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Newsletter and Proceedings of
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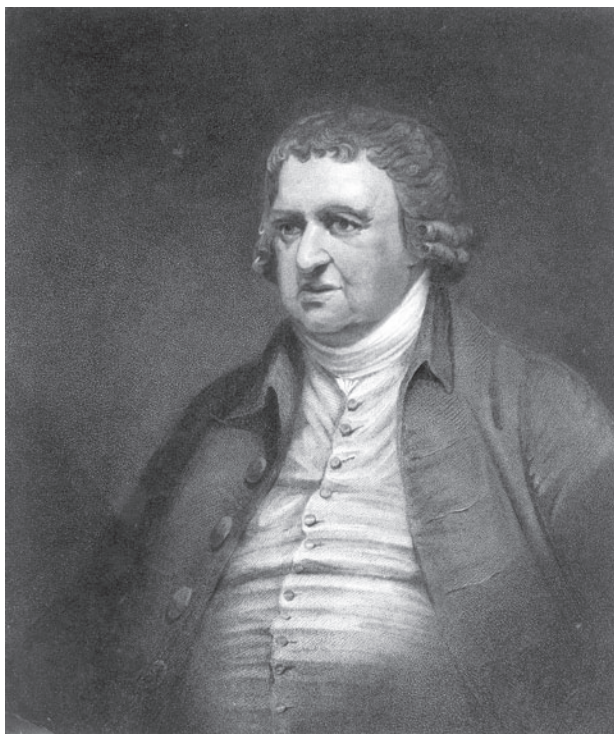
Newsletter and Proceedings of the Linnean Society of London

Edited by B. G. Gardiner

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Editorial

This issue contains a paper (p. 25) on Erasmus Darwin (1731–1802). Darwin's early enthusiasm for technology led him to produce a whole series of inventions in the 1760's. These included canal lifts, carriage springs and steering mechanisms, a speaking machine, a biographer for copying documents, electrostatic generators, a wire-drawn ferry, and



Erasmus Darwin, M.D., F.R.S. etc.
(Engraved by J.Heath. The picture is in our collection.)

compressed air actuators. Moreover, he also published sketches of many other proposed inventions which included – a horizontal windmill, motors for rockets driven by a mixture of hydrogen and oxygen, designs for a rotary pump, a steam carriage and ten drawings for the manufacture of a drill plough. In the 1760's Darwin and several of his friends, including Benjamin Franklin and Dr William Small, would meet monthly at the time of the full moon. Later, by which time the group included Joseph Priestley, they founded what was to become the Lunar Society of Birmingham. As King-Hele (1977) commented, there is little doubt that this Society was “the chief intellectual force behind the Industrial Revolution”.

Much more important to us, however, Erasmus Darwin was the first person to expound the theory of evolution. He was the originator and first promulgator of what we now

refer to as Lamarkism. Thus Charles Darwin, on the second page of later editions of the *Origin of Species*, remarks “It is curious how largely my grand father, Dr Erasmus Darwin anticipated the views and erroneous grounds of the opinion of Lamark in his *Zoonomia* (pp 500–510) published in 1794”.*

A few years later (1800) Erasmus Darwin published his *Phytologia*, in which he explained the essential ingredients as well as the products of photosynthesis. In this two volume work he also advocated biological control, as well as dealing with contentious subjects such as sexual selection, insectivorous plants, and artificial selection. He also wrote two great didactic poems the first of which was *The Botanic Garden*. This poem was divided into two parts, of which the second, *The Loves of the Plants* (1790), appeared before the first, *The Economy of Vegetation* (1791). This poem, written at the age of 57, brought him instant fame as a poet. In it he places great emphasis on insectivorous plants, goes through the 24 Classes of Linnaeus and even manages to discuss the relationship between poetry and art. In my opinion the verse is lively and humorous and at times topical (*vis.* opium addiction). His last poem, published posthumously in 1803, was *The Temple of Nature* (though he had intended it to be titled *The Origin of Society*). This poem portrays the origin of life in the primaeval ocean and its subsequent evolution through mollusca (“vast shoals of tiny creatures with shells”), insects, then up through the vertebrates. First the amphibia (“cold gills aquatic form respiring lungs”) and then the reptiles, birds and mammals and finally to the arrival of man. This struggle for existence is nowhere better manifested than in the “parallel evolution of plants”.

There can be no doubt that in these last two poems Erasmus Darwin, with his analysis of evolution, preempted his grandson’s *The Origin of Species* by more than fifty years. Erasmus Darwin’s intellectual achievements, however, went far beyond the exposition of the theory of evolution. King-Hele (1977) lists seventy-five subjects in which he was a pioneer. These range from the abolition of slavery, through the individuality of buds and deforestation, the travel of seeds, artificial insemination, to women’s liberation. Erasmus Darwin was indeed the greatest polymath of the 17th Century.

This issue also concludes the discussion of creationism with a major contribution from Professor Sam Berry. I am glad to say that we also have space to restart the series “From the Archives” to which Enid Slatter has made many fascinating contributions. As you will see we are not short of material – all contributions welcome for consideration!

BRIAN GARDINER

REFERENCES

- KING-HELE, D. 1977. *Doctor of Revolution. The Life and Genius of Erasmus Darwin*. Faber and Faber, London.
- KRAUSE, E. 1879. *Erasmus Darwin*. John Murray, London.

* C. Darwin later pointed out that *Zoonomia* was honoured by the Pope by being placed on the *Index Expurgatorius*.

Society News

Members will be sad to learn of the death at 76 of Franklyn Perring OBE on 11th October 2003. Frank served as Botanical Secretary of the Society from 1973 to 1978. Frank was co-author, with Max Walters Hon FLS, of the *Atlas of the British Flora* (1962) which set the scene for biological conservation in the UK. Frank himself followed that path via the Nature Conservancy, the Royal Society for Nature Conservation and the BSBI, of which he was President from 1993 to 1995. He was an active Fellow of the Society for 39 years. In April 2002, jointly with the BSBI, he organised an extremely successful and well-attended Society meeting entitled *Where do we find and train the next generation of field botanists?* Obituaries appeared in all the broadsheets, e.g. *The Daily Telegraph* on 18th October, *The Times* on 23rd October.

Members will also be saddened to know that Mr. RH (“Dick”) Roberts died on 27th September 2003. He won the HH Bloomer Medal in 1999, but his health did not allow him to attend the Anniversary Meeting then, so the Medal was presented to him by the Botanical Secretary later that year at a family event in North Wales. Originally a schoolteacher, Dick Roberts was a self-taught field botanist and taxonomist, who advanced our understanding of the taxonomy, distribution and ecology of the British flora and its conservation in a noteworthy way, publishing nearly 50 papers. He was certainly a worthy winner of the HH Bloomer Award.

* * * * *

Changes to the Committee Structure

The Society’s Council has been looking at its responsibilities for all its Collections – scientific specimens, books, manuscripts and archives, medals, pictures and portraits. The reasons for this are, firstly, the Society’s determination to raise the very significant funds we need to put all our Collections online. Secondly, and consequently, the need to consider our various collections as a whole. Thirdly, the need to continue to persuade appropriate experts from museums, botanic gardens and universities to help us with our Collections.

At its last meeting on 9th October, the Council received and agreed a series of recommendations. In essence, these were that an additional Secretary – the Collections Secretary – be created as part of the existing Officers’ Group. The first holder of this post is to be Mrs. Susan Gove FLS, co-opted for the remainder of the 2003–2004 session, but, like the other Officers, subject to ballot each year henceforward.

The Collections Secretary will chair two small committees (ca. 6 people each, each initially to serve for three years) to deal with the Biological Collections and the Library Collections and a new committee of limited duration, the **CARLS** Task Force – **C**omputer **A**ccess to the **R**ecords of the **L**innean **S**ociety – to provide just that. Provisional external membership of all three committees is set out overleaf.

The Council believes that these arrangements will serve the Society well in the future. It is deeply grateful to all those who, in the past, have served on the old Collections Curatorial and Library Committees.

Biological Collections

Dr Mike Fitton (NHM)§

Dr Charlie Jarvis (NHM)

Dr Nicholas Hind
(RBG Kew)

Ms Kathie Way (NHM)§

Dr George McGavin
(Oxford University Museum)

§ Curators *alternate with other curators

Library CollectionsMr John Collins
(Antiquarian Book Trade)Dr John David (CABI
Bioscience)

Mrs Carol Gökce

Ms Diane Mercer

Ms Elaine Shaughnessy
(IUCN)**CARLS Task Force**Mrs Carol Gökce
(NHM)

Dr Charlie Jarvis§*

Ms Diane Mercer
(UCL)

A.N. Other

* * * * *

The Society's Grants

In the recent House of Lords Report *What on Earth?* a recommendation was made, and endorsed by the Government that “*the systematic biology community, especially via the Systematics Association and the Linnaean Society, should continue to increase efforts to demonstrate the relevance and importance of systematic biology.*” The first moves in this direction are currently being made. After discussions between the Systematics Association and the Society, the Linnean Society of London and the Systematics Association have pooled resources in order to provide a fund for systematic biology research. These are small grants made available to all researchers regardless of nationality except where indicated*. The fund is a combination of small sources of funding that are being made available under one scheme (Systematics Association Small Grants, Linnean Society grants under the Side, Bonhote, Omer-Cooper and Westwood Fund and the Natural Environment Research Council Fund for Taxonomic Publication* – with the agreement of NERC). It is also hoped that other small granting organisations in the field of systematics will join the two societies in providing funds for small grants. Grants are *not* available for attending conferences or for routine research expenses where other monies would be expected to be available.

Applications for funding are to be made by completing the appropriate form at http://www.linnean.org/html/join_us/THE%20SYSTEMATICS%20FUND.doc and appending a single page (one side) of A4 paper outlining the objectives and methodology of the proposed project, emphasising its broader significance. Where appropriate, please give (a) starting and completion dates of specific activities, and (b) details and costs of equipment and/or facilities to be funded by the grant.

* The NERC Fund for Taxonomic Publication is only available for people based in the UK (although not necessarily UK nationals) and firm evidence of publication potential must be provided. The purpose of this fund is to provide costs for the publication of taxonomic research over and above the costs of normal scientific publication; tick the appropriate box on the form if you and the application are eligible for this fund.

Applications must reach: Dr Tim Littlewood, The Chair, Systematics Research Fund, The Linnean Society of London, Burlington House, Piccadilly, London W1J 0BF, UK **by 31st December** for consideration for the following year's awards. There are no exceptions. Further details and additional forms are downloadable from: www.linnean.org or www.systass.org

Guidelines for the management of funds received from **The Systematics Research Fund** of the Systematics Association and the Linnean Society of London are given below:

1. Recipients will acknowledge receipt of money received by contacting the Chair of the Fund (see below*).
2. Recipients will endeavour to keep careful records of funds spent in case an account of expenditure associated with the award is required by either the Systematics Association or the Linnean Society of London.
3. Upon completion of the project, recipients will provide a brief report on the project supported by the Fund, with emphasis on how the funds were actually spent and with details of any publications resulting from the work. We expect a report within 1 calendar year of receipt of funds. Please provide the report in a format suitable for use in newsletters or websites of the Systematics Association and/or the Linnean Society of London. Please contact the Chair of the Fund (Dr. Littlewood, above), the newsletter editors (details on respective websites) or webmasters for guidance of the format required.
4. Acknowledgement for funds received should be made in publications, reports, websites, wherever possible. Acknowledgments should be made with reference to the "Systematics Research Fund of the Linnean Society of London and the Systematics Association", or the Systematics Research Fund of the Systematics Association and the Linnean Society of London".
5. Any unspent money should be returned to the Chair of the Fund* by international money order or cheque in sterling made payable either to "Linnean Society of London – Systematics Research Fund", or "Systematics Association – Systematics Research Fund", who in turn will return the funds to one or other Treasurer of each respective society.

It is hoped to mark the first grants made under the Systematics Research Fund by a reception in the House of Lords in April 2004.

JOHN MARSDEN

Library

The Library was open for 110 days from 12 May to 9 October during which 247 visitors (125 FLS) were recorded, Fellows being 50% of the total. This represented a visitor use of 2.25 visitors/day, slightly less than the same period last year. Loans totalled 85 and the new "user slips" record consultation of 114 books and 66 journals for the May-September period. Those consulting manuscripts numbered 17, and included visitors from Canada, Sweden and the USA as well as from the UK. The Library now receives an increasing number of communications by e-mail and 660 such messages have been responded to by the Library staff during this period, about half of which are directly related to the Library holdings, the largest single subject area being biographical enquiries. Many of these enquiries can now be responded to rapidly through access to the in-house database of past Fellows of the Society, which is being added to by Lynn Crothall and

has now reached those elected in 1865. The Society participated in London Open House on 20 September and attracted 315 visitors from 14 countries. We are grateful to all who helped as Guides or Stewards. It is hoped that the Society will participate again on Saturday 18 September 2004.

Cataloguing has continued over the summer but the piles of books in the Library Annexe have not diminished appreciably as we have been adding older accessions from hidden boxes. The Library acquired some diaries and associated papers from the late Dr E.B. Worthington to supplement other manuscripts of his presented earlier in the year by John Collins of Maggs Bros. These are now being sorted and listed by Jeanne Pingree. Rebinding is now being completed on the Folio *Notebook* of John Ellis for which, with the *Peter Collinson Commonplace books*, conservation work was supported by the National Manuscripts Conservation Fund. Both have now been microfilmed as part of that project and working copies of both are available in the Library as photocopies.

The vacation of two rooms on the far side of the courtyard by the Society of Experimental Biology in mid July has allowed us to move some of the older bibliographic journals from the Library Annexe and Lower Gallery to make some additional space. We have also gained a new bookcase in the Library Annexe, making use of timber salvaged the previous year from the Geological Society. This now holds the oversize books on botanical and zoological illustrations.

In March we finally “signed off” the remaining members of the team of NADFAS volunteers that had been working here for many years. The work on the Linnaean material and the reprints has now been completed and provides the essential background information which will help make this material accessible. The remaining two team members have now been presented with a Tercentenary Wedgwood medallion of Linnaeus as an expression of our gratitude. We have recently benefitted from a 5-week placement by a Library student from Sweden, Ms Yasmin Mandani who was able to help with a number of on-going projects.

From 5th January 2004 there will be some staff changes in the Library as Cathy Broad will be seconded to work on the Linnaean holdings at the Natural History Museum as Project Officer for the Linnaeus Link project. This project’s aim is to create a comprehensive catalogue of publications by Linnaeus and his students prior to 1831. Cathy will be building the bibliographic database forming the core catalogue. More information will be available as the project develops.

GINA DOUGLAS

Donations

The book sale on 16 October has added £250 to the Library purchasing fund as well as a number of “gap-fillers” which will go into the library but which are not acknowledged here. Donations received in September and October are listed below:

- Barney Books Lafford High School & Molly Burkett, *Sir Joseph Banks, Flora explorer* (People to remember IV) 24 pp., illustr., Lincoln, Barney Books, 2003, ISBN 1 903172 26 8.
- Conservatoire & Jardin Bot. J-P. Lebrun & A.L. Stork, *Tropical African Flowering Plants, ecology and distribution*, Vol. 1 *Annonaceae - Balanitaceae*, 797 pp., maps, Geneva, Conservatoire et Jardin Botanique de la ville de Geneve, 2003, ISBN 2-8277-0114-6.
- Geneve
- Ivan Crowe Crowe, Ivan, *The quest for food, its role in human evolution and migration*. 258 pp., illustr. some col., maps, Stroud, Tempus, 2000, ISBN 0 75241462 3.
- Dr F.G. Hardy Hardy, Frederick Gavin & Guiry, Michael Dominic Richard, *A checklist and atlas of the seaweeds of Britain and Ireland*. 435 pp. maps, London, British Phycological Society, 2003, ISBN 0 9527115 16.
- Harley Books Moore, Norman W., *Oaks, Dragonflies and people, creating a small nature reserve ...* 132 pp., illustr. some col., maps, Colchester, Harley Books, 2002, ISBN 0 946589 71 2.
- Hunt Inst. for Bot. Doc. White, James J. & Bruno, Lugene B. (compilers), *The healing plants of Ida Hrubesky Pemberton, catalogue of an exhibition*. 64 pp., col. illustr., Pittsburgh, Hunt Institute for Botanical Documentation, 2003, ISBN 0 913196 76 2.
- Koeltz Scientific Books Richter, Hermann E., *Codex Botanicus Linnaeanus* & 2 (edited by John Edmondson, biographical sketch by H.W. Lack, and including alphabetical index by W.L. Petermann) *Regnum Vegetabile* 140. Vol. 1: 53 + xxxii + 1102 pp., Vol. 2: 5 + iv + 202 pp. Ruggell, A.R.G. Gantner, 2003, ISBN 3 906166 03 1.
- Adrian Lister & Lynn Rothschild Rothschild, Lynn & Adrian M. Lister, Eds., *Evolution on Planet Earth, the impact of the physical environment*. Linnean Society Symposium, 1999, 438 pp., col. illustr. figs., maps, Amsterdam, Academic Press, 2003, ISBN 0 12 598655 6.
- Prof. W.R. Mead Mead, W.R., *Pehr Kalm, a Finnish visitor to the Chilterns in 1748*. 158 pp., illustr., maps, privately, Aston Clinton, 2003, ISBN 1 85065 729 7.
- Dr P.A. Morris Morris, P.A., *Rowland Ward, Taxidermist to the world*. 164 pp., illustr., Ascot, MPM, 2003, ISBN 0 9545596 0 6.
- Dr M. Nixon Nixon, Marion & Young, J.Z., *The brains and lives of Cephalopods*. 392 pp., illustr., map, Oxford, Oxford University Press, 2003, ISBN 0 19 852761 6.
- Oxford Univ. Press Shermer, Michael, *In Darwin's Shadow, the life and science of Alfred Russel Wallace*. 422 pp., Oxford, OUP, 2002, ISBN 0 19 514830 4.
- H.L. Pearson Mader, Detlef, *Paleoecology of the Flora of the Buntsandstein and Keuper in the Triassic of Middle Europe*. 936 pp., illustr. some col., maps, Gustav Fischer, Stuttgart, 1990, ISBN 3 437 30650-2.

- Dr E. Rushen Rushen, Elizabeth *Single and free, female migration to Australia 1833–1837*. 227 pp. illustr., Melbourne, Australian Scholarly Publishing, 2003, ISBN 1 74097 038 1.
- Dr F.A. Skinner Stott, Rebecca, *Darwin and the barnacle, the story of one tiny creature and history's most spectacular scientific breakthrough*. 308 pp. illustr., London, Faber & Faber, 2003, ISBN 0 571 20966 1.
- The Tree Council Rodger, Donald, Stokes, Jon & Ogilvie, James, *Heritage trees of Scotland*. 160 pp., col. illustr., map. London, The Tree Council, 2003, ISBN 0 904853 03 9.
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Correspondence

Dear Editor,

Herewith some thoughts provoked by recent issues of *The Linnean*.

God & Darwin: The Two Books Of Nature

Reading Randy Moore on “The sad state of evolution education in American schools” (*The Linnean*, **18**: 26-34, 2002) and his support from John Cloudsley-Thompson (**18**: 35-43, 2002) and Rene Lavocat (**19**: 26-34, 2003) produced two emotions in me: gloom that it is still necessary to publish such articles, and amazement that naive creationism still flourishes. I am a creationist. I believe that God created the world and everything in it. BUT I believe that He used natural processes (i.e. evolution) to produce the world which I, as a biologist, study. Indeed my scientific work is refreshed and stimulated by the idea (in Kepler’s words) of “thinking God’s thoughts after Him”. The naivety in the assumptions of those we commonly call “creationists” is that the world has somehow come about by divine magic as opposed to divinely-instigated mechanisms.

Such naive creationism is actually non-Biblical. The author of the book of Hebrews wrote (**11**:3) “*By faith* we understand that the universe was formed by God’s command”; if we chose to use faith to believe something else, that is up to us. The Bible is about change - from chaos to order, from a garden to a city, from sin to salvation - but only rarely are we told the mechanisms God uses to bring about these changes. One of the few examples is in Exodus **14**: 21, about the crossing of the Red Sea (for a scientist’s recent interpretation of this, see Humphreys, 2003). Notwithstanding the Bible’s silence, virtually all believers accept that God works in his or her personal life through natural processes - in answering prayer, healing, guiding, and so on. I find it astonishing that some people still argue that the Bible is anti-evolution.

This is not the place to expound Bible teaching nor to examine the dubious tactics used by some “creationists” (from hereon, I will use inverted commas to indicate naive creationism) for establishing their credibility (Pollitzer, 1980; Plimmer, 1994; Dawkins,

2003: 218-221). My purpose is to enquire why “creationism” continues to persist despite the evidence arraigned against it. As long ago as the fourth century AD Augustine of Hippo wrote in *De Genesi ad Litteram*:

“Even a non-Christian knows something about the earth, the heavens, and the other elements of this world, about the motions of the stars and even their size and relative positions, about the predictable eclipses of the sun and moon, the cycles of the years and the seasons, about the kinds of animals, shrubs, stones and so forth, and this he knows as being certain from reason and experience. Now, it is disgraceful to hear a Christian, presumably giving the meaning of Holy Scripture, talking nonsense on these topics; and we should take all means to prevent such an embarrassing situation, in which people show up vast ignorance in a Christian and laugh it to scorn. The shame is not so much that an ignorant individual is derided, but that people outside the household of faith think our sacred writers held such opinions, and, to the great loss of those for whose salvation we toil, the writers of our Scripture are criticized and rejected as unlearned men. If they find a Christian mistaken in a field which they themselves know well and hear him maintaining his foolish opinions about our books, how are they going to believe those books in matters concerning the resurrection of the dead, the hope of eternal life, and the kingdom of heaven?”

In his *Linnean* article, Moore chronicles the repeated and virtually unanimous rebuffs that “creationists” have received from the American courts. One of their most important defeats was in Arkansas, where a law seeking “Balanced treatment for Creation-Science and Evolution-Science” was ruled unconstitutional on the grounds that creation-science is religion and not science (Montagu, 1984). A key prosecution witness was Stephen Jay Gould. After the trial he wrote to me, “I brought your *Adam & the Ape* (a small book I wrote in 1975 to try and help sixth formers; a revised and enlarged edition has been issued by Regent College Publishing: Berry, 2001) to Arkansas ready to use it in cross-examination if anyone raised charges that evolution equals atheism and I needed to demonstrate that committed Christians could not only be evolutionists, but even Darwinians. As it turned out, the opposition was so demoralised by this time that they scarcely bothered to cross-examine.... The trial was a complete rout for the creationists”.

It is one thing to show a man he is in an error, and another to put him in possession of truth *John Locke*

“Creationists” seem unable to accept that their basic premises may be wrong. After all, the assumption that the Earth is only a few thousand years old and has remained more or less in its original state was questioned on scientific grounds from at least the time of Newton, Buffon and Hutton in the 17th century (Baxter, 2003). The early geologists were troubled about how to interpret the Bible, but they did not challenge its authority (Gillispie, 1951). Darwin was careful not to attack religion; one of his most important supporters was the botanist Asa Gray, a committed Christian who played a key part in establishing Darwinism in North America. In Britain the compatibility of evolution with Christian doctrine quickly became ‘both permissible and respectable’. Reviewing the debates that followed the publication of the *Origin*, James Moore (1979: 10) wrote, “Darwin’s burial in Westminster Abbey in 1882 and Frederick Temple’s 1884 Bampton Lectures, *The*

Relations Between Religion and Science, were amongst the events which highlighted the progressive accommodation, and Temple's consecration in 1896 as Archbishop of Canterbury may be taken to mark the final acceptance of the doctrine of evolution among the divines, clerics and leading laity of the established church".

Ironically, Darwin's ideas were more readily accepted by evangelical than liberal theologians because the former had a strong doctrine of providence – God's active working in the world (Livingstone, 1987), although it was a liberal, Aubrey Moore who spelt out the positive gains that Darwinism gave to theology. He described the deism produced by the rationalism of the 18th century Enlightenment:

"Science had pushed the deist's god farther and farther away, and at the moment when it seemed as if He would be thrust out altogether, Darwinism appeared and, ***under the disguise of a foe, did the work of a friend***. It has conferred upon philosophy and religion an inestimable benefit, by showing that we must choose between two alternatives. Either God is everywhere present in nature, or He is nowhere..... We must frankly return to the Christian view of direct Divine agency, the immanence of Divine power in nature from end to end..... It seems as if, in the providence of God, the mission of modern science was to bring home to our unmetaphysical ways of thinking the great truth of the Divine immanence in creation" (Moore, 1889: 99–100).

It is worth noting in view of subsequent events that several of the authors of the booklets produced between 1910 and 1915 to expound the 'fundamental beliefs' of Protestant Christianity as defined by the 1910 General Assembly of the American Presbyterian Church (and which have given rise to the concept of fundamentalism) were sympathetic to evolution. For example, James Orr (Professor of Systematic Theology in the Glasgow College of the United Free Church of Scotland) argued that the Bible is not a textbook of science, that the world is 'immensely older than 6000 years', that the first chapter of Genesis is a 'sublime poem' which science 'does nothing to subvert', and that although evolution was not yet *proved*, there was growing evidence for some form of evolutionary origin of species. The geologist, George Wright declared that 'if it should be proved that species have developed from others of a lower order as varieties are supposed to have done, it would strengthen rather than weaken the standard argument from design'. And Princeton theologian B.B. Warfield, well-known (or notorious) as a determined defender of the inerrancy of the Bible, believed that evolution could provide a tenable 'theory of the method of divine providence in the creation of mankind', and that Calvin's doctrine of the creation 'including the origination of all forms of life, vegetable and animal alike, including doubtless the bodily form of man [was].... a very pure evolutionary scheme'.

Evolution was broadly accepted by mainstream Christian thought by around 1900. Modern day "creationism" has little intellectual links with the debates sparked by the *Origin*. Its midwife was George McCready Price, a self-proclaimed geologist (according to Numbers, 1992: 89, he was "an armchair scientist.... insecure about his lack of scientific training) and Seventh Day Adventist whose clarion call was "No Adam, no fall; no fall,

no atonement; no atonement, no Saviour” (a mistaken argument: Berry, 1999). He regarded his magnum opus to be *The New Geology* (1923), placing the Genesis flood as the central geological event in the history of the earth. One of the most influential recent “creationist” texts, *The Genesis Flood* by Whitcomb & Morris (1961), is a direct development of Price’s thesis.

The more cerebral end of “creationism” has now moved away from a crude dependence on Noah’s flood to explain our current world to what is called “intelligent design” (ID), based on the claim that the living world is too complex to have arisen by naturalistic mechanisms, and must therefore have had a designer. The intricacies and flaws of ID have been well set out by Pennock (1999, 2001) and do not belong here, except to recognize that ID is really little more than a sophisticated version of Archdeacon Paley’s “Divine Watchmaker” (as acknowledged by Michael Behe, author of *Darwin’s Black Box*, 1996, an unconvincing text heavily relied on by ID protagonists); it is a bastard offspring of the natural theology of John Ray and the Bridgewater Treatises. It is pertinent to recall Temple’s comparison of Paley and Darwin: “The creative power remains the same; the design with which that creative power was exercised remains the same. He [God] did not make the things we may say; no, but He made them make themselves.... The doctrine of Evolution restores to the science of Nature the unity which we should expect in the creation of God” (Temple, 1885: 114, 121).

Recycling Controversy

The history of evolution is full of legitimate scientific controversies. Unfortunately recycling them without acknowledging their satisfactory resolution is a common ploy of “creationists”. They commonly claim that all mutations are harmful, that natural selection is impotent, that punctualism has disproved Darwin’s ideas. They are wrong. Science – including evolutionary understanding – advances. It matters not that the neutralism of the 1970s carries strong overtones of the biometric debates of the 1900s, nor that punctualism was anticipated by De Vries’s saltationism, while 1920s vitalism was exposed by J.B.S. Haldane, who prefaced Chapter 1 of his *Causes of Evolution* (1932) with ‘Darwinism is dead: any sermon’ (echoing the opening of Vernon Kellog’s *Darwinism Today*, 1907, written to mark the Golden Jubilee of the Origin of Species : “Ever since there has been Darwinism there has been occasional death-beds of Darwinism on the title pages of pamphlets, addresses and sermons”).

The difficulty with bringing anti-evolution arguments to a robust conclusion is that “creationists” conflate and hence confuse three lines of argument (Berry, 1997):

1. *Scientific*. There are entirely proper debates about the relative importance of different factors in evolutionary change and speciation. These have only matured and begun to produce answers since the neo-Darwinian synthesis showed the relevance of complementary disciplines to the total process. This development is largely ignored by “creationists” who tend to treat scientific questioning as an indication of tentativeness and doubt.

2. *Philosophical.* Neither the Bible nor the Koran states how God brought the world into being, although both insist on his control. The argument that knowing evolutionary mechanisms renders God unnecessary is logically flawed. As long ago as the fourth century BC, Aristotle pointed out that all events have material, efficient, final and formal causes (roughly the matter, cause of change, purpose and essential nature of a thing). It is legitimate to concentrate on a particular cause for the purpose of analysis or experiment; this is part of the normal practice of science and can be called operational reductionism. On the other hand it is unhelpful as well as positively confusing to insist that the cause in question is the only possible one; such an assumption is doctrinaire or ontological reductionism (Ayala, 1974). Mary Midgley (1992) upbraids scientists for answering ‘how’ questions and pretending these are the same as ‘why’ questions. Keith Ward (1996) has pointed out the logical impropriety of many of the assaults on religion by scientists because they illegitimately use doctrinaire reductionism as the basis of their arguments. He cites Peter Atkins and Richard Dawkins as particular offenders. A more sensible approach is that of Steven Jones (1993:xi) who writes: “It is the essence of all scientific theories that they cannot resolve anything.... Genetics has almost nothing to say about what makes us more than just machines driven by biology, about what makes us human. These questions may be interesting but scientists are no more qualified to comment on them than is anyone else”.
3. *Cultural.* This is probably the root problem. In his infamous confrontation with T.H. Huxley, Bishop Wilberforce of Oxford (who was no scientific ignoramus: he had a first class degree in mathematics, and was a fellow of the Royal Society and a Vice-President of the British Association) was more concerned about attacking factors which legitimised change than Darwinism as such. He had three anxieties:

Sociological: conventional church-going was declining fast as people moved from the country into towns, where they tended not to be worshippers;

Theological: the triumphant progress of manufacture, engineering success and colonialism contrasted and apparently conflicted with the Bible’s picture of human weakness and the need for redemption; and

Ecclesiological: doubts about the authority of the Bible (and hence of the Church) were beginning to spread, fuelled by the ‘higher criticism’ of German scholars and stimulated by the 1860 publication of *Essays and Reviews*, a collection of essays by authors who explicitly rejected the inspiration of scripture.

Wilberforce’s attack on evolution was secondary to his main aim of protecting the *status quo* of society and Church. A number of authors (e.g. Godfrey, 1983) have suggested that “creationism” is basically a symptom of fear about an uncertain future, manifesting as outrage against evolution as something which portrays the inevitability of change.

Reason and Un-Reason

The “creationism” situation may be paralleled by current confusions about genetical modification (GM) – tacitly accepted for medical use but demonised by many in agriculture. A recent sociological and theological enquiry (Deane-Drummond, Szerszynki & Grove-White (2003) concluded that GM represents “the irruption of uncertainty into the modern world [and] can be understood theologically as a return of repressed transcendent mystery”. In other words, where (or is there) God once we have got rid of the stasis represented by innate changelessness? The simple certainties of the Judæo-Greek universe are now rationally untenable, so we reject reason and grasp mystery. In a Reith lecture, Prince Charles quoted Professor Alan Linton of Bristol University: “evolution is a manmade theory to explain the origin and continuance of life on this planet without reference to a Creator”. Prince Charles’s conclusion from this is that “It is because of our inability or refusal to accept the existence of a guiding hand that nature has come to be regarded as a system that can be engineered for our own convenience or as a nuisance to be evaded and manipulated, and which anything which happens can be fixed by technology and human ingenuity” (Patten, *et al.*, 2000: 83-4). Put another way, bring back the Divine Watchmaker and all will be well. We are back in “creationism” territory.

In itself “creationism” is a mere intellectual curiosity. However it has two serious dangers. It confuses and distracts young people, and – if St Augustine is right – is likely to turn them away from faith. But more hazardous to us all is its effect in obscuring the responsibility that we have for the natural world. Because of “creationism”, conservation becomes little more than utilitarian self-interest and not a moral imperative (Berry, 1995, 2000). Scientists, philosophers and theologians have fulminated against “creationism” (Lack, 1957; Berry, 1975, 2001; Kitcher, 1982; Futuyama, 1983; Miller, 1999; Edwards, 1999; Haught, 2000; Ruse, 2001, 2003) but it shows no sign of decaying. Oh that we would all learn from Galileo that “The Bible teaches us how to go to heaven, not how the heavens go”.

Darwin placed three quotations on the page before the title-page of the *Origin*. One of these was from Francis Bacon’s *Advancement of Learning* (1605): “Let no man out of a weak conceit or an ill-applied moderation think or maintain that he can search too far or be too well studied in the book of God’s words or in the book of God’s works; but rather let all endeavour an endless progress or proficience in both”. The idea is that God wrote Two Books – a book of words (the Bible) and a book of works (Creation). They have the same author but are written in very different languages (Berry, 2003). Darwin presumably had a reason for recalling Bacon’s admonition. It is one that should be taken to heart by creationists of all sorts.

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Picture Quiz

Mungo Park (1771–1806)

Mungo Park was born on 10th September 1771 at Fowlshiels on the Yarrow near



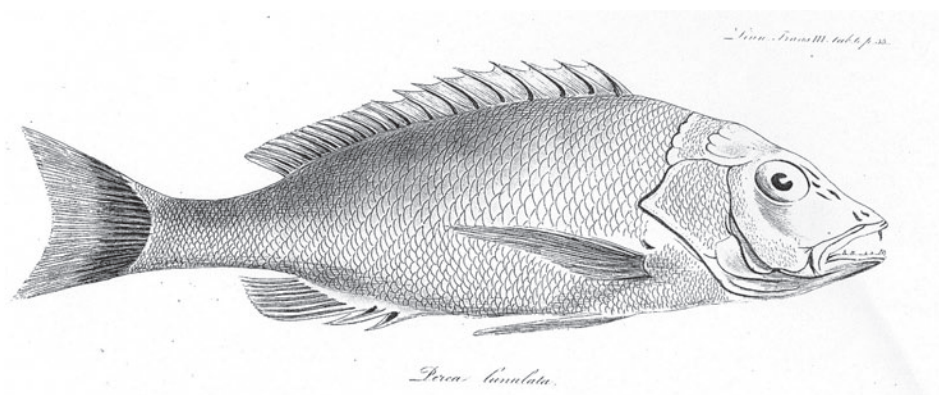
Selkirk, where his parents farmed on the estate of the Duke of Buccleuch. He was the seventh child in a family of thirteen and, like his brothers and sisters, was initially educated at home by his mother. Later he went to Selkirk Grammar School and then, at fifteen, he was apprenticed to a local surgeon. Later, with his new medical knowledge he entered Edinburgh University and gained his LRCP in 1790. He then left Edinburgh for London where he stayed with his brother-in-law, James Dickson, who was an eminent gardener and botanist*. This proved propitious because James was a friend of Sir Joseph Banks, who by this time was the most influential man of science in Britain. Banks suggested to Mungo Park that he take up a position as ship's medical officer and then secured him a

place on an East India Company boat, the *Worcester* bound for Sumatra.

Back in 1770 Banks and Solander had spent some time collecting on Java, around Batavia, which they had reached after HMS *Endeavour* has passed through the Sunda Sound separating Java from Sumatra. Realising that Park would have to spend over two months in the area around Bencoolen, Banks entreated him to make a thorough collection of the local flora. This Park did, but he also spent time fishing in the nearby rivers and lakes. On his return he gratefully presented Banks with over a hundred plants new to science while the fish were described in the *Transactions of the Linnean Society* 1794, **3**: 35–38. The seven new species of fishes (preserved in alcohol) he then donated to the Society, which by this time was housed in Paton Square; our Society Museum, to which donations of botanical and zoological specimens could be made, had started some six years previously in 1789.

* James Dickson had originally been a gardener in the Selkirk area but was presently a Covent Garden nurseryman. It was he who proposed Park for the Linnean Society, and he was seconded by John Fairburn. Park was elected ALS 15 January 1793.

Later in 1794 Banks, using his influence on the board of the African Association, suggested that Park would be an ideal person to ascertain the course of the river Niger since Houghton, a previous explorer sent out to do this in 1790, had disappeared without trace. Thus, in 1795, Mungo Park embarked on the *Endeavour* bound for the Gambia. After learning the Mandingo language he set out with a negro servant and a boy whose duty it was to prepare the food. After many tribulations, including robbery and imprisonment by an Arab chieftain, he arrived at Sego with his horse, the clothes he stood up in and a compass. He then fell ill and was brought back to Senegal some five months later. Then, making his way to Pisania, he caught a boat which eventually arrived in Falmouth in December 1797.



A new species of perch, *Perca lumulata*. From Trans. Linn. Soc. 1794.

Park had quite a literary talent and the publication of his travels in Africa proved an instant success, going through three editions and making him famous overnight. With the monies from his book he returned to Scotland and married the daughter of his old schoolmaster from Selkirk Grammar School, setting up home in Fowlshiels. During this period he practised medicine at Peebles.

In 1804 he was invited by the Colonial Office to lead an expedition of discovery to Africa. In a memo to that office he laid down the object of the expedition as “the extension of British commerce and the enlargement of our geographical knowledge”. The Colonial Office on the other hand, issued him a warrant “To pursue the course of the Niger to the utmost possible distance it can be traced”. Following an intensive course in Arabic he was given £5,000 with which to purchase food and equipment. In the event, Park took with him his brother-in-law, who was a surgeon and a friend from Selkirk, a Mr Scott, to draw up the maps. They sailed to Gorea where they were met by 30 soldiers and their lieutenant, all of whom volunteered to accompany them on the expedition (together with four carpenters and two sailors). As they set off from Pisania on the Gambia, Park employed a local Roman Catholic priest named Isacco to act as their guide. However,



Clue: Wallace did not agree with him.

by the time they were attempting a descent of the Niger, the ravages of malaria and yellow fever had whittled down the party to less than a dozen. With the death of both Scott and his brother-in-law, only three soldiers and their lieutenant, Isacco, Park and a guide named Amadi Fatouma, whom Park had employed at Sansanding, remained. In the event, the seven survivors sailed down the Niger to the town of Boussa, where there were rapids and white water. According to the various reports it was the natives or settlers of that town who prevented their further progress; a fight developed in which they were all drowned. Sources suggest that Amadi Fatouma joined in on the side of the natives endeavouring to detain Park over the monies he thought Park owed him for his guidance, and it was he who was ultimately responsible for Park's death by drowning.

Park was just over 6 feet in height and of an inclement nature. He left four children, all of whom received £7000 from the Colonial Office. *Parkia* is named after him.

I gratefully acknowledge the DNB from which much of the above information was gleaned.

BRIAN G. GARDINER

From the Archives

William Markwick FLS a forgotten naturalist

William Markwick, later Eversfield, (1739–1813) FLS 1792 was a wealthy landowner of Catsfield, near Battle, East Sussex. He was a local magistrate and Deputy Lieutenant of the county. In May 1758, he was admitted to the Inner Temple, London, and in June, to Peterhouse College, Cambridge, but he neither practised law, nor did he take a degree. Instead, in the typical manner of a country gentleman of the period, he spent his time looking after his estate of some 1,600 acres, which extended from beyond Hastings in the east, to west of “East Bourn”, where he spent his summers to benefit from its healthy sea air. He attended to the affairs of his villagers and the state of his crops and his livestock, in that area, principally sheep.

His “mansion”, variously named Catsfield Place or Church House, is adjacent to the village church. Markwick entertained the notion of creating the idyllic prospect of his sheep peacefully grazing on the sward outside his windows. Unfortunately, his seedsman mistook his order for the very short Sheep’s Fescue and sent him some other grass (perhaps the Bearded Fescue), which the sheep refused to eat and which grew so rank and tall (3–4 feet), that his men had to use scythes to cut it down.

Markwick celebrated his 50th birthday by marrying Mary Date of Southampton a few days later. In 1803, when he was 64, he inherited the estate of Denne Park, just south of Horsham, West Sussex, from his aunt, Olive Eversfield, which entailed his taking that surname. Royal Licence was granted in 1807. Even though the family thenceforth used the name of Eversfield, he continued to sign himself “William Markwick” on papers that he sent to our Society. Although he must have anticipated this inheritance, as the years passed he may well have wondered if he would live to see the day – Olive Eversfield was 90 when she died. As it was, Markwick personally scarcely benefited. The lengthy legal procedures and, ultimately, the writing of a new Will – a complicated document, 15 pages long – seem to have occupied his time and energy for several years.

His Will is dated 1811. On his death, his widow removed to Denne Park. She died in 1822 and is buried at Horsham. His elder daughter, Sophia, received a dowry of £10,000; she married at Horsham in 1820, aged 28. His second daughter, Mary, had died in 1810, aged 19. The property at Catsfield was divided between the two sons; Charles, the elder, was also left the means to buy a commission (Lieutenant) in the 10th Hussars. His residence was at Charlton Court, near Steyning, West Sussex, an Eversfield property. He died in 1818 (or, according to Army records, in 1821), aged only 24 (or 27). He is buried at Catsfield. The younger son, James, was originally intended for the Church. Like his father, he also entered Peterhouse in 1813; in 1822, he became High Sheriff of Sussex, as had his great-grandfather, William Markwick in the reign of George I. In



The Red Godwit *Scolopax Lapponica*.

Of a large flock near the sea shore at the beginning of May, 10 were shot. Male [facing left] measured 12 inches from top of head to tip of tail; bill 3 inches; from wing tip to wing tip 2 feet 4 inches. Female [facing right] overall measured about 1 inch more than the male; bill 4 inches. The bill turns up slightly at the tip.

1823, he sold the Catsfield property and moved to Denne. James married and had 3 children, but died young, in 1826, just short of his 31st birthday. He is buried in Horsham. The miniature at Hastings Museum showing a “William Markwick”, bewigged in the fashion of the 1730s, must be that of the High Sheriff (died 1740), not our naturalist of two generations later. The names ‘William’ and ‘James’ alternated with each generation. Charles, Sophia, Olive and Mary were also family names, used repeatedly.

Markwick became a Fellow of our Society in 1792 – his sponsors were the Rev. Samuel Goodenough, the first Treasurer; Jonas Dryander, the first Librarian; and Thomas Marsham, the first Secretary. Like most countrymen, Markwick took a keen interest in the wild life around him and since much of his land was on the Pevensey Levels or along the coast, he became particularly concerned with marshland and wading birds, sea creatures and fish. He was also a competent botanist. He wrote up his records as articles for publication in our *Transactions*: six papers between the years 1789 to 1801 (*Trans.* I, II, IV and VI, 1797–1807). He also submitted papers in 1797, 1800, 1806 and 1807, which remain in manuscript form in our archives. The greater part of Markwick material is to be found in Hastings Museum, Cambridge Road. The 46 volumes, bound in calf, contain his hand-written records on plants and birds and ‘scrapbooks’ of illustrations culled from books and newspapers, assembled for his daughter, Sophia, most probably with her assistance. There are also 200 books and his own library catalogue of some 750 titles, compiled by Markwick about 1780.

From these library lists and the copious bibliographies that he includes with each article, the diversity of Markwick’s interests can be assessed. As well as containing the major ornithological and botanical works of the 17th and 18th centuries, there are books on rural economy and husbandry, gardening, geography and travel, political history and law, theology, literature, poetry and drama, all subjects that an educated gentleman would have in his collection. Other subjects that might be expected to figure, such as philosophy, history and antiquities are strangely wanting. There are no Classical authors, yet Markwick was able to translate some of Linnaeus’s work from the Latin and annotate the text. It is, of course, possible, that such works had been disposed of before the remainder were listed in 1925.



The Grey Gurnard *Trigla Gurnardus*. Caught at Hastings, 24 March 1805.



Money-wort leaved St Johnswort *Hypericum nummularium*
 "On the paper was written Yellow Violets."

One interesting title: *The Art of Painting*, 1678, by John Smith points to the ability Markwick possessed to illustrate his writings with 'portraits' of the subjects discussed. Using the popular grey wash of the period or full-colour, his pictures are painted with confidence on good quality laid paper. For his major articles, he employed the customary format of text opposite picture. He gives Latin and vernacular names, synonyms, references, detailed description, location and observations, the whole followed by a comprehensive bibliography.

Markwick's first publication was on bird migration [*Trans*.I, 1791]. At the end, there is a 'Calendar' for the years 1768–83, listing the dates of appearance and disappearance of 25 different birds [SP755(5)]; the list for 1783–94 [SP 758], 51 birds, is published in *Trans*.IV, 1798. At Hastings, there are 3 volumes called: *A Calendar of Flora or Naturalist's Journal*, covering the years 1768–76, recording the first sight, flowering, setting seeds, etc. of flowers. The information was published alongside the similar records collected by his contemporary, the Rev. Gilbert White (1720–93), in the 8vo edition, 1802, of *The Natural History of Selborne*. The editor, John White, acknowledges that these additions were obtained through "the Kindness of William Markwick, Esq., FLS, well known as an accurate Observer of Nature". He and his father Benjamin (Gilbert White's brother) were the publishers of the Linnean Society's *Transactions* so knew of Markwick's work. It seems, however, that Markwick and White never knew each other, though it is always possible that their correspondence has been lost. That they were not close friends is a great shame, seeing that they had so many interests in common. Gilbert White even repines that he had nobody with whom he could have a scientific discussion. They could have exchanged views on the nesting of the ravens in the vicinity of their houses and commiserated with each other on not having glimpsed the noble Great Bustard, then still inhabiting the Sussex Downs, though depleted in numbers and soon to be coursed to extinction. White, who had observed the exotically plumaged Hoopoe in his garden, would have envied Markwick, who had a wounded bird brought to him and watched it strut about the room, pecking at the floor, raising its crest and uttering loud "schreitches". Alas, it died in the night.



The Common Heron *Ardea cinerea*. It measured 3 feet 4 inches from the tip of bill to the end of the tail; from wing tip to wing tip 5 feet; weight 2 pounds 13½ ounces.

Markwick owned the first edition of White's *Selbourne* and some of his *Remarks* on the text were also published in the 2nd edition, as well as his *Calendars*. On the whole, he corroborates White's findings, though he occasionally hints at a certain naivety in his views. They both stand in awe of "the wonderful Works of God in the Creation" and "His Wisdom in adapting the singular Form and Position" of the limbs and the bills of birds to their particular mode of life. When he set himself the task of copying *Extracts* from the English translation (1786) of Count Buffon's *Histoire Naturelle des Oiseaux* (1770–86) 1796, adding his own *Remarks* [MS 473], Markwick rebukes the Frenchman for "finding Fault with the Works of the Creator". For instance, when he considers the uneven lengths of the mandibles of the Shearbill or Black Skimmer to be "an awkward and defective Instrument" and others, such as the curiously shaped beak of the Crossbill to be "a Deformity" and the turned-up bill of the Avocet to be "an Error of Nature", which must ultimately lead to the bird's destruction, Markwick points out that, on the contrary, they are "admirably well formed" for their purpose, designed specifically "to fill a gap in Nature". He chides Buffon for implying that he could have done better.

Markwick followed his paper on *Migration* with two on the Wood Sandpiper [*Trans.*I, 1791; II, 1794 – SP 755 (2); SP 757] and, in *Trans.*IV, 1798 his important *Aves Sussexiensis*, read in 1795, the first avifauna of the county; the illustrations are in his manuscript [SP 758]. Unfortunately, the supplements: *Remarks on Birds*, 1795–1800 [755] and *Remarks on ... Aquatic Birds called ... Grallae or Waders*, 1800 [SP 205] were never published. It is true that he sometimes misidentified the species, mistaking the duller plumage of a female or juvenile, even a male without its courtship colouration, for a related species, but any bird that was not either caught or shot could not be closely examined, the optical precision of telescopes of that period being wholly inadequate for such exactitude. Markwick sought help when he could, but that was not always so simple. The Scaup Duck and the Tippet Grebe that he sent to Goodenough for identification were, instead, carried off to the kitchen and served up as a delicacy for his dinner.

As well as water-fowl, Markwick also studied coastal fish and “sea blubbers” (jelly-fish). He sent papers on them to Thomas Marsham, with specimens and coloured figures, in 1806 and 1807 [SP 762; MS 475]. Of 4-footed creatures, there is a single manuscript, dated 1800, concerning the Harvest Mouse [SP 760, *British Zoology*, vol.4], with a water-colour of two animals. He rightly takes exception to White’s belief, that they spend the winter in holes underground “in a torpid State”. In his opinion, they only resort to them “as a Place of Security from Danger” – a nice subject for discussion between the two naturalists. There are four volumes called *British Zoology* at Hastings.

Markwick’s two major botanical papers, sadly remain unpublished. In 1802, he submitted: *Plantae Sussexiensis* [MS 474], a first flora for the county, comprising 558 species. In 1800, he had already sent: *Descriptions and Figures of several Grasses and Rushes* [MS 491] of a



Canadean [sic] Hemlock Spruce *Pinus Abies Americana*
“Found by Coll. Mann in Canada.”

[General Gotthard Mann (1747–1830), Inspector-general of Fortifications; Colonel-commandant of Royal Engineers.]

further 37 species. At Hastings, there are two volumes called: *Centuria Plantarum indigenarum*, 1799 [–1800?] with 200 species and another 50 species in each of the 8 volumes entitled: *Fasciculus Plantarum indigenarum*, 1786–1808. Belatedly as a first flora, if integrated together and published now, they would still be of considerable historical value, highlighting the tremendous changes that have overtaken the Sussex landscape – drainage of the marshes, massive urbanization, the coastline built over, deforestation followed by monoculture agriculture, not to mention huge tracts of land devastated for roads and railways. Many plants and birds, which for Markwick were a common sight, have become rarities or have disappeared altogether from the scene.

His second major contribution to botany and another ‘first’ was, strangely enough for a Sussex gentleman, *Florula Canadensis*, 1805, 6 parts in 3 vols [MS 472], a flora for Lower Canada – Nova Scotia, New Brunswick and the Gaspé Peninsula – the only parts of Canada under British rule at that time. The flora itemises over 100 genera, plus some two dozen plants, which Markwick was unable to name. There are 219 figures and a bibliography of 67 titles. The collection was made by General Robert Prescott (1725–1816), Colonial Administrator, General of His Majesty’s Forces and Colonel of the 28th Regiment of Foot, while he was Governor-in-Chief of the two Canadas from 1797 to 1799. (The town of Prescott, Ontario, on the St Lawrence River, is named in his honour.) He retired to England and became a near neighbour of Markwick’s, living at Rose Green, a property just outside Battle. He is buried at Winchelsea.

Markwick used grey wash for most of his illustrations of these unusual plants, since they were made from the herbarium specimens prepared by Mrs Prescott. He cleverly manages to make them look reasonably fresh, as if drawn from nature, which does Mrs Prescott great credit. He may, in fact, have compared some with examples growing in their garden, brought over as seeds or living plants. General Prescott had also made a plant collection, while he was stationed in the West Indies (Governor of Martinique, 1794–95, where his life was spared by the revolutionary French). A few plants from there may also have been flourishing at Rose Green.

Now that the Markwick manuscripts in our archives have been catalogued and the contents listed, although 200 years on, it only remains for specialists to edit them in conjunction with the material at Hastings Museum and, by publication, to release to science these valuable additions to botanical and ornithological knowledge and bring to William Markwick the recognition he so rightly merits.

ENID SLATTER

July 2001

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Erasmus Darwin and the Australian Darwinias

The formal text of an invited paper presented to The Linnean Society,
10th October, 2002, on the occasion of the
Bicentenary of the death of Erasmus Darwin

“Immortal Nature lifts her Changeful Form”

Erasmus Darwin in: “Roll On, Ye Stars”

Erasmus Darwin has many memorials. It is said that the most beautiful of all memorials are living genera or species of plants, herbs or trees. Such bloom afresh, each in its season, and recall the life and works of those whom they commemorate.

The most vigorous period of Erasmus Darwin's life (1) coincided with that window of time when European Settlement was established in Australia. He was interested in the new Colony, albeit an open-air gaol and military garrison on the unknown, and initially unmapped southern shores of Sydney Harbour. In June 1789 Darwin wrote the first poem about Australia – an amazingly prophetic poem of Hope, encouraging Peace, Art and Labour newly landed at Sydney Cove (2), in January 1788. It was a poem in which Darwin predicted that the natural beauty of the antipodean land, together with its flora and subsequently agriculture and horticulture would co-mingle with the built environment, in harmony. It is fitting that the beautiful genus of Australian wildflowers, *Darwinia*, the Scent Myrtles, commemorate his life and work (3). Erasmus Darwin, unlike his grandson, Charles, never visited Australia. But his legacy is there, to bloom anew each spring.

The Darwinias

The genus *Darwinia* was raised in 1815, 13 years after Erasmus Darwin's death, by the English botanist, Edward Rudge (1763–1846), of the Abbey Estate, Evesham (5). Rudge had developed a special interest in Australian flora; and in 1811 had described and named the new genus, *Trachymene*.

It should be pointed out that when William Dampier, on H.M.S. *Roebuck* in 1699 and when Captain James Cook and Joseph Banks on H.M.S. *Endeavour* in 1770, first explored in Australian waters, the western scientists and botanists encountered what they perceived to be a “new” wonderland of flora. The botanists on H.M.S. *Endeavour* – Banks, Solander and the Forsters (3) – simply had to row ashore with a collecting bag and a notebook. Every herb, moss, alga, fungus, shrub and tree was new to western science (3). Such were not new of course to the Aboriginal Peoples of Australia, whom we now know for more than 40 millennia had developed an encyclopaedic knowledge of the Australian flora and its properties. Today, some 60 percent of drugs are plant-derived; and it is believed that the average doctor has a personal pharmacopeia of perhaps



FIGURE 1: Erasmus Darwin (1731–1802), Doctor, Botanist, Poet and Scientist. From a portrait *circa* 1792 attributed to Joseph Wright of Derby (1734–1797), courtesy of the Pickford House Museum, Derby, with acknowledgements.

60 drugs. It is known that even young Aboriginal people knew the names and uses of many hundreds (sometimes more than 500) of Australian plants. Thus in one sense, the re-naming of plants is something of a presumption. But in another, the Linnean binomial system* of ascribing to each plant a genus and a species, such renaming has brought order to the study of the entire Kingdom Plantae.

In this context, the Australian Darwinias have for about 200 years, commemorated the life and works of Erasmus Darwin and his contributions to botany, gardening, literature and to medicine. The Darwinias comprise the Scent Myrtles; and include the Mountain Bell (*Darwinia meeboldii*), Tulip Bells (cultivars of *Darwinia macrostegia*) and others

* In The Botanic Garden [Part II. The Loves of Plants; 1794: line 31] Erasmus Darwin referred to Linnaeus as “... the Swedish Sage [who]... with his keen eye... explored.... the secret haunts of the Botanic Muse” (4).



FIGURE 2: *Darwinia carnea*, a yellow and brown wildflower from Western Australia showing the stems, heavily-foliated with small elongate leaves, characteristic of this genus. Photograph circa 1992, of a specimen growing in Kings Park & Botanic Garden, Perth, Australia, with acknowledgements.

such as *Darwinia carnea* (Figure 2). Darwin died in 1802 and by 1815, when Rudge raised the new genus *Darwinia*, the former's fame had intensified following his death.

The Darwinias or Scent Myrtles have characteristic bell-like flowers. The sepals are partly fused, forming a calyx-tube which is almost cylindrical. There are five petals, cupped to form the characteristic bell. Typically, the bell-shaped flower-heads hang in clusters of two to four (as in *D. macrostegia*) or six to twelve (as in *D. fascicularis*). It is co-incidental, but deliciously apposite, that in *The Loves of the Plants* (Figure 3) Darwin wrote (4):

“On dewy dell, high wood, and winding shore;
Say on each leaf how tiny Graces dwell;
How laugh the Pleasures in a blossom's bell”.

Most species of *Darwinia* are “small beautiful plants rewarding when cultivated in rockeries or in containers. Cultivars of *D. macrostegia*, called ‘Tulip Bells’ produce coloured bells up to 6cm long”.

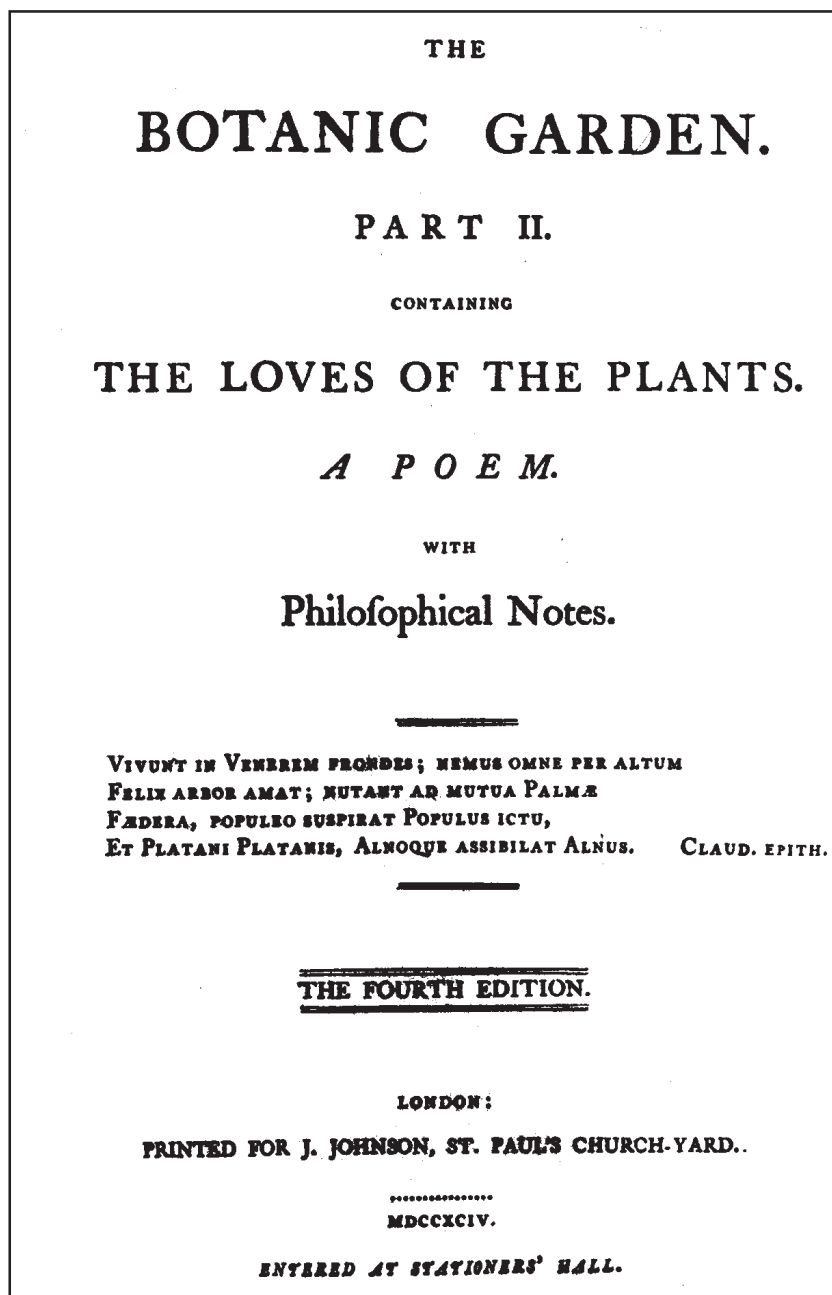


FIGURE 3: The Title Page of Erasmus Darwin's *The Botanic Garden*, containing the lines "How laugh the Pleasures in a blossom's bell" [line 36]. The Fourth Edition, published in 1794.



FIGURE 4: *Darwinia neildiana*, growing in the Eneabba-Badgingarra region of Western Australia. This species commemorates both Erasmus Darwin (1731-1802) and Dr James Edward Neild (1824-1906) both medical practitioners committed to the improvement of social conditions. James Neild was the founder of St John Ambulance in Victoria in June 1883. Photograph courtesy of Kings Park & Botanic Garden and Mr Bob Dixon, with acknowledgements.

Linked Memorials

Darwin's name in turn is linked, genus with species, with two other British medical practitioners who were to make their lives in nineteenth century Australia; and, like him, were to become leaders in the profession of medicine in their own communities.

Darwinia neildiana commemorates Erasmus Darwin and also Dr James Edward Neild (1824–1906), a Yorkshireman who emigrated to Melbourne in 1853 “attracted by colonial gold”. Neild began medical practice in Melbourne in 1861; and was to become a leader in the profession of medicine in his adopted country (3). Like Erasmus Darwin, Neild took an active role in the promotion of charitable issues in society. He was one of the founders of St John Ambulance in Australia. A beautiful stained-glass window portraying *Darwinia neildiana* graces the entrance gallery of the Priory Headquarters for St John Ambulance in Australia (Figures 4 and 5).

Darwin's name is forever linked also with that of the Welsh-born Dr David John Thomas (1813–1871) a pioneer and founder of medicine in Victoria, in Australia (Figure 6). David John Thomas was the pioneer anaesthetist in Melbourne; and was claimed to



FIGURE 5: Erasmus Darwin (1731–1802) championed public and philanthropic causes such as women’s education and alcoholic temperance. This photograph portrays the stained-glass windows in the entrance gallery of the National Headquarters of St John Ambulance Australia, in Canberra. The bottom right-hand pane portrays *Darwinia neildiana*, commemorating both Erasmus Darwin and Dr James Edward Neild (1824–1906), this latter a Yorkshire medical practitioner who founded the discipline of forensic medicine in Australia and St John Ambulance in Victoria. Photograph by the author, 1996.

be the first to perform a laparotomy in Australia. He was renowned for his Welsh vivacity. He loved dinners, songs and horse-racing. He was President of the Ballarat Eisteddfod (in 1867) as a good Welshman should have been. *Darwinia thomasi* has white, pink or scarlet bells, and blooms in the Salvatore Rosa National Park, in Queensland (Figure 7).

The Darwinias have, in turn, given their name and further memorials to Erasmus Darwin, in the derived names of other species of Australian native wildflowers. One particularly beautiful example is *Homoranthus darwinioides* (10). This species was named in 1922, and occurs from Rylstone in the Blue Mountains to Dubbo in central west New South Wales. [A synonymous name is *Rylstonea cernua*]. This species grows to 80cms and has attractive blue-grey foliage, and survives in conditions of semi-shade.

Erasmus Darwin, Natural Selection and Darwinias

The Darwinias or Scent Myrtles are of special significance not only for their aesthetic and historically attributive synergy. Their speciation and their variety of form mirror the fundamental themes of evolution, as espoused by Erasmus Darwin himself. In *The Temple of Nature*, described by Desmond King-Hele as “Darwin’s finest achievement as a writer” (5) Darwin wrote:

“First forms minute, unseen by spheric glass,
Move on the mud, or pierce the watery mass;
These, as successive generations bloom,
New powers acquire, and larger limbs assume;
Whence countless groups of vegetation spring.”

Canto I. Lines 297-301 (6)

With specific reference to plant evolution, he explicitly described the concept of “survival of the fittest”:

“Herb, shrub and tree, with strong emotions rise
For light and air, and battle in the skies;
Whose roots diverging with opposing toil
Contend below for moisture and for soil”

Canto IV. Lines 41-46 (6)

Erasmus Darwin had come to his concepts of evolution, like so many including his



FIGURE 6: Dr David John Thomas MD, FRCS, LSA (1813–1871), pioneer of Melbourne and the first surgeon to practise in the State of Victoria. An ebullient Welshman, he loved practical jokes. His life and works are forever linked to those of Erasmus Darwin (1731–1802) in the scientific name of the Scent Myrtle, *Darwinia thomasi*. Photograph courtesy of the Australian Medical Association (Victorian Branch) with acknowledgements.



FIGURE 7: *Darwinia thomasi*, Thomas' Scent Myrtle which flowers in the Salvatore Rosa National Park in Queensland. Its annual bloom commemorates both Erasmus Darwin and David John Thomas (1813–1871), each renowned physicians. Photograph courtesy of Mr Murray Fagg, of the Australian National Botanic Gardens, Canberra, with acknowledgements.

grandson, through the study of local fossils. In *Zoonomia*, in 1794 (7), Erasmus Darwin had made the first tentative suggestions of natural selection with his speculation on the potential for speciation – developed of course 65 years later by his grandson in “The Origin of Species”.

Erasmus Darwin wrote, in 1794, courageously for his time and place, of the sudden changes in species brought about by “monstrosities” (“enormities of shape”) (7) – or “mutations as we should now say” (8). Erasmus Darwin wrote of sexual selection through the competitive advantage of fittest and strongest males:

“the strongest and most active animal should propagate the species, which should thence become improved.” (7)

He knew that dramatic changes had been produced in domestic animals over the few hundred years of recorded history; and extrapolated this to affirm the concept of evolution:

“Would it be too bold to imagine, that in the great length of time since the earth began to exist, perhaps millions of age before the commencement of the history of mankind, would it be too bold to imagine, that all warm-blooded animals have arisen from one living filament...” (7).

In this context, there have to date been 41 species of *Darwinia* identified in Australia. New species undoubtedly will continue to be found.

It is important to appreciate that the environmental extremes encountered throughout the Australian continent today, are of recent origin. The different species of *Darwinia* are found broadly in regions defined by Pliocene times. Australia has not always been an island continent. Even in recent times (late Pleistocene), northern areas known today as Arnhem Land and Cape York Peninsula were connected by land bridges to the present land masses of Papua New Guinea and the eastern Indonesian islands. In earlier times, ‘Australia’ was part of Pangea and later the Gondwanan continent. As a result of Australia’s great age and these connections, the present Australian biota, including its flora, is comprised both of elements which are truly indigenous (that is, they evolved there), and elements with southern continental affinities and with New Guinean-Asian affinities (9). The fact that *Darwinias* exist only on the Australian continent, but exist in different species and forms in “islands” of diverse and distinct habitats many with arid barriers between, is another example of the influence of “local” environment driving speciation. It is probable that the different species represent autochthonous evolution, with evolution *in situ* in such different “islands” of distinct and specific ecosystems on the Australian mainland – possibly from an earlier Gondwanan ancestor. These distinct isolated habitats, in which *Darwinia* evolved, are another example as dramatic perhaps as that of the Galapagos, of the power of natural selection. The evolved species of *Darwinia* have been modified in dramatically different niches (10), five thousand kilometres apart, across the Australian continent. *Darwinia macrostegia*, the Mondurup Bell grows in south-west Western Australia (10). Across the continent, in Queensland, has evolved *Darwinia thomasi* (Figure 7).

The Darwinias thus link two parallel themes – one of etymology with the name of the genus linked to one who was a father of evolutionary theory. The other is of wildflowers whose beauty is cognate with the poetry of their namesake; and whose diversity yet relationships symbolise the fundamentals of evolutionary lore.

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Thoughts on Plants

Some years ago the late Jack Harley, Linnean Medallist in 1988, offered the following topic for research – why it is that trees grow so slowly? Given Jack's knowledge of plant nutrition and the role of fungi in this process, it seems unlikely that he – and others, notably John Cram at a recent Society meeting,* – had not given thought to the idea of nutrient limitation and discarded it. It must also be said that some large plants, notably bamboo, can grow staggeringly rapidly. But most trees have adopted a more languid lifestyle. Why?

Plants and their animal predators are thought by some to co-evolve in ways generally advantageous to both (1). The very size of trees, their slow growth, coupled with decades before some are in a position to reproduce, suggest that predation is at best ineffective, although metazoan defoliation and gall formation must take some toll of arboreal health.

Metazoa have developed sophisticated immune systems, whereby invading disease-causing organisms are attacked by a variety of humoral and cellular systems all of which depend on recognition of the invaders by proteins, which induce antibodies and other processes specifically directed against them. Such immune systems depend for their success on having a wide range of proteins to recognise new invaders. Whilst the immune *system* is inherited, the precise structures of many of the recognition proteins and antibodies are not. The genes responsible for these proteins are composed of sequences which can recombine relatively rapidly and independently to provide variability. Coupled with this is an *immunological memory*, a mechanism for preventing self-destruction, which also enables those sequences which have proved effective in dealing with an invader to be retained for future use.

This has at least two advantages – it provides a means of responding to new or altered pathogens, and the amount of genetic information which has to be passed from generation to generation is reduced, countering the generally malign effect of mutation. Finally, the immune system triggers *metabolic cascades*, which ensure that a massive and rapid response is mounted to an invader.

Plants, too, have immune systems (2). These include mechanisms for the recognition of pathogenic micro-organisms, cellular self-destruction (apoptosis), oxidative attack and proteolysis which are familiar to (animal) immunologists. At present, these mechanisms appear genetic in origin and rather less specific than their animal counterparts. The sedentary lifestyle of many plants exposes them to injuries, such as grazing, not generally the lot of animals. To complement the immune response to predators, plants have taken other actions to defend themselves against attack and have become chemical factories of great sophistication, each species producing hundreds of different chemical compounds – secondary metabolites – not, as far as can be seen, involved directly in metabolic housekeeping, ego photosynthesis, respiration, protein synthesis and the production of structural materials. These include those supposedly

* *Evolution of Plant Physiology*, 9-11 th April 2000

directed against micro-organisms and insects (antimetabolites) which can also have drastic effects on higher animals. Biologically active secondary metabolites are uncommon, but a little of them may go a long way. Some plants are able to mobilise fluorine in the soil to produce derivatives of monofluoro-acetic acid, a powerful inhibitor of the Krebs' tricarboxylic acid cycle, a ubiquitous and essential pathway in virtually all living organisms. Such plants are a considerable hazard to grazing animals in parts of Africa and Australia and have been used as human poisons. These adaptations are seen by some as part of a *biological arms race* (3), whereby plants keep one step ahead of their predators. The term *arms race* seems, incidentally, to be an inappropriate one for this particular catch-as-catch-can, given the implication of malice aforethought not part of natural selection.

Are these pathways also inherited? Certainly, the use of patterns of plant secondary metabolites for taxonomic purposes suggests that some of the pathways are. How are they controlled? We are now aware of cellular signalling molecules which can switch on antimetabolite production in response to a perceived threat. Some of messengers are volatile and can 'pass the word' to other plants of the same species. How does the plant respond to new or altered pathogens? Within some pathways, some ("sloppy") enzymes may possess broad substrate specificity increasing the potential range of substances produced (4). The closely related compounds catechol, phenol, quinol and resorcinol may all be substrates for a single enzyme or pathway. How do plants avoid poisoning themselves? Almost certainly by controlling the timing of the appearance and cellular locations of antimetabolites. These fundamental questions are not without significance in agriculture and, given the increasingly widespread search for plant-derived drugs, to the pharmaceutical industry.

Insecticide resistance is something that we are all well aware of in connection with efforts to eradicate insect vectors of disease. So what of the plants' own insecticides? There seems no good reason to suppose that pests cannot develop metabolic pathways to overcome the effects of these. This fact poses a problem for co-evolutionists in that the dice seem stacked against the plant, particularly the long-lived ones, whose pests, with much shorter generation times, are able through mutation to bring the plant's life to a premature end.

A factor which seems worth consideration is whether, early on in their evolution, trees and some other plants might not have developed something approaching the ultimate deterrent. The combination of cellulose, lignin and hemicelluloses in wood is one that has proved exceptionally difficult to crack biochemically. Very few organisms have even parts of the system necessary to degrade this particular structural melange. Abiotic processes – mainly fire, water and weather – play a major part in the natural degradation of wood which involves extensive physical modification to these polymers. Great efforts, without significant success, have been put into the rapid degradation of native cellulose using enzymes, so as to make use of the energy it contains. Cellulose is a linear, hydrophobic polymer of indefinite size, as are the hemicelluloses. Coupled with the

complex branched structure of the even more hydrophobic and chemically inscrutable lignins, the result is something which enzymes are simply not built to degrade, although enzymes are known which will degrade, if unspectacularly, the individual components. There is evidence that lignification plays a significant role in protection against pests (5). Lignins are largely synthesised by non-enzymic processes involving free radicals, and have proved particularly difficult to degrade. No amount of genetic modification on the part of plant pests seems to have enabled them to tackle this biochemical complex.

That said, recent work suggests that not everything in the arboretum is necessarily lovely (6). Poplars raised in the drylands of NE Oregon under near-ideal conditions of irrigation, fertilisers and pest control ('fertigation') produce wood at ten times the rate of their less fortunate fellows worldwide. Given insatiable human demand for wood – expected to be up 20% between now and 2010 – this observation is highly significant, suggesting as it does that tree growth is suboptimal. It suggests, too, that there may be scope for genetically manipulated (gm) trees ('Frankentrees') resistant to pests and producing more commercially valuable wood to reduce destruction of what's left of the planet's natural forests. Such technology is not without its critics and, given the public perception of gm crops, scientists are wary this time around. Arboreal lifespans being what they are, this seems wise. Early research is being directed at delayed flowering, so that gm trees are less likely to pollinate native stock. This is not the only objection to gm plants; it has been suggested that this may decrease resistance to RNA viruses via recombination in the plant of viral and gm RNA (7).

Those who have argued (8) that insect pests have done little to shape the course of plant evolution may be in for a surprise as we continue the search for the answer to Jack Harley's conundrum.

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JOHN MARSDEN

The Linnean Society Programme

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| 22nd Jan.* | 6pm | SEASIDE PLEASURES: PHILIP HENRY GOSSE AND THE BATHING WOMEN Dr Ann Lackie Lingard |
| 11th Feb. | | LYELL MEETING 2004: DINOSAUR PALAEOBIOLOGY † Dr Mike Benton FLS (Day meeting at the Geological Society) with the Geological Society and Palaeontological Association |
| 13th Feb. | | DARWIN AND THE BARNACLE 150 YEARS ON (Day meeting) † Prof. Phil Rainbow FLS, Natural History Museum |
| 13th Feb. | 6pm | DARWIN AND THE BARNACLE Rebecca Stott |
| 4th March | 6pm | CEPHALOPODS: ECOLOGY AND FISHERIES † Paul Rodhouse (with the London Malacological Society) |
| 11th March | | ENGLISH NATURAL HISTORY DATABASES † Dr Malcolm Scoble FLS (Half day meeting with Specialist Societies) |
| 18th March | 6pm | THE NATIONAL TRUST AND THE LINNEAN SOCIETY Dr Pat Morris FLS |
| 1st April | 6pm | LAUGHTER IN PARADISE: HERBERT SPENCER'S WILL Dr John Marsden |
| 22-23rd April | | SQUAMATE EVOLUTION AND SYSTEMATICS † Dr Roger Thorpe FLS (with British Herpetological Society & American Herpetological League) |

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