Editorial

In our last issue we introduced the contentious subject of creationism by publishing a lecture given by the late Colin Patterson which was primarily about cladistics as a method for classification, but was, unfortunately, taken by anti-evolutionists to support their cause. In response, a good deal of correspondence has been received by *The Linnean*, some of which is reproduced in this issue, along with articles by Randy Moore and John Cloudsley-Thompson which defend the evolutionary view. More will be included in subsequent issues, as will the lecture given by Professor Dawkins when last year he unveiled a plaque commemorating the Darwin-Wallace lecture of 1858.

In this issue we note how, throughout the United States, anti-evolutionists presently undermine the teaching of science by villifying evolution and demanding time in the schools to teach "creation science" and "intelligent design". Much of the impetus for the movement against evolution was intitiated in 1925 when a Tennessee Democratic congressman and lay preacher named John Butler proposed a law which stated: "It shall be unlawful for any teacher in any of the universities, normals, and in all other public schools of the State, which are supported in whole or in any part by the public school funds of the State, to teach any theory that denies the story of the Divine Creation of Man as taught in the Bible, and to teach that man has descended from a lower order of animals." The bill passed in the House, seventy-one to five and in the Senate, twenty-four to six, and the Governor, a Southern Baptist, signed it into law on the 21st March 1925.

Within four months of the passage of the bill a High School biology teacher, John Scopes of Dayton, Tennessee, was charged with violating the State's new law against teaching human evolution. What ensued was the famous "Monkey Trial" which pitted the fundamentalist politician William Jennings Bryan against the liberal lawyer Clarence Darrow in a classic courtroom drama. Scopes was convicted and fined $100 but the verdict was overturned on a technicality.

Tennessee's anti-evolution law was finally repealed in 1967 and the following year its Arkansas counterpart was declared unconstitutional by the Supreme Court.

Despite the ridicule that the Scopes trial engendered, today a Tennessee academic's survey of his students found that there was a widespread misunderstanding of evolution and that they believed God had created man in the last 10,000 years in a single act of creation (Niall Shanks in *Free Inquiry*, Fall 2001). More incredible is that in nearby Alabama the biology textbooks include a sticker warning students that evolution is a controversial theory (*Chattanooga Times*, Nov. 11, 2001).

Today we find that in the United States money floods in to the anti-evolutionist coffers. The table overleaf gives just a few examples.

More recently, Walter Olson reported in an article in the January issue of *Reason* that the Discovery Institute newsletter, listed a recent donation of $1.5 million to the Centre for Renewal of Science & Culture, from Howard Ahmanson whose goal was to

cure Western culture of naturalism, a pernicious product of the Enlightenment, with a research and publicity programme to unseat not just Darwinism but also Darwinism's cultural legacy. Ahmanson has long supported the Chalcedon Institute, which advocates converting America to Old Testament law and theocracy. He is also a board member of the Claremont Institute which lists its mission as "to restore the principles of the American Founding Fathers to their rightful, preeminent authority in our national life" (http://www.claremont.org/1aboutus.cfm).

By way of comparison, Glenn Branch informs me that the National Centre for Science

Annual income and expenditures of some Creationist Organisations

(for the fiscal year 1998 unless noted otherwise)

Organisation	Revenue	Expenditures
Access Research Network (formerly students of Origins Research)	$59,311	$82,548
Answers in Genesis, KY (Ken Ham)	$3,702,800	$3,492,904
Creation Education Society, TN	$19,508	?
Creation Evidence Museum, Glen Rose, TX	$420,460	$365,816
Creation Moments (formerly Bible Science Assn.)	$292,318	$284,846
Creation Research Society, San Antonio, TX (1997)	$263,391	?
Creation Resource Foundation, El Dorado, CA	$66,756	$68,102
Creation Science Association for Mid-America	$34,714	$40,103
Creation Science Fellowship, Pittsburgh, PA	$51,193	$22,671
Creation Worldview Ministries, Orlando, FA	$114,604	$93,076
Genesis Institute, Mead, WA	$62,464	$63,695
Institute for Creation Research	$4,167,547	$3,997,419

Education reported for the 1998 fiscal year revenues of $258,9557 and expenditures of $268,730. The balance sheet for 1999 will perhaps show temporarily better numbers due to the rush of publicity caused by the Kansas Board of Education's vote to drop evolution from state examination requirements, but in no way does the NSCE budget approach the creationists' war chest.

A recent survey by Lawrence Lerner for the *Scientific American* revealed that the doctrine of creationism was spreading at a disturbing rate and had taken a powerful grip on education at local level even in northern states such as Illinois, Ohio and Wisconsin. It is against this background that we publish an article on the Sad Status of Evolution Education in American schools.

B.G. GARDINER

Society News

The Linnean Society is co-sponsoring a three-day international symposium – *Plant species-level systematics: patterns, processes and new applications* 13–15th November 2002 in Leiden The Netherlands. Plant systematics has seen some dramatic changes over the past decades, mainly due to the application of molecular markers in phylogenetic reconstruction at the generic level and above. In contrast, species-level patterns and processes in plants remain less well understood, partly because of limited resolution of commonly used phylogenetic markers. This symposium seeks to review current insights from the fields of molecular biosystematics and speciation, focusing on the following selected topics of particular importance:

- Plant species radiations
- Molecular evolution in time and space
- Multiple genomes: plant hybrids, polyploids and systematics
- Identification and diagnostics

Attendance is limited to 150 participants, and brings together a panel of internationally known experts, as well as scientists from within the National Herbarium of the Netherlands. There will be invited papers, but the symposium is also open for contributed papers from anyone with an interest in species-level systematics and plant evolution, especially research students and post-doctoral fellows. Other sponsors are the Nationaal Herbarium Nederland and the International Association for Plant Taxonomy (IAPT). A circular was sent to members in 2001. Further details, including registration and accommodation arrangements can be found at *www.nationaalherbarium.nl/symposium2002/*

Members should note in this connection another meeting of the Society, with the Royal Botanic Gardens, Kew, on 27–30th April 2003 entitled the *International Polyploid Conference*, details of which are to be found with this issue. Dr. Andrew Leitch FLS, the organiser, writes: *Polyploidy is an important driving force in evolution that can potentially influence plant and animal genotypes, phenotypes and developmental pathways. Genome analyses and molecular biology are revealing the causes and consequences of polyploidy and proving it to be a widespread phenomenon. Central arguments need exploring in the context of a scientific meeting requiring expertise from ecology, systematics, cytology, genomics and developmental biology. This will be the first international conference devoted to polyploidy in the post-genomics era.*

Although 2007 seems a long way off, the tercentenary year of Linnaeus' birth will need a suitably long gestation period if the Society is to mark the event in style. To this end the Society has appointed Dr. Jenny Edmonds, former elected Council member, to coordinate the Society's thinking on this seminal celebration; Jenny has joined the Officers group and is also a co-opted member of Council. At this stage, various ideas are being kicked around and Members are welcome to contribute. Jenny can be contacted at *edmondsj@btinternet.com* or *bgyjme@leeds.ac.uk*. We shall be providing regular updates on her activities.

We have received the following note on annual summer courses on Linnaeus at Uppsala University which are a prelude to the Linnaean tercentenary celebrations in 2007. "When the Swedish summer is most delightful, a five-week programme named "Carl von Linné" will be given at Uppsala University when experts on Linnaeus and Linnaean sciences will be brought together from the fields of history, botany, zoology, history of sciences, rhetoric, theology, archaeology, geology, medicine, and pharmacognosy.

One of the aims of the course is to give an understanding of why Linnaeus was such a popular teacher. The students will follow in Linnaeus' footsteps on his famous *Herbationes Upsalienses* excursion paths. They will listen to his own words describing the different plant species, taken from 18th century student protocols, and will learn about the 18th century landscape around Uppsala. In the very same lecture hall where Linnaeus lectured in the 1740s, one of his speeches will be read by an actor. This is to be followed by a rhetorical analysis by the students. Historical places like Linnés Hammarby and Sävja, the Linnaean Garden and the Linnaean Museum in Uppsala will be visited and presented by professional lecturers. A lecture on Linnaeus' religious views will be given in his own parish church at Danmark. The natural sciences of Linnaeus will be presented by current researchers in the fields of, eg, systematic botany, systematic zoology, ethnobiology, medicine and geology. The students will get an insight into current research, as well as the historical traces of Linnaeus. Linnaeus' impact on the Swedish society will also be analysed. Some days will be dedicated to the Linnean students and their accomplishments. Historians will lecture on the study situation and travel conditions in the 18th century. Botanists and historians will present Linnean "apostles", including Kalm, Thunberg, Hasselqvist, Sparrman, Solander and Osbeck. One lecture is reserved for the women around Linnaeus, including his daughters. The Biology Education Centre at Uppsala University is responsible for the course, which is open to all students. The course is given in Swedish, but a www version is planned to appear in English next spring. Further information and a detailed schedule can be found on *http://kimura.ibg.uu.se/linnaeus*.

The course-leaders are Dr Mariette Manktelow from the Dept. of Systematic Botany, Dr Åsa Karlsson and Ms Hanna Hodacs from the Historical Dept. who have recently started the research project *To teach and learn in the name of science – a study of Linnaeus and his pupils*, together with Dr Nils Ekeblad, lecturer in rhetoric, and Dr. Annika Ström, lecturer in Latin, both from Södertörns Högskola. Dr Manktelow will speak at an evening meeting of the Society on 5th December 2002 on Linnés Hammarby: a floral and cultural heritage. She will also speak briefly about the Tercentenary. The project is financed by the Swedish Research Council, and will focus on the relationship between teaching and the growth of science. Special studies will be carried out on the *Herbationes Upsalienses* excursions and other selected lectures, where Linnaeus' teaching ability and rhetoric capacity will be analysed. The project will also focus on the students of Linnaeus, both the travelling pioneers and those who worked locally in Sweden. What impact did Linnaeus' teaching have on their careers, social life and family life? The progress of Linnaeus' scientific work will be correlated to the contribution by

his students. Associated with the research project is the project *Linnaeus' Historical Landscape*, working on the conservation and partial reconstruction of the 18th century landscape in the surroundings of Linnaeus' Hammarby, Linnaeus' Sävja and Uppsala, as well as preserving the local Linnaean flora. Contact Dr Mariette Manktelow, Uppsala University, Dept of Systematic Botany, Evolutionary Biology Centre, SE-752 36 Uppsala, Sweden, *Mariette.Manktelow@ebc.uu.se*."

The Galton Institute is holding a one-day conference on Thursday, 19th September 2002 on *Society and Genes: Looking at Public and Media Perspectives on Human Reproduction*. Contact Mrs. Betty Nixon at the Institute, 19 Northfields Prospect, Northfields, London SW18 1PE.

An International Symposium on Biodiversity of Flowering Plants of South Asia will take place in Karachi on 1–5th November 2002. Contact *mquaiser@super.net.pk*.

Hard on the heels of the House of Lords Select Committee on Science and Technology's investigation of systematic biology under the title *What on Earth? The Threat to the Science Underpinning Conservation* which is available in the Society's Library (published by The Stationery Office Ltd. ISBN 0104420723: www.publications.parliament.uk/pa/ld/ldstech.htm), the House of Commons has weighed in with its investigation – *Government Funding of the Scientific Learned Societies*. Here is the memorandum submitted by the Society's President, reproduced by kind permission of the Select Committee:

Government Funding of the Scientific Learned Societies: Memorandum from the Linnean Society of London

A. Information on the history and activities of the Linnean Society.

1. The Linnean Society, founded in 1788, is the world's oldest continuously active natural history society. Its mission is to promote the study of the biology of whole organisms by persons at all levels of age, background and expertise. It was at the Linnean Society that Charles Darwin and Alfred Russell Wallace first made public their thoughts on the origin of species. The society has maintained this tradition by subsequently continuing to sponsor ground-breaking work in many relevant areas of natural history.

2. The Society's members include both amateurs and professionals. The categories of membership (with standard annual subscriptions in brackets) are: Fellows (£40), Associates (over 18 and under 29 years of age, £24) and Student Associates (over 18 and under 24, £9). In terms of ethnicity, nationality, social background, age and gender, the society's fellowship has always been diverse. The one proviso of fellowship is an active commitment to the pursuit of biology and natural history. The Linnean does, however, pride itself on having been the first learned society in Britain to admit women fellows, and women have long ranked among its officers, presidents and most distinguished members. The Society has an open and democratic constitution dating back to its 1802 Charter. Members are drawn from 93 countries; 36% of the UK membership live or work in the Home Counties.

3. The Society organizes a programme of meetings throughout the year (see Annex I for details of

the breadth of topics), in which the general public are welcome to participate. It publishes three learned Journals of Biology, Botany and Zoology, which have international stature in terms of their editors, contributors and readers. The Society also produces a highly regarded Members' newsletter *The Linnean*, the *Synopses of British Fauna*, with occasional and special publications. Each year there are in total more than 40 issues of all these. Papers are subjected to rigorous peer review. The journals help to maintain the perception of Britain's leadership in biology.

4. It awards small grants to support research in a wide variety of scholarly studies in natural history and systematics, to give assistance to serious natural historians in the UK and abroad, and to help young PhD students. It awards a variety of medals and prizes – for example, a recent obituary of the internationally distinguished US naturalist, Richard Evans Schultes, referred to his receipt of a Linnean medal as the equivalent of a Nobel Prize. The various other awards go not only to professional and amateur natural historians, young and old, but to botanical artists as well. We also offer an annual prize for the best PhD thesis in plant sciences. Grants are available to support research by those no longer in full-time employment, and to pay the subscriptions of those unable to afford them, e.g. Members in Eastern Europe, Africa or Asia.

5. The Society has strong overseas connections with occasional meetings abroad. For example, we are determined to go ahead with a meeting in Pakistan on the natural history and archaeology of the Hindu Kush either later this year or early next year since this will bring together scientists from the West and from Muslim countries. The Society also makes grants every other year for work in tropical African botany, which have involved scientists from a range of African countries.

6. The Society holds in trust for the benefit of scientists across the world the botanical and zoological collections, library and correspondence of Carl Linnaeus (comprising over 25,000 items in all). Apart from the extraordinary historical value of these 18th century holdings, they are the very scientific reference specimens (*types*) on which the names used today for many well-known plants and animals are based. The Society's holdings are, therefore, an exceptional resource for researchers both in taxonomy and the history of science and are curated to the highest standards for inspection by scholars and natural historians. We have embarked on a programme to make available all our collections, for free, on to the world-wide-web so that they can then be viewed by anyone with access to the Internet.

7. The Society's library, in continuous operation since our founding in 1788, is consulted (free of charge) by scholars from all over the world.

8. The Society has initiated – either alone or in partnership – a number of major national and international projects in systematics and conservation of biodiversity. For example, for many years in the first half of the 20th century the desirability of a Flora of Europe had been evident. In 1957, with the aid of a starter grant from the old DSIR, the Linnean Society became the sponsor of the *Flora Europaea* project, which was successfully completed only in 1980; the five volumes comprising the Flora represented the work of 187 botanists in 24 countries, and covered 11,557 species. This work continues with a major grant from the EU Framework 5 programme. With partners on the mainland of Europe, we also obtained Framework 5 funding for an even more ambitious *Fauna Europaea* project to cover all the animal species of Europe. Both these initiatives were taken forward by some of our members as a result of a Linnean Society meeting held in Leiden in 1995. The Society also sponsored Prof. R. J. Berry's project *Biological Recording: Need and Network* which foreshadowed the National Biodiversity

Network. Outside Europe, the Society contributed to the 1988 Kimberley bicentenary expedition in Australia.

B. Government funding.

9. *Recurrent funding.* The Linnean Society receives no recurrent government funding.

10. *Project funding.* On a few occasions post-war, the Linnean Society has been involved in government-funded projects. An early example was the *Flora Europaea* project (see para. 8 above) where the Society administered the Trust that was established with the DSIR grant, coordinated the voluntary participation of many professional botanists from a variety of countries, and oversaw the final publication of the *Flora.* In 1993 and 1995, grants from DFID allowed the Society to mount two meetings on Brazil. More recently, after OST funding for The Systematics Forum expired, the Society commissioned a report on its activities and future prospects and is exploring ways of ensuring continuation of its activities for specialist groups of systematists, alongside its long-standing specialist groups in computer applications, evolution, freshwater biology, palaeobotany, palynology and plant anatomy. The Society has administered for many years the NERC Fund for Taxonomic Publication.

11. *Premises.* In 1854 the Government purchased Burlington House to fulfil a historic obligation to accommodate certain scientific societies, and in 1856 allocated some rooms in it for the use of the Linnean Society. The location of the present day rooms is different due to changes elsewhere in Burlington House. The precise legal status of the terms and conditions of occupation of these rooms by the Society has been the subject of ongoing discussion with government for a number of years. At present, the Linnean Society carries responsibility for their upkeep, maintenance, decoration, cleaning, security and other running costs, as well as for conformity with legislation such as that for Health & Safety.

12. Our rooms are made available for meetings of a range of other learned societies and relevant charitable organizations at modest rates. The Society has participated in London *Open House* during which some hundreds of people have visited the Society's rooms. Two pamphlets on the building and the Society have been produced for these occasions (Annex 2).

C. Advice to Government

13. Over many years the Society has given advice when requested to government and NGOs on matters concerned with natural history, systematic biology and conservation. Ten years ago, a House of Lords Select Committee on Science and Technology chaired by the late Lord Dainton published a report highlighting the parlous state of research in systematic biology; two former Presidents of the Societies were the Committee's specialist advisers, and the Society was amongst those submitting detailed evidence.

14. In the past 12 months we have commented to DETR, now DEFRA, on the quinquennial review of the Royal Botanic Gardens at Kew, to the former DETR on the government draft report under the UN Biodiversity Convention, to DEFRA on its proposed research strategies, and to NERC on its research strategies.

15. In the case of DEFRA and NERC, although both have indicated the importance of the conservation of biodiversity, neither provides the means to do it by supporting the kind of research in systematic biology that is essential to underpin any comprehensive programme of biodiversity conservation. We therefore felt obliged to submit our views to the current House of Lords Select Committee in Science and Technology enquiry into Biodiversity and

Systematics earlier this year – a continuation of the enquiry mentioned in para 13 above. The President of the Linnean Society also gave evidence in person to the Committee.

16. Because of the general concern about the parlous state of research in systematic biology in the UK, in 2000 we contacted 27 other Learned Societies interested in aspects of the subject and arranged two meetings for their representatives. The outcome was a document outlining both the problem and a possible solution to it, which was then sent to the Government Chief Scientist and the Minister for the Environment in July 2001. Again, we have the feeling that firm support will be lacking from either quarter.

17. Through its representative on the Council of the National Trust, the Society has contributed to the recognition by the Trust of its responsibilities for biodiversity conservation and land management, as well as the upkeep of its buildings. A former representative of the Society was instrumental in introducing a deer management programme for the Trust's land.

D. Communicating science to the public

18. The Society has sought, so far unsuccessfully, to become a registered museum, which would allow it, through eligibility for various grants, to become more accessible to the general public. At present, the 'public' with which the Society communicates may be considered in four categories: school students; those non-professional biologists in the UK with serious interests in aspects of natural history; certain organizations in other countries; the global community of workers in biology and its associated professions.

19. The Society's Schools Programme has involved arranging meetings in various parts of the UK primarily for sixthformers interested in natural history. To this end, the Society has a coordinator of its schools' programme on its Programmes Committee. In April 2001, with the Society for Experimental Biology, the Society's President chaired a panel discussion at the University of Kent at Canterbury involving some 60 sixthformers from local schools. In January 2002, our coordinator, Ms. Mary Griffin, organized a successful Saturday morning event in Dublin for sixthformers, teachers and advisers, attended by over 100 people. Both the Canterbury and Dublin meetings were concerned with current ethical problems in biology. We are seeking to fit our own programmes into the new curricula in schools.

20. With regard to amateur naturalists, they are welcome at any of our meetings (see Annex 1, www.linnean.org) whether or not they are members of the Society, and the Society's Programmes Committee welcomes any suggestions for meetings on appropriate topics. Apart from our Journals which are very much aimed at professionals, we publish a variety of types of books of interest to a wide audience (see Annex 2, www.linnean.org), the latest to go to press being on wildlife and roads. Three display cases containing artefacts and representative biological material are made available to the public in the foyer of the Linnean Society (10–5pm on weekdays other than Bank Holidays). The Society's rooms are used by other societies and organisations 400 times a year, so providing access to the foyer exhibition and to some 50 framed portraits of biologists hanging throughout the building. Visiting groups receive conducted tours by staff by appointment.

21. With regard to the international scene, a good example is the preparation for events to celebrate the tercentenary of Linnaeus' birth in 2007. The President has already visited Sweden to participate in a meeting to plan a range of public events, television programmes, a new visitor centre, etc, and to explore how the Society can be of assistance. Additionally, we have already delegated to one of our Council, Dr. Jenny Edmonds, of Leeds, the responsibility over the

next five years for coordinating various activities for a parallel celebration of the enormous contribution to science made by Linnaeus.

E. General views on the role of learned societies

22. In the field of natural history, we are alarmed at the declining state of research into systematics and whole organism biology in institutions, and its virtual disappearance in universities (see paras 13 and 15, above). Likewise, education in these subjects in schools and universities is in a parlous state, despite the widespread lip-service paid to the 'importance of conserving biodiversity'. We have now reached a stage where, for example, there is now no longer any expert employed anywhere in the UK by either government, museums or universities who can authoritatively identify a number of major groups of fungi (including, e.g., mushrooms and toadstools, let alone potentially disease-causing organisms in animals and plants). It is difficult to conserve species (or, indeed, to conduct any other work with them) without first having located, identified and studied them. These are all functions of systematic biology. But this discipline, the grammar and syntax of biodiversity studies, is increasingly disregarded. The Linnean Society is determined to ensure that the basic (some might complain, traditional) skills needed to meet a very modern challenge are upheld and understood. In its furtherance of this aim, the society would benefit from Government recognition.

23. The UK systematics crisis compares unfavourably with the situation in other nations. In the United States, for example, Federal, State and private support has encouraged botanic gardens and learned institutions to sponsor a great revival of interest in natural history and systematics. The New York Botanical Garden teaches natural history to schoolchildren from every age group and background and has come to be seen as a vital educational resource. At the same time, the garden's library and herbarium are home to more PhD candidates each year than the total of UK doctoral students in systematic botany – and the New York Garden is only one of several such institutions in the USA. Learned societies like the Linnean could, with suitable encouragement develop similar initiatives in the United Kingdom.

24. The tradition of the amateur naturalist is a strong one in the UK, and it is catered for by a wide variety of learned societies (some very small, with perhaps only 100 or so members). In the UK, professional taxonomists are complemented by their amateur colleagues in many areas such as bryology, entomology and mycology. The Linnean Society, with its central location and Meeting Room, Council Room, Committee Rooms and Library, is able to encourage and support both amateur and professional taxonomists, whose expertise benefits the furtherance of our knowledge of biodiversity and sustainable use of our natural resources in both education and research.

SIR DAVID SMITH FRS FRSE
President of the Linnean Society

April 2002.

One of our Fellows, Richard Milner at the American Museum of Natural History, where he is an editor of *American Naturalist* and author of *The Encyclopedia of Evolution*, has capitalised on his earlier background in showbusiness and his friendship with Stephen Jay Gould (they were at school together) to produce a musical *Charles Darwin: Live and in Concert*, which is doing the rounds in the US. He can be contacted at *rmilner @ncy.rr.com*.

Sadly, Stephen Jay Gould died on 20th May of cancer. In his obituary *The Times* noted: "Perhaps the most distinguished of his many medals was the Gold Medal of the Linnean Society of London, awarded for services for Zoology."

100 years ago

100 years ago, the President of the Society was the botanist, Professor Sidney Howard Vines, who said in his annual address: "In the course of the session a memorial in favour of the admission to women to the Fellowship of the Society has been presented to your council; and in view of the relatively large number of fellows who signed it, it received immediate and serious attention. It was found necessary to obtain legal assistance to determine whether or not the powers conferred by our Charter would enable us to comply with the prayer of the memorial. The opinion of the eminent Counsel consulted is that it is not competent for the Society to take such action; an opinion agreeing with that which, as I understand, has been given in the case of other learned societies similarly situated. It is therefore an essential preliminary to the admission of women that we should obtain a new Charter. The Council accordingly issued a circular to the Fellows with the object of ascertaining whether or not it is their wish that the necessary step should be taken. So far this important matter has been treated with singular apathy: 740 circulars were issued, but only about 377 replies have been received, of which 258 are in favour of and 119 against the proposal. It is to be regretted that the Council should not have received a more decisive mandate as to the course to be adopted. Possibly it has been felt that so fundamental a change in the constitution of the Society required careful and prolonged consideration; but it is to be hoped that those Fellows who have not yet recorded their views will do so as speedily as possible. For the present the question remains open." *(To be continued.)*

JOHN MARSDEN

Library

The Chairman has asked that some of the information reported to the Library Committee on use of the Library should be included in *The Linnean*. From the beginning of January to the end of April the library has been open for 92 days during which 234 visitors (2.54 vis/day) have been recorded, 155(66%) of whom were Fellows or Associates. Library loans during the same period totalled 67. Those using manuscripts numbered 24 and included visitors from Argentina, China, Germany, the Netherlands and USA. General use of the Reading Room included Society meetings, for which the Display cases held exhibits from the collections. Associated events included a reception by "Wildscreen" on 5th March and a visit on Friday 15th March by the Pakistan Federal Minister of Education and her delegation, for whom exhibits were arranged in both the Reading Room and the Linnaean Collections Store, and some filming by a French TV company working on a Darwin documentary. Significant acquisitions purchased include a translation of Aristotle's Zoological Works, recent volumes of *Flora of Australia*,

The Admission of Ladies.

The painting above hangs in the Society's rooms. It shows the occasion on 19 January 1905 when eleven women signed the Society's Book of Admissions and Obligation. The picture was commissioned and paid for by Frank Crisp the Treasurer at that time and was not presented to the Society until after his death in 1919. A collotype of the original (below) as painted by James Sant RA in 1906 suggests that Crisp felt rather strongly about its compostion, since both the rather well-endowed lady in the foreground and her husband, the Rev. and Mrs T. Stebbings have been painted out by an unknown hand.

For the full story see *The Linnean* Volume 1(1).

Flora of China (English text edition), the last volume of the *Flora of Turkey,* and the new edition of *Guide to standard floras of the world.* There has not been space recently to list purchases in full.

Work has been continuing steadily since the beginning of the year in the East Basement store which now has shelves or closed cupboards to maximise use of all available space. Removal of older shelves in the innermost part of the basement revealed an old oil-tank storage area partitioned off by a wall. The tank has now been removed to give additional storage area. We hope that all associated re-shelving of back stock will be done by the end of August.

Council has agreed to the purchasing of an electronic Library system which will be installed in early July and also to the appointment of Lynn Crothall, who will join us in July in a short-term cataloguing post. Meanwhile Cathy Broad has been taking steps for conversion of existing electronic catalogue records as the first element in providing a web-based Library catalogue. The Society's web site will be updated to include information on progress with the electronic Library catalogue and its accessibility.

The summer months will see the usual international group of summer student workers helping to sort and clear the book stock and journals. This may make the Reading Room less quiet but should provide us with much needed hands to move things from place to place as well as removing large quantities of Piccadilly grime.

Recent Donations

Dr J. Akeroyd	Balech, Enrique, *The genus Alexandrium Halim. (Dinoflagellata).* 151 pp. illustr., Sherkin Island, Sherkin Island Marine Station, 1995.
Prof. M.C. Boulter	Boulter, Michael, *Extinction, evolution and the end of man.* 210pp., illustr., maps, London, Fourth Estate, 2002.
Dr S. Bunney	Bruce-Chwatt, L.J. & Zulueta, J de, *The rise and fall of malaria in Europe, a historico-epidemiological study.* 240pp., illustr., maps, Oxford, OUP for WHO, 1980. Eltringham, S.K. *The ecology and conservation of large African mammals.* 286 pp., illustr., maps, London, Macmillan, 1979. Gauthier-Pilters, Hilde & Innis Dag, Anne, *The camel, its evolution, ecology, behaviour and relationship to man.* 208pp., illustr. map., Chicago, Chicago University Press, 1981. Gutherie, R. Dale, *Frozen fauna of the Mammoth Steppe, the story of Blue Babe.* 323pp., illustr., maps, Chicago, Chicago Univ. Press, 1990. Jacobs, Louis L., *Aspects of vertebrate history.* 407pp., illustr., maps, [Flagstaff], Univ. N. Arizona Press, 1980. Young, David A. & Seigler, D.S., *Phytochemistry and angiosperm phylogeny.* 295pp., figs. New York, Praeger, 1981. Zohary, Daniel & Hopf, Maria, *Domestication of plants in the*

	old world (2nd ed.). 278pp., illustr., maps, Oxford, Clarendon Press, 1993.
Dr H.-M Burdet	Spichinger R. & Ramella, L. eds., *Flora del Paraguay,* 35: *Droseraceae,* by R. Duno de Stefano, Fatima Mereles & Lorena Martinez, 15pp., illustr., map, 36: *Hippocrateaceae,* by J.A. Lombardi & L.G. Temponi, 36pp., illustr., map, Geneva, Cons. & Jard. Bot., 2001.
Dr J. Camerini	Camerini, Jane ed., *The Alfred Russel Wallace reader, a selection of writings from the field.* 219pp., illustr., maps, Baltimore, John Hopkins Univ. Press, 2002.
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GINA DOUGLAS

The Earl and the Pussycat

The 13th Earl of Derby's Life and Legacy

This is the title of an exhibition currently on show at the Walker (William Brown Street, Liverpool – *www.nmgm.org.uk/walker/earl/*) until 8th September 2002. The exhibition is open Mondays to Saturdays 10.00 – 17.00 (Thursdays till 19.00) and Sundays 12.00 – 17.00. It features over 320 extraordinary items ranging from portraits, miniatures, furniture and books to seashells, birds and mammals. It includes more than 40 original watercolours by Lear, many drawn from Lord Derby's specimens or from living animals

in his menagerie at Knowsley Hall. The exhibition marks the 150th anniversary of the death of this remarkable man, whose collections founded Liverpool Museum.

The Linnean Society was one of the sponsors of this exhibition and we therefore reproduce below, with the kind permission of Dr Janet Kear, formerly Director of Martin Mere Wildfowl and Wetlands Trust Centre and a Trustee of the National Museums and Galleries on Merseyside, an address that she gave at a Memorial Service in the Derby Chapel, Ormskirk Parish Church on 2 July, 2001.

The 13th Earl of Derby, naturalist

Edward Smith Stanley [Figure 1] died 150 years ago today at Knowsley, and was buried here in Ormskirk Parish Church on 8 July 1851.

He was a truly remarkable man – a self-taught naturalist of distinction – with a circle of friends and associates who were making scores of exciting scientific discoveries at a time of revolution in the history of zoology. Charles Darwin's *On the Origin of Species by Means of Natural Selection* was published less than a decade after the Earl's death. Clearly, Lord Derby was well respected in scientific circles, for he was elected a Fellow of the Linnean Society of London in 1807 and became its Vice-President in 1817 and President from 1828 to 1834.

He financed zoological expeditions to the south and west coasts of Africa, to Honduras, to Hudson Bay and to Europe; he was in touch with over 20 agents around the world who supplied him and, through him, the British Museum and the Zoological Society of London, with scientific specimens. Many of these specimens came to Knowsley Hall for his museum, or went into his live collection, for he was to become the greatest animal keeper that England had ever seen. A hundred acres of land, and 70 acres of water, were given over to enclosures and aviaries, and his menagerie employed up to thirty keepers.

But he was not just a collector. He ensured that any new animal was described and recorded; he seems to have taken a personal interest in their well-being and behaviour and-- being well ahead of his time – made efforts to breed them. Knowsley kept some remarkable creatures that we will never see again alive, such as North America's only parrot, the Carolina Parakeet, and the Quagga, the striped ass of Southern Africa, both of which were to become extinct within the next century.

Not the least of Lord Derby's considerable achievements was the establishment of a nesting colony of North America's Passenger Pigeon, another bird that was eventually doomed. Once it had been so numerous that, as flocks migrated, they darkened the skies; today the Passenger Pigeon is no more. The Earl seems to have realised that, in order to breed, the birds needed the security and confidence that large numbers bring, something that no-one else had considered, and a theory that is now being tested in relation to the decline of the House Sparrow. When he died, his breeding flock of 70 Passenger Pigeons was sold in pairs, and never bred again – with hindsight, we can see what a mistake that was, and one which I like to think he would never have allowed.

Figure 1. Edward Smith Stanley PLS (1775–1851), 13th Earl of Derby.
[By permission of the Earl of Derby.]

Although he was fascinated by all animals, and, indeed, interested in plants as well, ornithology was his passion, and he devoted especial attention to ducks, geese and swans, maintaining over 50 different species on his 70 acres of water [Figure 2]. He obtained the first Black-necked Swans ever brought to Britain from their native South America through the exertions of his brother-in-law, Admiral Phipps Hornby, who was Commander-in-Chief of the Pacific. In 1834, the first captive Hawaiian Goose, or Nene to give it its native name, hatched at Knowsley, and he kept diligent notes of their behaviour and published his observations in the *London and Edinburgh Philosophical Magazine and Journal of Science*.

Some years ago, I wrote a book on the Hawaiian Goose* with Andrew Berger, the Professor of Zoology at the University of Honolulu; my co-author was a bit sceptical

**The Hawaiian Goose: an experiment in conservation*, by Janet Kear and A.J. Berger. Calton: T. & A.D. Poyser, 1980.

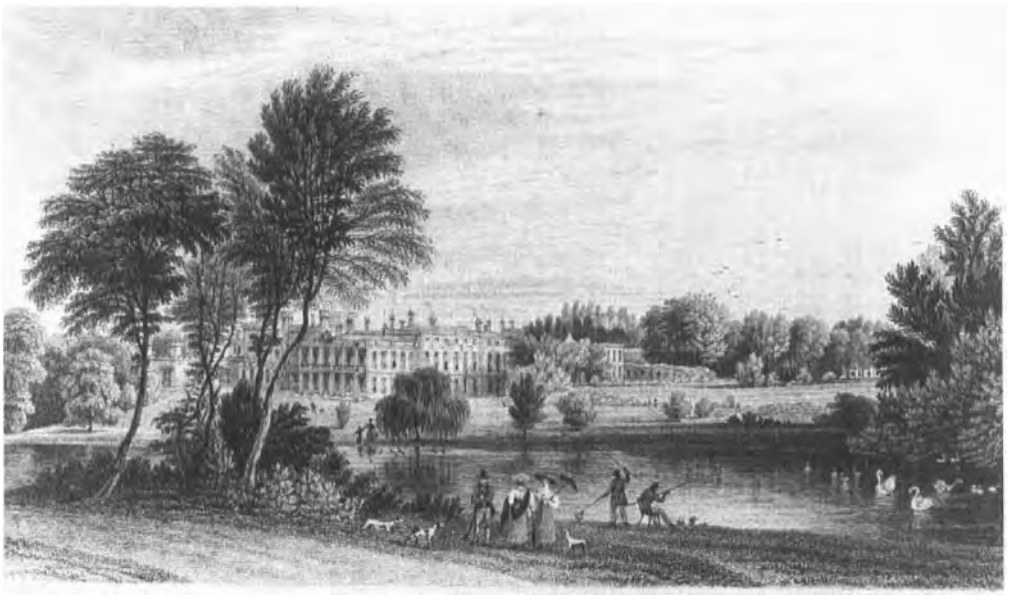


Figure 2. Knowsley Hall, near Prescot, by G. Pickering.
[By permission of the Earl of Derby.]

when I said that the type specimen was kept just down the road from Martin Mere in Liverpool Museum. He was even more surprised when I said that the same was true of the very first gosling, hatched on 13th of April1834, which according to Lord Derby, was found dead on 14th April – "perfectly flat", although he went on "the remaining gosling is doing very well, and appears strong and lively, and the parents are extremely attentive to it". Hawaiian Geese became quite common as the Earl let other European keepers have birds, but inbreeding did its worst and one hundred years later the Hawaiian Goose had been reduced to only 50 individuals in the world. The species was eventually saved from extinction partly by the efforts of another Hero of mine, Sir Peter Scott.

Lord Derby used the services of a number of talented artists, such as Joseph Wolf and John Gould, to record his animals, and in 1832 employed the young painter Edward Lear [ALS], who took to writing amusing verses for the children of the household. *A book of Nonsense,* published in 1846, is dedicated to "the great grandchildren, grand-nephews and grand-nieces of Edward 13th Earl of Derby by the author, Edward Lear". I think that Lear was very proud of the fact that he shared his name with his illustrious patron. Lord Derby also befriended John-James Audubon, who had landed at Liverpool from North America, and needed advice on how to get his magnificent pictures of American birds published. As well as collecting drawings and paintings of birds, mammals and plants, many new to science, the Earl assembled a library that was second to none – he had copies of almost every Natural History book then published in the English language.

When he died, his son, who was to become Prime Minister within seven months, presented a pair of those precious Black-necked Swans to Queen Victoria at Windsor and, happily, the Zoological Society of London, of which the Earl was a founder member in 1826 and its President from 1831 until his death, bought the remaining pair. They hatched cygnets in Regent's Park six years later, the first ever seen in this country, although sadly, not by Lord Derby himself.

Many animals, especially birds, were named in his honour, and have *derbyana* or *stanleyi* as part of their scientific name. South Africa's national bird, Stanley's Crane, which my husband and I were lucky enough to see in the wild, is called after him. He had seen the cranes first at the Tower of London, and acquired some which became famous at Knowsley for their courtship dances in the spring. Edward Lear painted one in 1835.

With great generosity, Lord Derby left his splendid, and beautifully cared for, museum collection to the Mayor and Corporation of Liverpool, in trust for the benefit of Liverpool's inhabitants. It contained nearly 1,300 mammals, nearly 19,000 bird skins, numerous type specimens, some brought home on the ships of Captain James Cook, and large collections of eggs, reptiles and fishes. He wrote "it is my principal object. . . to keep together in one body, the collection which has been formed by me, and to devote it to the benefit of the rising generation, as some memorial of the interest I have, from boyhood, felt in the study of Natural History, and my earnest wish to make that which has formed a constant pleasure during my own life, as far as possible conducive to the welfare and gratification of my fellow countrymen and neighbours". His museum was the foundation for the Institution which we now know as National Museums & Galleries on Merseyside, and it is the envy of scientists throughout the world. Our debt to Lord Derby is enormous. His bones may lie here in Ormskirk Parish Church, but his place, surely, is in Heaven.

JANET KEAR

Picture Quiz

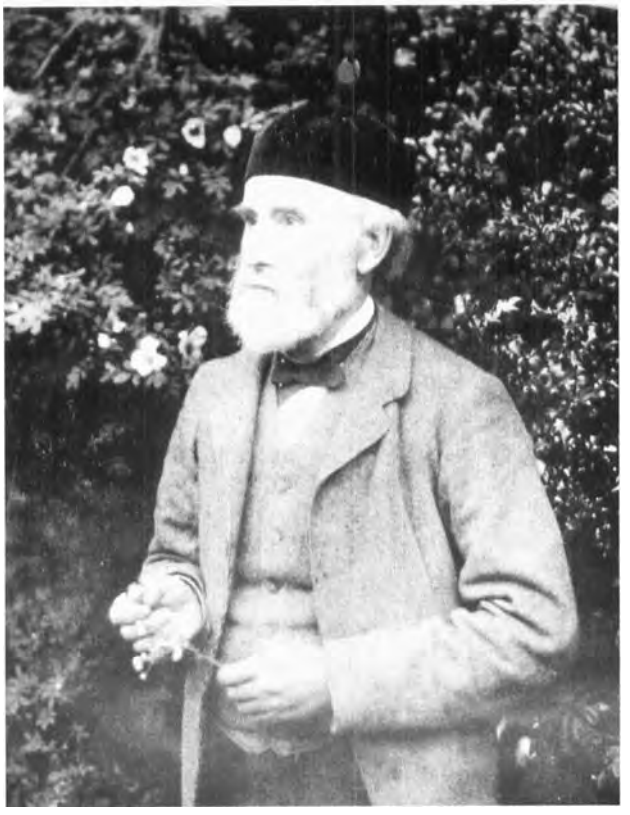
John Miers (1789–1879)

The April Picture Quiz (**18**(2): 11) featured John Miers who was born in London on August 25th 1789. His father was a jeweller and miniaturist whose business he joined on leaving school. He began attending evening classes at the Royal Institution where he came under the influence of Faraday and Davey and by the age of 23 undertook research on the composition of nitrogen, publishing three papers in Thomson's *Annals of Philosophy* in 1814. In 1818 Lord Cochrane persuaded Miers to apply his expertise in chemistry to developing the reported mineral riches, particularly copper, of the newly independent Chile. Subsequently, in 1819, Cochrane, together with Miers and his wife, left Buenos Aires and made the arduous journey across the pampas and over the Cordilleras to Chile.

On arrival Miers quickly became convinced that the local mining methods were so crude that it precluded a profitable injection of capital, consequently he resolved to abandon the whole venture. In retrospect we know that this was a monumental misjudgement for by mid-century Chilean copper was being so economically extracted that it accounted for over a third of world output!

Meanwhile, Miers turned his attention to the natural history of the area using his few months' stay to make the acquaintance of several leading botanists. He also made important observations on the geological structures of the Cordilleras such as earthquakes and the changes of level on the sea-line. He also collected birds and insects. In June 1825 he returned to London where he arranged all his notes and drawings and published, *Travels in Chile and La Plata* 2 vols 1826. Besides containing a record of his travels it also included a history of the country and gained him a lasting reputation as one of the foremost authorities on the geography and way of life in Chile. Fortuitously, whilst in England in 1825 he made the acquaintance of both Brown and Lindley who persuaded him to make a study of the South American flora. Returning to Buenos Aires, where he had been awarded a contract to supply machinery for a national mint, he found time to cross the continent in both directions – collecting extensively the plants of the Pampas. Then in 1831, he moved to Rio de Janeiro when he secured a similar contract with the Brazilian government. Thus between 1826 amd 1838, when he finally left South America to return to London, he made extensive botanical collections in both Brazil and Argentina.

He was elected a Fellow of the Linnean Society in 1839 and in 1841 published his first botanical paper in our *Transactions*. In the following year (1842) he published a paper on: *A description of machinery employed in Deptford dockyard for spinning Hemp*, followed by some 80 botanical papers, many of which were subsequently grouped together and republished as two books. The first was entitled: *Illustrations of South American Botany* (2 vols 1850; 1857) and the second: *Contributions to the Botany of South America* (3 vols 1867–71). Included as the third volume of this latter work is his monograph of the Menispermaceaea, considered to be his most important work. The illustrations for both books were a series of lithographs made by himself from his original drawings. They include upwards of 700 tracings of menispermaceous plants from the principal herbaria in England and on the continent. Sadly, he insufficiently appreciated the range of variability to which natural groupings of plants are prone. This, coupled



Clue: Described Richard Spruce's South American collection.

with his dogged belief in the fixity of species, has meant that a mere 43 of his species from Chile are regarded as valid. Luckily for us he bequeathed his 25,000 meticulously documented specimens from Chile to the NHM* where they bear testimony to the magnitude of his pioneer contribution.

He was elected Fellow of the Royal Society in 1843, while the value of his services to Brazil were recognised by the Emperor, who decorated him first with the Cross and then with Grand Cross of the Order of the Rose.

Genial, kindly and straight-forward he served on the Councils of several scientific societies including the Linnean, The Royal and the Botanical Society of London. He is commemorated in three genera of plants, the lily-like *Miersia* Lindley, of Chile and Bolivia, 1826; *Miersella* Urban, a tropical American saprophyte allied to orchids, and *Miersophyton* Engler, a member of the Menispermacae.

B.G. GARDINER

*He presented duplicates to the Kew Herbarium.

Correspondence

7 February 2002

Dear Professor Smith

Response to the review of *The Quest for Food*

Whereas it would be churlish not to thank Tim Cloudsley for his complimentary comments about my book, The *Quest for Food,* I cannot ignore the content of his review that appeared in *The Linnean* January 2002, which was to all intents and purposes a statement of his own political stance. In the space of less than two pages there were twelve direct references to Marxist philosophy. The third paragraph of the review for example is entirely concerning Marxist concepts. My initial reaction when reading the review was total bemusement, as it was difficult to see how the subject matter of my book could have been interpreted as political. My second was annoyance.

The Quest for Food, which begins 65 million years ago with the first primates, is essentially about the role of food in human evolution – and after analysing the reasons why our species has been so successful – in the final chapter draws attention to the resulting dilemma we now face. In no way can it be construed as a political statement. In the earlier chapters, largely concerning primate diets, it would have been totally irrelevant and I was at pains to avoid introducing any political element even in the later sections that do deal with critical aspects of human society and early civilisation.

My major objections are that Tim Cloudsley's review has misrepresented my work on two counts: firstly it does not tell the reader what my book is really about and secondly, without my consent, it uses my book as a spring board for a political diatribe to which I do not prescribe. Finally, in my opinion it is not appropriate that such a prestigious journal as *The Linnean,* with its long history of serving science and scientists of all persuasions, should be used as a political soapbox.

IVAN CROWE FLS, FRAI

The Manchester Museum
University of Manchester M13 9PL

18 April 2002

Dear Brian,

You published Colin Patterson's talk entitled *Evolution and Creationism*, and Peter Forey asks what exactly Patterson was doing. What indeed! I have always avoided discussions of cladistics in the belief that I had insufficient mental agility to keep up. In his lecture Patterson makes the difficulties admirably clear. It is easy to see from his examples that questions of similarity, affinity and relatedness may be impossible to

decide, and that the idea of evolution may provide no help in elucidating them. A similar situation can occur in the genetics, where it becomes impossible to find the unique route connecting an ancestor to a descendent possessing the same gene. But that in itself does not indicate lack of connection, neither does the idea of evolution arise from the hermetic world of cladistics, or depend on it. If measurements of geological time are more or less what we think they are, if fossils are the remains of once living organisms, if they occur in the sequence we think exists and if during geological time all life is derived from other life, then it is impossible to reject evolution. Did Patterson think that his systematic analyses had some bearing on the truth or falsehood of this conclusion? Of course, it is open to anyone to assert that the earth is 6000 years old, that species are repeatedly specially created, that the earth is flat (I got 905,000 hits in an internet search for that one) or that the moon is made of green cheese, but the assertion also implies exemption from laws which prevail universally elsewhere. The idea of common sense, that universally admitted impressions should be taken as corresponding to fact, was used by the 18th century Scotsman Thomas Reid to combat contemporary solipsism. It is still needed. Common sense, along with consistency or consilience, is the underpinning of science. If one truly wishes to understand nature there is no room for arbitrary rejection of evidence in selected areas. Systematics is the process of grouping. The material may often be intractable, but the difficulties cannot in themselves overthrow the concept of evolution. Patterson seems to have picked up a finely honed logical instrument and suffered a self-inflicted wound.

Yours sincerely,
LAURENCE COOK

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28 January 2002 kerp@uni-muenster.de

Dear Professor Gardiner

The new Picture Quiz is an extremely easy one, even for someone who is a palaeobotanist rather than a micropalaeontologist. The person who is pictured in *The Linnean* 18(1) is the famous French scientist Alcide Dessalines d'Orbigny. He was born in Couron near Nantes (Loire-Atlantique) on 6 September 1802 and he died on 30 June 1857 in Pierrefitte-sur-Seine, now one of the northern suburbs of Paris.

The D'Orbigny family moved to La Rochelle in 1820 where he became interested in the study of microscopic organisms that he called foraminifera. From 1826 to 1833 he travelled as naturalist of the Museum d'Histoire Naturelle through South America and collected over 10,000 plants, animals, rocks and fossils. He published a large number of papers and his major contribution on this expedition is: "La relation du voyage en Amérique Méridionale".

After his return to France he worked at the Museum in Paris, mainly on palaeontology

and stratigraphy and he became Professor of Palaeontology in 1853. D'Orbigny is the founder of micropalaeontology and he recognized the importance of microfossils for stratigraphic correlation. He described many new taxa. In addition, he defined several of the stratigraphical standard stages: Toarcian, Callovian, Oxfordian, Kimmeridgian, Aptian, Albian and Cenomanian.

Yours sincerely,
HANS KERP

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Dear Brian

Alcide d'Orbigny

The picture on p. 16 of The Linnean Vol. 18(1) must be Alcide Charles Victor Marie d'Orbigny (1802–1857), although he usually called himself Alcide Dessalines d'Orbigny (Heron-Allen, 1917; Calvez, 1974). Not only is he the father of Micropalaeontology, he also (d'Orbigny, 1826) separated Lamarck's "céphalopodes" into the "céphalopodes polythalames" (the Foraminifera) and the molluscan "céphalopodes acétabulifères" (the "suckered" cephalopods: i.e. the octopuses, squids and cuttlefishes).

An enthusiastic marine biologist from childhood, among other notable achievements he published a major work on the cephalopod molluscs (Férussac & d'Orbigny, 1835–1848). Originally planned in co-authorship with Férussac, d'Orbigny completed it alone following Férussac's death in 1836, releasing it as a series of livraisons, the dating of which was reviewed by Tillier & Boucher-Rodoni (1994). This was a comprehensive and systematic compilation of the then known cephalopods of the world and included descriptions of specimens in the Rijksmuseum van Natuurlijke Historie, Leiden, communicated by the Museum Director, Temminck, and the Curator of Invertebrates, De Haan. Included were the first European descriptions of specimens from Japan, although no type material was designated (precipitating a great deal of subsequent confusion). The specimens in Leiden were part of several shiploads of specimens of Japanese flora and fauna sent from Japan by Philipp Franz von Siebold. D'Orbigny commissioned a translator to provide his descriptions of the Japanese material: the original descriptions were found subsequently to have originated in the large library of Japanese literature brought back to Leiden by Siebold (personal observations of manuscripts and the catalogue of Siebold's library). The specimens and literature were originally intended for publication as part of the ambitious "Fauna Japonica" (Siebold, 1833–1850) but unfortunately, apart from d'Orbigny's descriptions of some of the Leiden cephalopods, only two volumes on the invertebrates reached print (the Crustacea and the Echinodermata).

Sadly, it seems that most of d'Orbigny's possessions were dispersed upon his death. He sold his shell collections from Central America, the Caribbean and the Canary Islands to the British Museum in 1854 (F.C. Naggs, pers. comm.), and the manuscripts of his Foraminifera papers were purchased from a Parisian book dealer by Heron-Allen.

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Best regards,
IAN G. GLEADALL

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20 February 2002 SueT@qm.qld.gov.au

Dear Brian

How are you and thanks as ever for the Lovely Linnean! I was pleased to see that handsome chap Alcide d'O on p16 even more so as the French have just been lauding him (and I was an agent of the CNRS from Sept to December) and one of the first things I curated while at the Hancock [Museum] was a fine set of foram models based on his design. Also poignant seeing as how stratigraphy geology as such is being villified in so many places these days.

I had hoped to get to London in January but in the end it wasn't possible except en route back to France for my stint at UNESCO. But I did discover the lovely St Mary's Lambeth with its new Museum of Garden History – worth a plug in *The Linnean* sometime – with Cap'n Bligh in the churchyard.

Best wishes
SUE TURNER

The three correct solutions to the Alcide d'Orbigny Picture Quiz, will all receive an appropriate mug. Editor.

The Sad Status of Evolution Education in American Schools

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Abstract

Throughout the United States, anti-evolutionists continue to undermine the teaching of science. Their attacks on the teaching of evolution have included adopting weak standards for teaching evolution, vilifying evolution, and demanding time to teach "creation science" and "intelligent design". The anti-evolutionists include surprisingly large numbers of biology teachers who endorse (and sometimes teach) creationism. Although evolution is the unifying concept in biology, our former students overwhelmingly endorse creationism.

Additional Key Words: Biology Teachers – Creation Science – Creationism – Lawsuits

In May of 2001, anti-evolutionists presented a three-hour briefing before the US Congress condemning evolution and arguing that life and the universe are the work of an "intelligent designer". One month later, the US Senate passed by a vote of 91–8 a "Sense of the Senate" amendment stating that "It is the sense of the Senate that (1) good science education should prepare students to distinguish the data or testable theories of science from philosophical or religious claims that are made in the name of science, and (2) where biological evolution is taught, the curriculum should help students to understand why the subject generates so much continuing controversy, and should prepare the students to be informed participants in public discussions regarding the subject" (Henry, 2001). The amendment, which was crafted by anti-evolutionist Phillip Johnson, is the latest attempt by anti-evolutionists to ensure that creationism is taught in science classes and, in the process, undermine science education, free thought, and academic freedom in the US. Although the most famous event associated with the evolution-creationism controversy was the criminal prosecution and trial of John Scopes in 1925, there have been many more recent attacks on the teaching of evolution. These attacks by anti-evolutionists have been multifaceted and remarkably effective.

ADOPTING WEAK STANDARDS FOR TEACHING EVOLUTION

State standards for education are important because they are supposed to be the foundation of what students learn and, in the process, produce the state's desired educational outcomes. However, according to Lerner's *Good Science, Bad Science: Teaching Evolution in the States* (Lerner, 2000), 26 states have adopted standards for teaching evolution that range from "weak" to "useless" and "disgraceful." Although evolution is biology's unifying idea, many states pretend that it does not exist. Indeed,

these many states do not include the word evolution in their science education standards (Lerner, 2000).

Although state standards for teaching evolution can support the biology teachers who want to include evolution in their courses, they do not necessarily ensure that evolution receives much coverage in all biology courses. For example, Indiana's standards for teaching evolution received a grade of "A" by Lerner (2000) and are among the 10 best in the US. Nevertheless, one-third of Indiana's high school biology teachers spend less than three days on evolution, 43% characterize their teaching of evolution as "avoidance" or "briefly mention," and at least 20% do not accept or are undecided about the scientific validity of evolution (Rutledge and Warden, 2000; Rutledge and Mitchell, 2002; for more about evolution, biology teachers, and educational standards, see Moore, 2002b).

ENCOURAGING TEACHERS TO AVOID EVOLUTION AND/OR TEACH CREATIONISM

In several states, science education officials encourage teachers to avoid evolution and/or teach creationism. For example, in Kentucky, which deleted the word evolution from its science education standards in 1999, education officials categorize evolution with topics such as gun control as topics that "may not be suitable for assessment items". If students or their parents do not want to be exposed to evolution, students are given alternative assignments (Scanlon and Uy, 1999). Some schools in Kentucky have protected students from learning about evolution by gluing the offending pages of textbooks together (Berman, 1997).

In Louisiana, where large numbers of high school biology teachers are creationists, science education officials group evolution with incest, witchcraft, drug use, and the occult as topics to avoid on the state's exit exam for high school students. Because evolution does not appear on the exam, and because the distribution of resources to schools is often linked to students' performance on the exam, many biology teachers in Louisiana do not include evolution in their courses (Moore, 1999; Moore, 2002b).

LAWSUITS

Courtroom challenges associated with the evolution-creationism controversy began with the Scopes "Monkey Trial" in 1925, which challenged Tennessee's law banning the teaching of evolution in its public schools. After the constitutionality of that law was upheld in Scopes' appeal in 1927, no one challenged any of the anti-evolution laws for more than 40 years. Laws banning the teaching of evolution were finally overturned in 1968 when the US Supreme Court ruled that they are unconstitutional (*Epperson v. Arkansas*; Moore, 2002a).

Wright v. Houston Independent School District in 1970 was the first lawsuit filed by a creationist. In that case, Judge Woodrow Seals ruled that the free expression of religion is not accompanied by the right to be shielded from scientific findings (e.g., evolution) that are incompatible with one's religious beliefs. Since the *Wright* decision, anti-

evolutionists have filed several other lawsuits to subvert science education. The anti-evolutionists have lost every major legal challenge associated with the evolution-creationism controversy (see discussion in Moore, 2002a). For example:

- Can states demand that teaching and textbooks be tailored to particular religious beliefs (e.g., Biblical creationism)? No (*Willoughby v. Stever*).
- Can a state mandate that creationism and evolution be given "equal emphasis" or "balanced treatment"? No (*Daniel v. Waters, Edwards v. Aguillard*).
- Can creationism-based textbooks be adopted in public schools? No (*Hendren v. Campbell*).
- Can federal institutions be banned from using tax money to promote evolution as science? No (*Crowley v. Smithsonian Institution*).
- Do exhibits that promote evolution as science restrict the free exercise of religion? No (*Crowley v. Smithsonian Institution*).
- Is creation science really science? No (*McLean v. Arkansas Board of Education*).
- Does creation science have any scientific or educational merit as science? No (*McLean v. Arkansas Board of Education*).
- Is creation science anything but religion masquerading as science? No (*McLean v. Arkansas Board of Education*).
- Does a teacher have a First Amendment right to teach creationism in a public school? No (*Webster v. New Lennox School District #122*).
- Can a teacher teach creationism if creationism is not included in the state's educational guidelines? No (*Peloza v. Capistrano Unified School District*).
- Can a teacher read aloud a disclaimer favoring the Biblical version of creationism? No (*Freiler v. Tangipahoa Parish Board of Education*).
- Are proposals for intelligent design different from those for creation science? No (*Freiler v. Tangipahoa Parish Board of Education*).
- Does a teacher's right to free speech entitle him or her to teach the alleged "evidence against evolution"? No (*LeVake v. Independent School District #656*).

Throughout the history of the controversy, high school teachers have led the courtroom challenges of anti-evolution laws (e.g., John Scopes, Susan Epperson, Don Aguillard). The anti-evolution laws have applied to colleges and universities, but university professors have been little more than expert-witnesses and cheerleaders in those lawsuits.

WEAKENING THE TEACHING OF EVOLUTION

Science educators and biology teachers who have endorsed weak standards for teaching evolution have not been alone in compromising the teaching of evolution. Indeed, state legislators and other policy makers have repeatedly intervened to undermine the teaching of evolution while simultaneously promoting the teaching of Biblical creationism in science classes of public schools. For example, although a US District Court struck down an attempt by Louisiana education officials to force science teachers to read aloud a disclaimer favoring the Biblical story of creation (*Freiler v. Tangipahoa Parish Board of Education*), Alabama requires all state-approved biology textbooks to

include a disclaimer telling students that evolution is a "theory, not fact" (Greenwood and North, 1999; Moore, 2000). Similarly, in 1990 the Kentucky legislature reenacted a law passed in 1976 stipulating that teachers who cover evolution can also teach "creationism as presented in the Bible" and that "students who adhere to the Biblical account should get credit on exams." This law has not been challenged, despite the fact that it violates court decisions such as *McLean v. Arkansas Board of Education* and *Edwards v. Aguillard* (Moore, 2000, 2002a).

POLITICS AND RELIGIOUS AGENDAS

Attacks on the teaching of evolution have often been driven by anti-evolutionists' determination to convert science teachers into missionaries, and schools and federal agencies (e.g., the National Science Foundation, Smithsonian Institution) into churches that promote the anti-evolutionists' religious agenda. This is why many of the attacks have been motivated by religious beliefs (e.g., William Willoughby of *Willoughby v. Stever*; James Holsted of *McLean v. Arkansas Board of Education*). To these people, the creationism-evolution controversy is a holy war. William Jennings Bryan's claim in 1925 that "The contest between evolution and Christianity is a duel to the death ... the two cannot stand together" has often been restated by modern-day anti-evolutionists such as Answers in Genesis Executive Director Ken Ham, who believes that "There is a war going on in society – a very real battle ... it's really creation versus evolution" (Moore, 2002a).

Politicians understand the immense popularity of creationism in the United States; that's why they often endorse the teaching of creationism. For example, in the 2000 presidential election, virtually all of the major candidates endorsed the teaching of Biblical creationism, as have previous presidents such as Ronald Reagan (Moore, 2000). The Republican Party's platforms in several states endorse the teaching of creationism (Paterson and Rossow, 1999).

VILIFYING EVOLUTION

Throughout the past century, anti-evolutionists have blamed evolution for societal ills such as murder, abortion, drug abuse, wars, and communism. For example, Tennessee legislator John Butler, who drafted the anti-evolution law that was used to convict John Scopes in 1925, claimed that evolution is "the greatest menace to civilization in the world," and William Jennings Bryan warned believers that "all the ills from which America suffers can be traced back to the teaching of evolution". More recently, Henry Morris – the most famous and influential anti-evolutionist in the last 70 years – announced that "Satan himself is the originator of the concept of evolution," and Judge Braswell Deen of the Georgia Court of Appeals claimed that "the monkey mythology of Darwin is the cause of permissiveness, promiscuity, pills, prophylactics, perversions, abortion, pornotherapy, pollution, poisoning and proliferation of crimes of all types." In 1999 US House of Representatives majority whip Tom DeLay linked the teaching of evolution with school violence, and in 2001 a state legislator in Louisiana introduced a bill blaming

evolution for racism (Moore, 2002a). Although anti-evolutionists are quick to note that some scientists have used evolution to justify discrimination and racism, they forget that creationists have often done the same thing (e.g., Moore, 2001b).

THE EUPHEMISMS FOR CREATIONISM: "CREATION SCIENCE," "INTELLIGENT DESIGN," ETC.

The "creation science" movement can be traced to the teaching of George McCready Price (1870–1963), a preacher and self-proclaimed geologist who founded the Deluge Geology Society in 1938 (Price was the only scientist cited by William Jennings Bryan as a creationist at the Scopes trial). Although Price's ideas initially attracted little attention, they became famous in the 1970s when Henry Morris renamed them "creation science." Creation scientists insist that the Bible is a science book, but US courts have ruled otherwise. For example, Federal District Judge William Overton ruled in *McLean v. Arkansas Board of Education* that "creation science has no scientific merit or educational value as science" and that "creation science is not science". Although some creationists have tried to disguise their religious ideas and agenda with various euphemisms (e.g., "creation science", "abrupt appearance theory", "intelligent design"), "creation science" remains immensely popular; it forms the foundation for the world's two largest anti-evolution organizations – Answers in Genesis and the Institute of Creation Research (see below). According to Answers in Genesis, all animals were originally vegetarians and there was no death or disease. Death, bloodshed, carnivory, and disease were caused by Adam's sin.

DOGMATISM

Creationism is a form of religious orthodoxy, and is therefore defined by who it excludes. This exclusion is most obvious in the dogmatism exemplified by many creationists. Whereas science is self-correcting and often abandons ideas when they are no longer supported by evidence, many anti-evolutionists are harshly dogmatic, as exemplified by their proclamations:

> *I want you to have all the academic freedom you want, as long as you wind up saying the Bible account [of creation] is true and all others are not.* — Television preacher and university administrator Jerry Falwell

> B*y definition, no apparent, perceived, or claimed evidence in any field ... can be valid if it contradicts the Scriptural record.* – Answers in Genesis

> *The final and conclusive evidence against evolution is the fact that the Bible denies it. ... There is not the slightest possibility that the facts of science can contradict the Bible. ... If the Bible teaches it, that settles it, whatever scientists might say, because it's the word of God.* – Henry Morris

> *If the Bible and the microscope do not agree, the microscope is wrong.* – William Jennings Bryan

> *The Bible is not to be tested by men's ideas or science, but science is to be brought to the test of [Scripture].* – Seventh-Day Adventist Church founder Ellen White

Creationists' dogmatism is also exemplified by several of the anti-evolution organizations and their publications. For example, the editorial policy of the *Creation Research Society Quarterly* states that all of the Bible's "assertions are historically and scientifically true" (Moore, 2000).

DEMANDING "EQUAL TIME" FOR "CREATION SCIENCE"

This approach is based on the notions of equality (i.e., that evolution and creationism are equally scientific) and fairness, as exemplified in this justification by Henry Morris: "Let us present as many theories as possible and give the child the right to choose the one that seems most logical to him. We are working to have students receive a fair shake." However, the scientific and educational validity of "creation science" was destroyed in *McLean v. Arkansas Board of Education*. Moreover, anti-evolutionists do not want to present "as many theories as possible" – they want science teachers to teach only their religion.

DEMANDING THE RIGHT TO TEACH "EVIDENCE AGAINST EVOLUTION"

The strategy for this attack is based on the dissenting opinion of US Supreme Court Justices Antonin Scalia and William Rehnquist, who wrote in *Edwards v. Aguillard* that

> *the people of Louisiana, including those who are Christian fundamentalists, are quite entitled, as a secular matter, to have whatever scientific evidence there may be against evolution presented in their schools, just as Mr. Scopes was entitled to present whatever scientific evidence there was for it.*

Scalia displayed his and other creationists' confusions about evolution when he noted that

> *The body of scientific evidence supporting creation science is as strong as that supporting evolution. In fact, it may be stronger. Evolution is merely a scientific theory or "guess." Creation science is educationally valuable. Students exposed to it better understand the current state of scientific evidence about the origin of life ... Although creation science is educationally valuable and strictly scientific, it is now being censored from or misrepresented in the public schools ... Teachers have been brainwashed by an entrenched scientific establishment composed almost exclusively of scientists to whom evolution is like a "religion". These scientists discriminate against creation scientists so as to prevent evolution's weaknesses from being exposed.*

A biology teacher's recent lawsuit (funded by an organization owned by television preacher Pat Robertson) demanding $50,000 and the right to teach evidence against evolution was dismissed in June of 2000, as was his subsequent appeal (*LeVake v. Independent School District #656*).

APOLOGETIC BIOLOGY TEXTBOOKS

Publishers of science textbooks have often responded to anti-evolutionists' criticisms by reducing their coverage of evolution and, in some cases, advocating creationism (Moore, 2001c). Today, many textbook publishers continue to be wary of the topic of evolution.

APOLOGETIC BIOLOGY TEACHERS

Biology teachers often teach evolution poorly, do not teach evolution at all, discredit evolution, or teach creationism because they fear the consequences of teaching evolution, know little about evolution (many biology teachers in Louisiana don't recall hearing the word evolution in any of their biology classes in college), support the teaching of creationism, or are creationists (Moore, 2000, 2001a, 2002b). The cycle of ignorance is perpetuated when these teachers' students become biology teachers. As Don Aguillard discovered in his study of Louisiana's biology teachers, "Creationism is alive and well among biology teachers" (Moore, 1999).

APOLOGETIC FEDERAL AGENCIES AND MUSEUMS

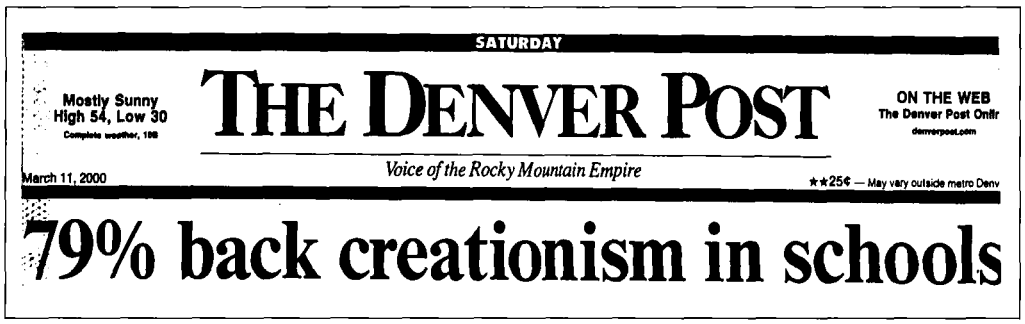
Like many biology teachers, the National Science Foundation (NSF) has also been afraid of publicly promoting evolution. Although the NSF is an independent federal agency charged with promoting basic science, it often avoids public endorsements of evolution (Pigluicci, 1998). For example, in 1989 the NSF funded a grant to the Biological Science Curriculum Study (BSCS) for a project entitled "Advances in Evolution: Biological and Geological Perspectives". Fearing that some members of Congress would be unhappy to learn that the NSF had funded an educational program about evolution, the NSF asked BSCS Executive Director Joseph McInerney to remove the word evolution from the title of the program (J. McInerney, personal communication, 21 May 2001). Similarly, scientific museums in the US seldom sponsor or include exhibits on human variation and evolution because most people reject the fact that humans evolved from other animals (Marks, 1998).

AGGRESSIVE, WELL-FUNDED ANTI-EVOLUTION ORGANIZATIONS

Anti-evolution organizations such as Answers in Genesis and the Institute for Creation Research have remarkably powerful "outreach" programs involving syndicated radio programs, newspapers, web sites, seminars, books and textbooks, courses and academic degrees, toys, sporting events, videos, safaris (e.g., looking for Noah's ark), and museums (e.g., Answers in Genesis will soon open a $14-million creation museum that covers 47 acres in northern Kentucky). These organizations are well-supported by the believers; for example, Answers in Genesis and ICR both have annual budgets that exceed $4 million. For comparison, the annual budget for the pro-evolution National Center for Science Education is only about $260,000 (Cole, 2000).

UNCRITICAL JOURNALISTS

When journalists report attacks by creationists on the teaching of evolution, they often encourage illiteracy by refusing to consider the competence and motives of people making claims or the merits of the anti-evolutionists' arguments. This results in most people being unable to distinguish experts and science from crackpots and religious agendas, and with merit being replaced by arbitrary authority. When creationism and evolution are presented as being equally meritorious, the validity of evolution is transformed into little more than personal opinion. I'm reminded of this every semester


SATURDAY

Mostly Sunny
High 54, Low 30

THE DENVER POST

ON THE WEB
The Denver Post Onlir

March 11, 2000

Voice of the Rocky Mountain Empire

★★25¢ — May vary outside metro Denv

79% back creationism in schools

Figure 1. The public's overwhelming support for creationism is exemplified by this front-page headline from the 11 March 2000 issue of *The Denver Post*.

when I begin my introductory biology courses with discussions of evolution. Virtually none of my students view evolution as a fact of nature; those who do also want creationism to be included in the course. When I discuss evolution with my students, their most often-asked question involves whether I "believe" in evolution. As one student noted, "It's just what a person believes. No one was there that's still alive today that actually witnessed creation or evolution. It's just what a person believes. I mean, we have no right to say what exactly is true" (Larson and Witham, 1999).

THE SAD RESULTS

The attacks by anti-evolutionists have been remarkably successful, as judged by the fact that Biblical creationism remains overwhelming popular among the public (i.e., our former students; Figure 1). For example (Gallup and Newport, 1991; Shermer, 1997; Moore, 2002a),

- Almost half of Americans believe that "God created man pretty much in his present form at one time within the last 10,000 years."
- Almost 80% of Americans believe that creationism and evolution should be taught in public schools.
- Most Americans reject the fact that humans developed from earlier species of animals.
- More than one-third of Americans favor the teaching of creationism instead of evolution.

At the Scopes trial in 1925, Scopes' defender Dudley Field Malone shouted at prosecutors, "Keep your Bible in the world of theology where it belongs and do not try to ... put [it] into a course of science." This has not happened, for the anti-evolutionists' attacks have resulted in "over a quarter – and perhaps as many as half – of the nation's high school students get educations shaped by creation influence" (Eve and Harrold, 1991).

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Footnote from the Editor: Several Presidents of the USA have commented on Christian fundamentalism. These include the great educationalist, Woodrow Wilson who stated that "no intelligent person at this late date denies evolution" while his successor, Theodore Roosevelt, claimed to have studied Natural History "at the feet of Darwin and Huxley" (or, rather, at Harvard University).

At the other end of the spectrum, Ronald Regan, who was not an evolutionist, saw nothing wrong with alternative theories of Creation being taught in his schools. More recently, George W. Bush went as far as to claim during his election campaign that "on the issue of evolution the verdict is still out on how God created the Earth."

Return of the Inquisition? A personal view

John Cloudsley-Thompson
Emeritus Professor in the University of London

INTRODUCTION

Many of the reports in the press about scientific matters, as well as the commentaries accompanying most TV documentaries, give the general public in Britain little idea as to the manner in which scientists actually think. For instance, animals are usually said, teleologically, to be 'designed for' rather than 'adapted to' some particular environment or function. Scientific investigations and experiments are regularly assumed to have been carried out to 'prove' some 'theory' rather than to test the validity of an hypothesis. The two are quite different because the investigator has to be unbiased in search of the truth. If an open mind is not maintained, invalid conclusions may well be reached. Moreover, trying to prove an hypothesis might well subconsciously involve the selection of data – by which, of course, any nonsense can easily appear to be substantiated. I am using 'hypothesis' in the context of a particular example that falls within the framework of a general theory. The latter is a systematic statement of principles, confirmed by observation or experiment and accepted as accounting for the known facts.

What the genuine scientist is really trying to do is to determine whether a particular hypothesis is true or not. As Marcus Aurelius wrote some 18 centuries ago: 'If anybody shall reprove me and shall make it apparent unto me that in either any opinion or action of mine I do err, I will most gladly retract. For it is the truth that I seek after....' Both Gandhi and Linus Pauling, among others, have said much the same.

The concept of evolution has a long history but it was not until the publication of *The Origin of Species* in 1859 that it began generally to be recognised, not merely as a theory but as proven fact. The Darwin-Wallace paper, published by the Linnean Society the previous year, had had little impact, even on biologists. As long ago as 1931, Wells, Huxley and Wells wrote in *The Science of Life* (a magnificent volume that influenced my thoughts more than any other book during my school days – 1995, *Biologist* **42**:80): 'The idea of the earth's going round the sun was considered to be just as impious in its time of novelty as was the idea of Evolution by the Fundamentalist of the backward States to-day.'

At the outset I should perhaps make clear that I am not an atheist: I am trying to argue from a scientific rather than a philosophical angle. I believe that people have a right to their opinions and should not have others forced on them. If they want to believe that the earth is flat, it is their affair, but fundamentalists have no right to stifle the views of others. About 15 years ago I was asked by an American publisher to write a high school textbook on invertebrate zoology. He sent me a contract and a cheque. When his reader saw the preliminary chapters, the publisher sent me an even larger cheque not to

write the book! The reader was alarmed that the evolutionary slant of my account could have made it unacceptable to teachers in the USA who would risk being sued by creationists were they to adopt it for their classes.

The British, of course, are not untainted by creationism either. Religious views, however, are considered to be private and are not usually regarded as political issues. When I returned to Cambridge as a mature student after the 2nd World War, one of my fellow undergraduates was a Roman Catholic priest. We were together in the University Museum when he pointed to the vestigial pelvic girdle of the whale skeleton suspended above us. Quite casually he remarked, 'It is that which first convinced me of the truth of evolution'. To this I replied that I had never considered any alternative. I asked him how he reconciled evolution with the teaching of the Catholic Church. He explained, using the analogy of keeping young children away from a fire, that such ideas were dangerous for uneducated people. Surely, if God gave us a brain, I said, he would have expected us to use it! Some years later, when a Jehovah's Witness came to the door, I was rash enough to ask him whether he believed that Adam had an appendix. This invoked such a lengthy discussion that my wife and I felt compelled to invite him in to share our dinner.

CREATIONISM

The recent revival of creationism in the United States has been reviewed by Randy Moore (2000), and the movement's evil influence on biological education is described by him in the present issue of *The Linnean*. The methods used by the creationists of today to suppress evolutionary teaching, although of course less extreme, seem to be on a par with those of the Inquisition during the 16th century. In 1500, Giordano Bruno was burned at the stake because be believed that the earth was not fixed but regarded it as a 'star similar to the moon, the planets and other stars infinite in number'. Galileo was forced to recant his Copernican belief in 1633, and to give assurance that in future he would believe what the Church recognised and taught was true.

John Marsden (2001, *The Linnean* **17** (2): 8) has commented on the fact that, according to a recent poll in the USA conducted by the National Science Board, only 9% of Americans believe that human beings evolved over millions of years without the intervention of God, and 80% believe that creationism should be taught in schools (see also Moore, 2000).

It is not always realised that science does not even pretend to embrace the entire spectrum of human knowledge and experience, and not all facts, however well established, come within it sphere. Science is concerned with how things work and how they evolved – with general phenomena rather than with isolated observations which cannot be regarded as instances of any widely applicable law. By this criterion, and contrary to Marxist dogma, history is not a science although it demonstrates causal relationships. Special creation, likewise, does not fall within the realm of science and therefore cannot be equated with evolution as the creationists demand.

Science itself depends upon various assumptions or presuppositions which are not themselves capable of rational proof, although they are usually regarded as axiomatic. A classical example of a presupposition is the word 'cogito' in the famous statement, '*Cogito ergo sum*'. To Decartes, the fact of his consciousness was not open to question. Such presuppositions are embodied in the principles of induction, continuity and order. If a particular situation has, in the past, always been followed by a certain event, it is assumed that it will continue to do so in future. Indeed, within the limits of the uncertainty principle, chaos theory and experimental error, a well-designed experiment should always give the same result. Furthermore, a statistical correlation does not guarantee a causal connection.

Of course, it would be impossible to dispute the claim of a religious fundamentalist that special creation might have occurred at a particular time in the past. But this proposition would require the assumption that the Creator had specifically included all the evidence to the contrary that has been found in the study of astronomy, geology, plate tectonics, palaeontology, and biology including carbon dating, DNA sequencing, and a host of other scientific disciplines. Moreover, the proposer of this improbable thesis would not be able to contradict the fact that evolutionary changes have been taking place since the moment of creation whenever it was, and are continuing to do so all the time. The unproven presupposition that 'entities must not be unnecessarily multiplied' – in other words that the simplest explanation should be adopted unless the evidence points to something more complicated – points unerringly to evolution rather than to special creation as the valid explanation of the origin of the universe and all within it. Incidentally, William of Occam (*c*1285–1349) who proposed it was born in Ockham, Surrey, and his name is sometimes spelt 'Ockham'. He joined the Francisan order and studied theology at Oxford, but left, whilst still an inceptor, on account of his controversial views. He represented the Franciscans in their dispute with Pope John XXII over apostolic parity (1327–1347), fled to Bavaria, and died from bubonic plague. His 'rule' of ontological economy has been used so frequently and to such effect that it has come to be known as 'Occam's razor'!

The details of the theory of natural selection are not free from criticism by biologists, but even those who disagree with some of Darwin's evidence seldom dispute the theory itself. For instance, Agnes Arber (1954) considered whether scientists' presumptions may unconsciously form their findings. She pointed out that 'Plato has seized the essential fact that any scientific system of explanation has a certain static finality, and hence must be imperfectly compatible with the unceasing flux of Nature....The biologist, when trying to express his own vision of reality, has no choice but to represent development and change by means of static statements'. She also emphasised that Darwin's theory depends largely upon an analogy between the controlled breeding of domestic plants and animals and the whole historic development of the organic world. 'One of the weaknesses of his theory lies in its failure to recognise the degree of incompleteness of this analogy.' I side with Darwin over this, and consider selective domestication to be very much closer to natural selection than mere analogy.

Creationism may not be science, despite the US Senate's endorsements on 13 June 2001 of an amendment to an education bill that defenders of evolution say will be used to promote creationism. Nevertheless, some scientific phenomena can be interpreted in a theological way, even though this does not contest the fact of evolution and the theory of natural selection. In 1913, L.J. Henderson published a book, *The Fitness of the Environment*, which is, today, almost forgotten. In this he pointed out that the physical characteristics of the environment present a unique collection of properties that is essential for the maintenance of life. These properties cover different systems, from the special properties of carbon and of water to the specific conditions which make life possible. For example, water is the only liquid that changes its state from solid (ice) to gas (vapour) within a range of temperatures so restricted that they do not cause the breakdown of biochemical compounds, themselves dependent upon the unique ability of carbon to form loose addition compounds with other elements. When we breathe, the haemoglobin in our blood takes up oxygen from the air and gives off carbon dioxide because the oxygen is bound in a loose, easily reversible manner.

Henderson (1913) concluded that there is not one chance in countless millions that the many unique properties of C, H and O, and especially the stable compounds H_2O, CO_2 (and HCO_3^-) should simultaneously occur in the three elements otherwise than through the function of a natural law which somehow connects them together. Since his day, the number of known unique properties favourable for the existence of living organisms has increased from the remarkable qualities of the DNA molecule, to those of sodium by which the cellular ionic composition is maintained. Darwin (1859) wrote: 'Let it be borne in mind how infinitely close-fitting are the mutual relations of all organic beings to each other and to their physical conditions in life' and Carl Pantin (1968) emphasised that these close-fitting relations are the result of natural selection (see Cloudsley-Thompson, 1975). Herein could lie some solace to the descendants of the disciples of Hans Driesch and Henri Bergson, whose vitalistic hypotheses were routed when urea was synthesised; while the last nail in the coffin of Wynne-Edwards's (1962) altruism, savaged by Richard Dawkins (1976), has yet to be driven fully home if this has not already been accomplished by William Hamilton's studies on kin selection.

ICONS OF EVOLUTION

When 'Belisha beacons' and zebra crossings were first introduced to London during the 1930s, I remember reading in the newspaper that a car driver had been prosecuted for not giving way to a pedestrian. His defence was that the crossing, on a bend of the road, was a few inches wider in one place than officially designated. He was acquitted on this technicality, but either the law or the crossing had to be altered to prevent any repetitions. Just recently, a driver who received notice of a £60 fine with a picture of his car caught in a speed trap, sent a photograph of the money instead of payment. But he paid promptly after Surrey police sent him a picture of handcuffs!

Such trivialities illustrate the type of nitpicking argument employed by Jonathan Wells (2000) in *Icons of Evolution. Science or Myth?* apparently to discredit the

monumental concept of Charles Darwin. This book cannot help but provide ammunition for creationism. Fortunately there is no need to rebut Wells's claims in detail, because Scott (2001), a much smarter 'eye in the sky' than I could ever be, has already done so very adequately in a review whose opening sentences sum up much of his criticism: 'If someone were to charge that textbooks present atomic theory using evidence that is erroneous, misleading, and even fraudulent, and that we should therefore question whether matter is composed of atoms, eyebrows would be raised – at least at the accuser. . . . Unlike atomic theory, evolution has obvious theological implications, and thus it has been the target of concerted opposition, even though the inference of common ancestry of living things is as basic to biology as atoms are to physics.'

Most creationists appear to confuse natural selection with evolution and to assume that criticism of the former casts doubt upon the latter. This is probably due to ignorance, but Wells (2000) is not so naive. He continually refers to 'Darwin's theory of evolution' although, as Jones (1999) had already pointed out, Darwin did not actually mention the word 'evolution' anywhere in *The Origin of Species*. Nor does Wells consider the effect that the writings of R.T. Malthus might have had on the formulation of Darwin's theory. In fact, this nasty book, based on a cunning selection of data, is clearly designed to appeal to the creationist lobby in the USA. Many of his objections to the theory of natural selection, which H.G. Wells *et al.* (1931) insisted is no longer theory but fact, had already been answered by the time of the publication of *Icons of Evolution*, most recently by Steve Jones (1999) in his masterly volume *Almost Like a Whale*. Jonathan Wells would have merited the same type of reprimand that T.H. Huxley administered to Bishop Wilberforce at the famous meeting of the British Association for the Advancement of Science, held at Oxford in 1860, when Huxley said that he was not ashamed to have a monkey for his ancestor, but he would be ashamed to be connected with a man who used great gifts to obscure the truth.

By the time my grandson, Dorian, had reached the age of 9, he had grown out of '*Thomas the Tank Engine*'. For a short while, before dinosaurs became an absorbing passion, his interests turned to robots. I once asked him: 'How do you know that you are a boy, and not a robot who thinks he is a boy?' His reply surprised me. 'How was I born?' he asked. I was considering this and thinking that perhaps he was a bit young to be introduced to Cartesian dualism or the ideas of Bishop Berkeley when he spoiled the effect by 'gilding the lily' with 'Mummy would have known if she had had a robot rattling around inside her'. Like Dorian, Wells spoils any effect he may have created by claiming that evolution is a shoddy science, maintained by ideology rather than evidence in order to keep the research dollars rolling in or to promote a materialist philosophical agenda (Scott, 2001).

Before turning to more positive aspects of Darwin's theory, I should like briefly to refer to a few of Jonathan Wells's niggles. These are often based on statements by evolutionary biologists taken quite out of context. The first, that textbooks rely uncritically upon Ernst Haeckel's drawings of embryos which are not accurate. Doubtless, like Gregor

Mendel, Haeckel may have doctored his evidence to some degree, but this does not mean that the conclusion was wrong. Textbook drawings are naturally simplified but, even when I was taught at school, before the War, that 'ontogeny recapitulates phylogeny' it was pointed out that only organs necessary for the development of subsequent organs are retained during embryological development.

Wells cites the work of Sulloway (1984) who showed that David Lack (1947) in his classic book, *Darwin's Finches*, did much to perpetuate the legend that Darwin had regarded the Geospizinae as evidence of 'evolution in action'. There is no specific reference to these birds in *The Origin of Species*, although Darwin mentioned them in the 2nd edition of his *Journal of Researches* (1845) and devoted one of the very few illustrations therein to the beaks of four species. None of this, however, in any way reflects adversely on the validity of natural selection, and Sulloway (1984) concluded: 'The Darwin-Galapagos legend notwithstanding, these famous islands will doubtless remain "a perennial source of new things" in science; and no one would be more disappointed than Charles Darwin if this were not the case'. He also wrote that the legend 'with its romantic portrait of Darwin's "unrealistic" insight into the Galapagos as a microcosmic "laboratory of evolution", masks the complex nature of scientific discovery, and, thereby, the real nature of Darwin's genius'. Moreover, Steve Jones (1999) had already answered Wells's criticisms before they were made!

Another of Wells's misleading claims is that 'the Cambrian explosion presents a serious challenge to Darwinian evolution'. As Jones (1999) had already emphasised, it is a 'failure in the geological record rather than of the Darwinian machine'. The new taxa that arose in the Cambrian period reflect not a series of exceptional events but the appearance of animals with skeletons that could be preserved as fossils. Richard Fortey (1997) accepts that 'it remains a challenge to explain why so many animals should have increased in size and acquired shells within so short a time at the base of the Cambrian' but adds that it is more than likely that the evolutionary fuse of the 'explosion' was lit long before the Cambrian.

ADAPTIVE RADIATION AND CONVERGENCE

According to Colin Patterson (2002), convergence is probably the aspect of evolution best known to most people – although not mentioned by Wells (2000) – so I will address it briefly in the final part of my argument. The more diverse a habitat, the larger is the number of species that are likely to be found within it. Furthermore, different kinds of environment are inhabited by plants and animals of different shapes and sizes. Evolution can be considered from different angles. From the viewpoint of the taxon (e.g. reptiles; Cloudsley-Thompson, 1999) it is seen as 'radiation', from that of the environment (Cloudsley-Thompson, 1998) as 'convergence' and, when considered laterally as it were, 'parallel evolution' becomes apparent. A taxon may radiate, parallel evolution then takes place between its various members and those of other taxa which, in turn, converge on particular habitats or microhabitats.

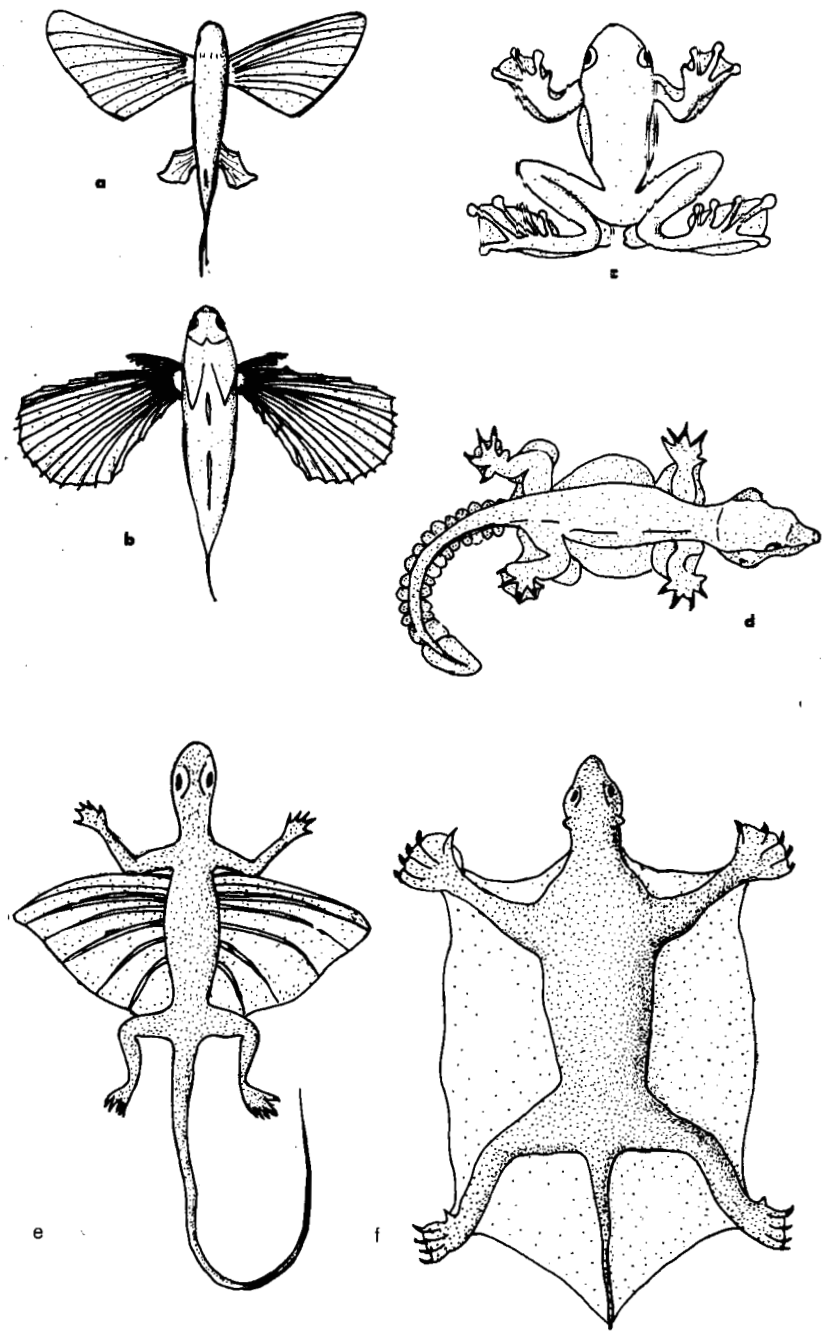

Figure 1: Gliding animals. **a** Flying fish (*Exocoetus* sp.); **b** flying gurnard (*Dactylopterus volitans*); **c** flying frog (*Rhacophorus reinhardtii*); **d** flying gecko (*Ptychozoön* sp.); **e** flying dragon (*Draco volans*); **f** flying phalanger (*Galeopithecus volans*). (Not to scale.) (From Cloudsley-Thompson, 1999 after various authors.)

Several kinds of animals have evolved the ability to fly. Only insects, birds and bats are capable of sustained flight, as were the extinct pterodactyls, but many others can glide for considerable distances. These include flying fishes, flying frogs, flying lizards of various kinds, flying snakes, flying phalangers, flying squirrels, flying lemurs and so on (Fig. 1).

Examples of convergence are probably most conspicuous in tropical rainforests, where many plant species are competing for light, the ultimate limiting factor there. Despite their independent evolutionary origins, the plants and animals of the deserts of the world often have a remarkably similar appearance (Cloudsley-Thompson, 2001). There has also been convergence at different times in evolution – for example between many Jurassic and Cretaceous reptiles, ornithomimid dinosaurs and ostriches, ichthyosaurs and dolphins, plesiosaurs and sea-lions, pterodactyls and vultures, and so on. Similarities between plant and animal communities that experience comparable environments have long been recognised by biologists. Adaptive convergence at the community level is a major factor of biogeography and has led to recognition of the concept of 'biomes' (Allee *et al.*, 1949).

Some of the finest examples of adaptation are to be seen in the coloration of animals, a subject to which I was introduced by my supervisor and friend, Hugh Cott (1940), himself inspired by the complexity of the interactions between predators and prey, camouflage and protective resemblance, mimicry and bluff that had previously convinced A.R. Wallace, H.W. Bates, F. Müller and other pioneers, of the truth of Darwin's theory of natural selection.

CONCLUSION

The Koran is less explicit than the Bible in giving a time frame for creation, but Muslim, Jewish and Christian creationism are all compatible. Fortunately, the majority of well-educated people of all faiths are not fundamentalists or creationists who would suppress the views of others in an inquisitorial manner. As Descartes remarked, one thinks metaphysically but lives and acts physically. Nevertheless, it is clear that theological fundamentalism is a threat to scientific progress and especially to the development of biology.

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Book Review

Alfred Russel Wallace – A Life, by Peter Raby, Chatto & Windus, 2001. ISBN 0 7011 6838 2, Price £20.00.

In this book about the life of Wallace Dr. Peter Raby has given us a most readable and meticulously researched account of one of the greatest biologists of all time, and one who shares with Charles Darwin the credit for proposing the theory of evolution through the action of natural selection.

Wallace's achievements are all the more remarkable when one remembers his only moderate social position. His father had a small unearned income on which the family lived, apart from the tuition fees of a few young scholars. Wallace went to school but the increasing number of his brothers and sisters put a serious strain on the family income, and when he was fourteen he became apprenticed to become a surveyor. Wallace's father died when Alfred was 20 years of age, and his mother was left with very little money to support and educate the family. Consequently, a university education was out of the question, but Wallace, who was an avid reader, embarked on a systematic course of private study of natural history, geology and other science subjects. He made full use of local libraries, Mechanics Institutes and similar bodies wherever he happened to be living.

He was intoxicated by reading Humbold's *Personal Narrative* of *Travels in South America* and realised here was a field of great potential biological interest. He had already come to know Henry Walter Bates, a fellow enthusiast in natural history, and they planned to visit South America on a collecting expedition. The plans were eventually realised and they set off together to explore in the regions of the Amazon and Rio Negro. After about five months collecting, Wallace and Bates decided to work separately, which they both did successfully.

When Wallace terminated his first expedition, there was a most disastrous fire on board the ship in which he was sailing back to England and most of his collections were destroyed. He was fortunate to survive many days exposure to the elements in an open boat.

After Wallace's return from the Amazon he remained in England. He had personal and family affairs to put in order. He joined the Entomological Society, attended meetings and read two papers. He began to be known among the scientists of the time. He produced two publications on his travels on the Amazon and the Rio Negro and on the palms of that area. But funds were low and he planned the next collecting journey to the Asiatic areas, making Singapore his headquarters. He set off in 1854, not to return till 1861 (7 years).

It was during this long period of travelling in the Malay Archipelago and collecting very successfully, that he still found time to think. Ideas on the evolution of species frequently occupied his mind, but the actual causes, which led to it, were unknown. During a period when he was immobilised due to an attack of malaria, he had time to think over his scientific problems and to re-read Thomas Malthus's *An essay on the principle of population.* He suddenly realised that this gave him the missing piece in the puzzle of how natural selection could be the active agent causing evolution. He wrote a short paper on this and sent it to Darwin in England.

Wallace's paper was brief, but in a form ready for publication, although there was no request for Darwin to send it to an editor. Darwin felt that despite his discussions with Sir Joseph Hooker and Sir Charles Lyell about his theory that natural selection was the active agency that drove speciation forward, he could no longer honourably publish a paper claiming this as his own idea. He was reluctant to give up the results of some twenty years painstaking study when there were men who could vouch for the truth of his claim.

In his despair, Darwin left it to Hooker and Lyell to decide what he should do. They came up with a suggestion of something unique. Darwin should write a short account of his work and results and the conclusions that flow from them, and this should be read at the same meeting of the Linnean Society as Wallace's paper, so that neither author could claim priority of publication. And that is what happened. And so it was that in the famous meeting in 1858 the theory that evolution is the result of natural selection was announced to the world.

Wallace was not present at the reading of his paper because he did not return to England until 1861. It was during this long period of collecting that he discovered that there was a host of plant and animal species that are found only on the western side of a

line that can be drawn on the map (the Wallace line) and another host of species found only on the eastern side of the same line. This was a most important discovery in biological geography and represents the line joining up the points of contact of Asian and Australian species advancing on one another. At some points the two hosts are separated by very short distances, for example by 28 km (*ca* 17.5 miles) at the narrowest point in the Lombock Strait between the islands of Bali and Lombock. Darwin made discoveries about geographical isolation of the species of finches etc. in the Galapagos Islands, but nothing of comparable importance. There are, of course, species with special means of dispersal (e.g. the coconut, *Cocos nucifera)* found on both sides of the line.

Wallace returned to England in 1862 and during the ensuing months he suffered from ill health as a result of the physical hardships of his travels. Much of his time had to be spent on money matters, and his collections had to be unpacked and sold. However he resumed his friendship with Darwin and began to make friends among the scientific leaders of the day. He was also planning his great book on the Malay Archipelago.

He read a paper to the Anthropological Society on the *Origin of Human Races from the Theory of Natural Selection*, in which he discussed the question of racial equality and inequality and claimed various superiorities for the people of Europe – a greater longevity, greater than average strength and a capacity for more rapid increase. Dr. Raby suggests that his audience would have been familiar with the facts on which these assertions were made. But in these days of truly international participation in the Olympic Games it seems unlikely that Wallace would make such statements, which have a distinctly racist sound.

At this time Wallace had become engaged to be married, but the engagement was suddenly, without warning, broken off by the girl and her father. Wallace was deeply hurt by the affair, and for several of the following months he did very little scientific work. But the following year he was able to meet up with his closest friend of the Amazon days, Richard Spruce, who was then staying at Hurstpierpoint in Sussex, where William Mitten, a pharmacist and bryologist, had offered to assist Spruce to classify his vast collection of tropical mosses and liverworts. It was when visiting Spruce at Hurstpierpoint that Wallace met his future wife, Annie Mitten, the eldest daughter. Annie and Wallace had a common interest in our native wild orchids and a close friendship ripened into an engagement and a happy marriage in 1866.

It was at the time of his meeting with Annie Mitten that Wallace became deeply and enthusiastically interested in spiritualism, a subject which continued to occupy his mind for the remainder of his life. Wallace's attitude to spiritualism has come under much deserved criticism, because of his failure to check whether there was not some other scientifically possible explanation of the phenomena. Even in the face of cases where irrefutable evidence existed that imposture had occurred, Wallace rushed into print to defend Spiritualism *in general.* Clearly emotional bias in favour of the survival of death by a spirit had triumphed over his objectivity.

In spite of his spiritualism his stock in the scientific world was high. In November 1868 he was awarded the Royal Medal of the Royal Society – a very great acknowledgement of his contribution to scientific knowledge. Later in life the scientific societies awarded him honours and medals. His reception of these was not enthusiastic. He genuinely disliked the ceremonies and making speeches on such occasions.

His publication of *Island Life* was highly acclaimed and Darwin, with other scientific friends, was instrumental in obtaining in 1880 a Civil List pension for Wallace, who could well then have retired from political, scientific and literary work, but he found causes that fired his enthusiasm, for example proposals for land tenure reform that would eliminate the injustice suffered by vast numbers of Irish peasants. He studied the subject in depth, attended meetings and influenced decisions and wrote a pamphlet "Land Nationalisation: its necessity and its aims".

The biographer has summarized Wallace's temperament in three words – rationality, enthusiasm and naïvety. All three play a part in his attitude to Land Nationalisation. Thus he wrote "Surround the poorest cottage with a spacious vegetable garden, with fruit and shade trees, with room for keeping pigs and poultry and the result infallibly is untiring industry and thrift, which soon raises the occupiers above poverty and diminishes if they do not abolish drunkenness and crime." All written as if the experiment had been tried and he is reporting the results. Can naïvety go further?

The Civil List pension gave Wallace some degree of financial stability, but with children to educate, and no paid employment other than what he received from lectures and publications and marking exam papers was, he was always short of money. However, in 1886, he was invited to Boston, U.S.A. to give a series of lectures at the Lowell Institute. Afterwards he made an extensive tour of the United States of America, from which he learned much about how the capitalist system had handed over the most valuable of all natural resources, the land, into the hands of railway speculators and others.

It was only to be expected that Wallace would take advantage of his American tour to inspect the two species of "big trees" of California – the Sierra Redwood (*Sequoia sempervirens*) and the mammoth trees (*Sequoiadendron giganteum*) further inland. The redwoods have straight graceful trunks, which in one extreme case reaches a height of 367 feet. They depend for their water supply on the heavy nocturnal dews of the sierras. The "Mammoth trees" have even more massive trunks than the redwoods but do not attain quite such enormous heights. Counts of growth rings in dead trees indicate ages from 1,200 to 4,000 years (the two genera combined). Wallace was appalled to see how these had been felled for timber, instead of being conserved as irreplaceable national treasures, and he added his voice to the call for government action.

After his American trip he settled down to a "second retirement", although he continued to produce a steady stream of scientific articles, which helped to keep his bank balance "in the black". Since his marriage to Annie Mitten and the birth of their young family, it is probable that, despite his Civil List pension, Wallace never enjoyed an hour free from some worry about money. Nevertheless, he decided to leave Godalming

and move away from London to the real countryside, settling at Corfe View, Parkstone with a view of the Dorset coast and the New Forest. He settled down happily to supervising the planting of the garden of his new home, while his wife developed her artistic skills in her watercolour painting. In his spare time he deciphered the minute script of his deceased friend, Richard Spruce, and in so doing saved for future generations the product of his friend's taxonomic skill.

Under considerable pressure from friends, Wallace accepted the degree of Doctor of Civil Law from the University of Oxford. Academic distinctions of this kind meant little or nothing to him now that the correctness of his and Darwin's theory of the origin of species was so universally accepted.

In 1998 the Linnean Society held a Special General Meeting in the Wallace Room of the University of Bournemouth to commemorate the reading in London140 years earlier of the papers by Alfred Russel Wallace and Charles Darwin, announcing to the world the theory that evolution is effected by the agency of natural selection.

The Society had a special medal made with the head of Wallace on one side and that of Darwin on the other, one medal in gold to Wallace and another in gold to Darwin (posthumously). The Society also had an excellent full-length portrait of Wallace painted by Roger Remington; it now hangs, side by side with a similar one of Darwin, in the rooms of the Society in Piccadilly. It has been judged by those who knew him best a life-like picture of his benevolence and serenity.

After a second move in 1901, building their final home further into the "wilderness", Wallace and Annie lived happily and busily, until in 1913 he died peacefully, at the age of 90, followed by Annie a year later.

As Peter Raby has put it "You might not agree with Wallace; you might think that his views on this or that were eccentric, even perverse, but that did not invalidate his contribution to mainstream scientific thinking." I think Dr. Raby is to be congratulated on producing such an excellent book, which is both authoritative, and a pleasure to read.

JOHN SPEARING FLS

ADDENDUM

At the Society meeting on 7th February 2002, Dr. George Beccaloni of the Natural History Museum spoke briefly about the work of the Alfred Russel Wallace Memorial Fund, which was set up a few years ago to refurbish and re-lease the grave of the great man. Dr. Beccaloni showed before and after slides of the grave in Parkstone Cemetery in Dorset, showing what an impressive job has been done on the grave and its surroundings. The lease of the grave, which runs for 100 years from 2015, is now in the custody of the Society. However, when the Society visited the refurbished grave in 2000 (*Annual Report 2000* pp2–4), it lacked a bronze plaque, which has now been added. A replica of the plaque was presented to the Society at the 7th February meeting by Mr.

Richard Wallace, grandson of Alfred Russel and Treasurer of the A.R. Wallace Memorial Fund. Professor Cutler, Vice-President of the Society, expressed the Society's and his personal deep appreciation of the gift. The citation reads:

Alfred Russel Wallace O.M., LL.D., D.C.L., F.R.S., F.L.S.
Naturalist – Scientist – Explorer – Writer – Social Campaigner – Humanitarian.
Co-discoverer of evolution by natural selection.
Founder of the science of zoogeography.

This monument was restored in the year 2000 by the A.R. Wallace Memorial Fund; it is cared for by the Linnean Society of London.

Obituary: Alan Wesley, 1926–2000

"Umbra mai fiu."
Larghetto from "Serse" by G F Handel 1738

In this aria, Zeus thanks a pine tree for the shade it affords him – a quotation that links Alan Wesley's research into gymnosperms from the Mediterranean region with his love of Italian culture, especially the opera. On hearing of Alan's death, I felt moved to write an appreciation of his contributions to botany and of his generosity in giving time and inspiration to his students.

FAMILY AND EDUCATION

Alan was born on 23rd October 1926, the youngest of three children, to Mr Thomas Edward Wesley and Mrs Constance Elizabeth Wesley (née Rook), in Tottenham, north London. His secondary education at Southgate County Grammar School, London N14, enabled him, in October 1943, to enter Imperial College, University of London to read Botany at the age of 16. It was during this latter part of the Second World War that Alan was introduced to palaeobotany through meeting Prof. WT Gordon FLS, then a lecturer in the Geology Department of King's College, London. Gordon's influence not only instructed and inspired the teenage Wesley in the realm of fossil plant studies, it also resulted in Gordon's giving him an Upper Carboniferous coal ball from the Lower Coal Measures of northern England. This coal ball contained the first recorded fossil plant specimen to be subjected to examination by transmission electron microscopy (TEM). On 9th July 1947 Alan obtained Second Class Honours in his BSc (special) and was made Associate of the Royal College of Science in Botany.

EARLY CAREER IN YORKSHIRE

Never of a robust build, Alan did his National Service in the army, in Yorkshire "to fatten up" – as his sister, Mrs Constance Reid, explained to me. This brought Alan his first contact with the Middle Jurassic flora of the North Riding and with Leeds.

The chair of Botany at the University of Leeds was at that time held by Dr RD Preston FLS and he appointed Alan Demonstrator in 1949. Preston had made significant

advances in plant cytology by applying TEM, invented in the 1930s, to investigate the ultrastructure of cell walls. At Preston's suggestion, Alan collaborated with a Dutch technician, B. Kuyper to apply TEM to observe lepidodendralean secondary xylem tracheids in the coal ball presented by Gordon in 1945 (Wesley & Kuyper, 1951). At that time regarded as a species of *Lepidodendron* Sternberg, this decorticated stem is now called *Diaphorodendron vasculare* (Binney) DiMichele. Primitive, perhaps, by present-day standards, this high-resolution image disclosed the details of numerous minute connexions linking successive scalariform bars in these tracheids (see Fig.1). As Wesley and Kuyper pointed out, such connecting threads had been recorded as long ago as 1869 by WC Williamson using light microscopy at only moderately high magnification. Indeed, they listed some fourteen other lepidodendralean species recorded by thirteen authors as having these minute structures in their xylem e.g. the rhizophore *Stigmaria ficoides* (Sternberg) Brongniart and the cone *Flemingites brownii* (Unger) Brack-Hanes & Thomas. However, the higher resolution of TEM allowed Wesley and Kuyper to confirm that these threads were neither part of the primary cell wall (as Solms-Laubach, Seward and Hill had earlier proposed) nor tertiary thickenings (as Calder suggested), but were secondary in origin, again as Williamson opined, being part of the same lignified transverse bars that they connected. Further, Wesley and Kuyper observed that the patterns formed by these anastomosing threads as they cross the pit areas between the transverse bars of contiguous tracheids are unrelated in their attachments or in the mode of branching. Very similar connecting threads were later observed also in the xylem of certain species of Protolepidodendrales. According to Erdtmann, the next published application of TEM to fossil plants came in 1954 and scanning electron microscopy (SEM) observations were first made in the following decade. Wesley (1954) gave a further account of his pioneering work with Kuyper, comparing its application in palaeobotany with various techniques of light microscopy. Might it not be fitting to commemorate the first electron microscopy in palaeobotany by employing the expression "Wesley and Kuyper's threads"?

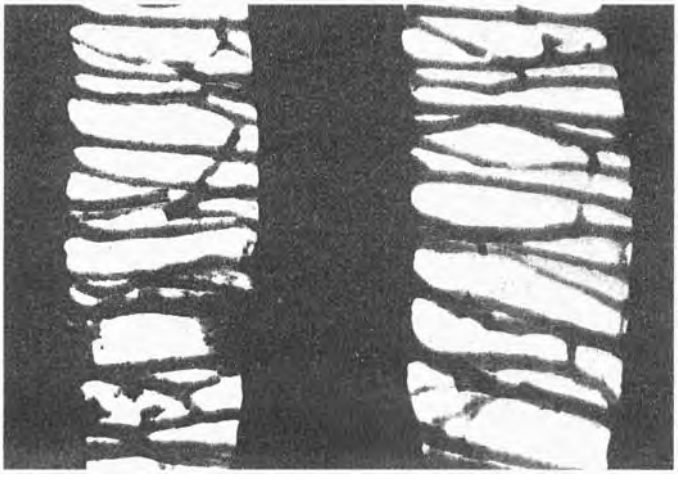

Figure 1. One of three transmission electron micrographs published in Wesley & Kuyper (1951). It shows three relatively broad transverse bars of a scalariform tracheid from the secondary xylem of a stem of the Carboniferous lycopsid, *Diaphorodendron vasculare* (Binney) DiMichele. Note the finer branching threads that cross the pit areas between successive bars. Ca.10,900 X.

Figure 2. From left to right; Alan Wesley (as usual, in polo-neck sweater and clasping his hand lens), Catherine Rogerson (University of Wales), the late Morag Jones (formerly of the University of Reading) and John Richardson (Natural History Museum, London). West Germany, 1976. Dr J. Galtier (University of Montpellier) kindly supplied this photograph.

During his career at Leeds, Alan was promoted to Assistant Lecturer in 1950, then to Lecturer in 1953 and he finally became a Senior Lecturer in 1965. The Chair of Botany passed successively from RD Preston to Irene Manton PPLS, Harold Woolhouse FLS, and then Gordon Leedale FLS. Prof. Manton, along with F Howarth and M Valentine, signed the Certificate of Recommendation that led to Alan being elected FLS in the ballot of 16th April 1959.

RESEARCH IN ITALY

In 1952, the same year in which Alan was elected to be a fellow of the Geological Society of London, he was granted an Italian Government Scholarship to spend four months at the Institute of Geology in the University of Padua. Leave of absence and further financial assistance from the University of Leeds enabled him to carry out research into the Liassic plants first recorded from the *calcari grigi* of the Veneto region in 1764 (Wesley, 1965).

Baron Achille de Zigno had published illustrated accounts of many adpressions from this Lower Jurassic flora between 1852 and 1891. De Zigno's descriptions of what he considered an Oolitic flora established new species on the basis of their gross morphology alone. Although minor revisions had been made to de Zigno's work in the first half of the twentieth century by Seward and certain Italian palaeobotanists, it remained for Alan Wesley to apply a modified version of John Lindley's oxidative maceration

technique (Wesley, 1954) in order to scrutinize the cuticles of the Veneto plants microsopically. By doing so, Alan helped to realize a prediction of Marie Stopes FLS for the progress she had hoped palaeobotany would make during the twentieth century – namely the application of critical new techniques to assist the taxonomic clarification of the already huge number of fossil plant names generated since the formal beginning of palaeobotanical nomenclature in 1820.

Although his research at Padua spanned a wide range of vascular plant fossils from the Grey Limestones of north eastern Italy, he included biostratigraphical considerations to define the plants' age as Pliensbachian, high in the Middle Lias (Wesley, 1956). However, the principal focus of Alan's research was the gymnosperms. Publishing in the house journal of Padua's Geological Institute, Alan produced detailed accounts of four genera of conifers, one bennettite, one cycad and two of *gymnospermae incertae sedis* (Wesley, 1956,1958). Two of these genera were new to science; namely *Dactylethrophyllum* Wesley, 1956 (a form-genus for peculiar leafy shoots of a conifer) and *Apoldia* Wesley, 1958 (for certain cycadalean fronds), plus five new species of *Brachyphyllum*, two each of *Elatocladus*, *Pagiophyllum* and *Desmiophyllum* and one of *Pityophyllum*. His choice of epithets for these new taxa honoured earlier Mesozoic plant workers, including de Zigno and MW Kendall of the University of Reading, as well as particular localities in the *Sette Comuni vicenti* where the fossils had been unearthed.

As well as his photographic plates, Alan illustrated selected hand specimens, and the epidermal anatomy deduced by light microscopy of their cuticles, with his own stippled line drawings. These closely resemble the mode of illustration of Mesozoic plant cuticles published by Prof. TM Harris, PPLS, in the interpretations placed on the possible original arrangement of epidermal cells in three dimensions around the stomatal openings. Indeed, Harris made detailed comparisons between Alan's accounts of the Italian plants in describing younger bennettites and conifers from Yorkshire. Whilst his texts were in English, Alan composed his own "*riassunti italiani*" for his papers published at Padua and it is evident that he had read Italian, French and German literature extending back to the middle of the eighteenth century.

TEACHING AND RETIREMENT

Alan retired in September 1988. He continued in his role as an examiner for a few more years. He supervised the final housing of his fossil plant collection at the Natural History Museum in London, at the Yorkshire Museum in York and at the School of Biology at the University of Leeds. The tradition of palaeobotany at the University of Leeds is continued by the current work of Dr Jane Francis in the School of Earth Sciences and by Mrs. Paula Radford who curates the Museum in the School of Biology.

Aside from academia, Alan was a keen birdwatcher and he collected floral stamps that he fixed "religiously" (Alan's adverb) in philatelic albums. From its inauguration in October 1978, Alan was an avid supporter of Opera North based in Leeds. He was

made an Honorary Life Member in 1997 and their performance of Wagner's "*Tristan und Isolde*" on 30th January 2001 was dedicated to his memory following his death from cancer on 30th December 2000. Alan's north London accent and his trademark polo-neck sweaters will be sadly missed.

ACKNOWLEDGEMENTS

I am pleased to thank the following people for their kind assistance in helping to prepare this notice: Mrs CM Reid (Alan's sister), Mrs G Taylor (of Otley), Ms L Richards of Imperial College, Dr JE Francis and Mrs P Radford of Leeds, and Dr JB Richardson (Natural History Museum, London) for help with Fig.2, Prof. BG Gardiner for Linnean Society Information, Ms. Kathleen Evens of Opera North, and Mr. Roger Pinkney for the typescript.

H.L. PEARSON

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NOTE: MEETING IN EARLY SEPTEMBER

THE TAXONOMIC CRISIS

Thursday, 5th September 2002 6pm (tea 5.30pm) in the Society's rooms
Professor Geoff Norton, University of Queensland

will discuss their contribution to tackling the taxonomic crisis by developing a suite of software products for developing and publishing multi-media keys (both matrix and dichotomous keys) on CD and the internet.
(*http://faunanet.gov.au/keys/index.htm; www.lucidcentral.com*)

Programme

2002

5th Sept.	6pm	THE TAXONOMIC CRISIS Professor Geoff Norton
7th Sept.	6pm	CYRIL CLARKE MEMORIAL (at the Athenaeum, Liverpool) Dr Laurence Cook Hon FLS
13th Sept.		PARASITISM AND ENVIRONMENTAL POLLUTION: PARASITES AND HOSTS AS INDICATORS OF WATER QUALITY (with the British Society for Parasitology) † Professor John Lewis FLS
20-22nd Sept.		**Visit to National Botanic Gardens of Scotland, Edinburgh** and Dawyck (reorganised from 2001)
26th Sept.	6pm	THE TAXONOMIC CRISIS (continued) Professor Charles Godfray FRS
10th Oct.*	6pm	ERASMUS DARWIN **Book Sale**** Dr Desmond King-Hele FRS & Professor John Pearn FLS
13-15th Nov.		PLANT SPECIES-LEVEL SYSTEMATICS: PATTERNS PROCESSES AND NEW APPLICATIONS at the National Herbarium, Leiden, Holland † Professor Pieter Baas FLS
20th Nov.	1.30 – 5.00pm	THE DIVERSITY OF POLLEN AND SPORES *Linnean Society Palynology Specialist Group*
5th Dec.	6pm	LINNÉS HAMMARBY: A FLORAL AND CULTURAL HERITAGE Dr Mariette Manktelow FLS (also discussion of the forthcoming Tercentenary of Linnaeus 2007)
13th Dec.		METALLOPHYTES: PLANTS THAT CONCENTRATE HEAVY METALS † Dr John Edmondson FLS
14th Dec.	2.30pm	**Conversazione**

2003

23rd Jan.*	6pm	AROID TAXONOMY Dr Simon Mayo

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
** All books gratefully received, preferably before the day of sale please.