organisers for joint meeting with the British Section of the Society for Protozoologists) Sponsored by the Systematics Association
30th Sept.	6pm	AUSTRALIAN ETHNOBOTANY John Pearn FLS
14th Oct	6pm*	THE GENETICS OF ANIMAL BODY PLANS Peter Holland FLS FRS
28th Oct.	6pm	IRONE MANTON FLS FRS (1904–1988). First Female President of the Linnean Society of London: A Centenary Biography. Barry Leadbeater **Book Sale****
3rd Nov.	7pm	IS *HOMO SAPIENS* JUST ANOTHER ANIMAL – OR DOES HE LIVE UP TO HIS NAME? Steve Jones FLS (A joint meeting with and at The Royal Institution, Albermarle St. Tickets – £5 for Fellows, £8 non-Fellows.)
18th Nov.	6pm	BOTANICAL EXPLORATION OF KAMCHATKA, RUSSIA Aljos Farjon FLS
18th Dec	2pm	CONVERSAZIONE venue tba

Unless stated otherwise, all meetings are held in the Society's Rooms.
For further details please contact the Society office or consult the website – address inside the front cover. * Election of Fellows † Organisers
**Books for the Book Sale gratefully received before the date of sale please.

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