



The Linnean



Carl Linnaeus
1707-1778

NEWSLETTER AND PROCEEDINGS OF THE LINNEAN SOCIETY OF LONDON

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A forum for natural history

THE LINNEAN SOCIETY OF LONDON

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THE LINNEAN

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Edited by Brian G Gardiner

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Editorial

February 12th 2009 is the 200th anniversary of his birth while *The Origin of Species* was published on 24th November 1859 by John Murray of Albemarle Street, who had been recommended to Darwin by both Lyell and Hooker. Incidentally, the first edition of *The Origin ...* sold out on the day of its publication! We shall celebrate these events in more detail in the April edition of *The Linnean*. In the meantime, the two new images on our cover are there to remind us that Darwin studied selectively-bred pigeons for evidence to support his theory of evolution by natural selection and he studied barnacles, as well as earthworms, in great detail other books. We are very grateful to John Stone, of RBG Kew for his design skills and willingness to spend time preparing the covers for *The Linnean* and the Special Issues over the last few years.

This issue contains two main articles and a short note on ‘Forgotten papers’! The first article, entitled ‘Tree and Leaf: a Different Angle’ concerns the attempt made by the Rev. James M’Cosh in the 19th Century to discover the laws of organic nature and to unwind the “Kantian threads off the spindle of Scottish realistic philosophy”. M’Cosh, using an enlarged version of a crystallographers goniometer, set about measuring the branching angles of trees and shrubs, using geometry as his analytical tool. He saw himself as the pioneer of a ‘Higher Teleology’ for the ‘Vegetable Kingdom’. Initially McCosh’s reasoning was on plants with reticulated leaves, referred to by John Lindley as exogens. However, McCosh then turned his attention to Lindley’s endogens – viz monocotyledons – pointing out that they have leaves with veins parallel, or nearly parallel, to the stem and have no ramified venation. Eventually these various arguments were gathered together in his publication of *Typical Forms* (1856, McCosh and Dickie) which went through two editions and some eight printings.

The second article concerns two naturalists in Africa, Sheffield Airey Neave and James Jenkins Simpson, who both worked on arthropods, mainly insects and ticks. However, it was entomology that was to bring their careers together when they were appointed by the Colonial Office to the Entomological Research Committee (Tropical Africa) to carry out work relating to the role of insects and ticks in the transmission of diseases. This work was, in essence, “a means of promoting Imperial Policy”. They were sent out to Africa just prior to the First World War and entreated to make large collections of insects and ticks and to carry out extensive field observations. In their mission statement they were told to “concentrate on the numerous insect pests which cause disease and death amongst human beings and animals and devastate crops”. Thus Neave and Simpson collected blood sucking mosquitoes, tsetse flies and tabanids, bed-bugs, fleas and lice, as well as ticks. Between them they produced more than a dozen research publications. Neave eventually became Assistant Director of the Bureau of Entomology, while Simpson became Director of the Public Museums of Liverpool.

The final note is, posthumously, from John Marsden in which, as in his October article, he demonstrates both his biochemical background as well as his thoughts on genetic manipulation.

BRIAN GARDINER

Society News

I'm delighted to be writing my first "Society News" and, as I write, I am amazed to discover that it is 3 months to the day since I took up the role of Executive Secretary; how time flies! I count it a huge privilege to serve the Linnean Society in this way and would like to say a sincere thank you to all those Fellows who have offered words of welcome whilst in the Society and to the many others who have sent e-mails of congratulations and welcome. The Society's Strategic Plan (2008-12) launched at the Anniversary Meeting in May, provides a dynamic framework for activity and I am already very much enjoying working with Fellows and the magnificent staff team to deliver this. I would like to extend sincere thanks on behalf of you all, to Gina Douglas for fulfilling the role of Executive Secretary so superbly (and for much longer than she had expected!); we are of course delighted that Gina remains on the staff team as Honorary Archivist.

What a busy three months it has been! Following all the refurbishments, in September we were thrilled to welcome over 500 visitors from 21 countries as the Society participated in Open House London. The newly decorated Library "shone", lots of visitors asked lots of questions and we've been very pleased to see some of these visitors at our evening meetings. These included lectures by Mariette Manktelow FLS (The Women around Linnaeus) and Nigel Hepper FLS (Phenology and Climate Change). Alastair Land completed an excellent series of 6th form lectures and 140 people packed the meeting room and the library to hear Martin Hall from the Natural History Museum talk on "Fly on the Wall: the role of insects in criminal investigation". In October, Ms Robin Myers, Dr Robert Anderson and Professor Hugh Torrens joined us for the launch of the 2nd edition of *The History of Natural History* by Gavin Bridson, former librarian of the Society and known to many Fellows. This was an evening which many reflected provided a "fitting tribute" to Gavin. The Annual Systematics Debate saw Geoff Boxshall and Sandy Knapp propose and oppose the motion that "The taxonomic community should focus its attention on flowering plants, butterflies and higher vertebrates for the next decade." The motion was soundly defeated by 26 votes to 6!

It's also been a very busy quarter for day meetings which included a 3-day Festschrift for Chris Humphries (Beyond Cladistics), Darwin and Domestication, The Longer the Better (a celebration of long-term data sets in commemoration of the 300th anniversary of the birth of Robert Marsham FRS) and a day investigating the Global Amphibian Crisis. Most recently, in a day jointly co-ordinated with the World Land Trust, we explored the role of restoration ecology in mitigation of climate change and loss of biodiversity. It was great to see the meeting room full to discuss this important issue.

With the Programme for next year now finalised, 2009 promises to be equally busy. Enclosed with this issue of *The Linnean* is a brochure specifically advertising

Nominations for Council are required by 12th March 2009.

Please send your nominations to Ruth Temple at the Society.

meetings taking place from January–March. Please note in particular, the Presentations of the Darwin–Wallace medals on February 12th 2009. This is an event for Fellows only and admission is free but by ticket only. More details of how to obtain tickets for this very important event in the Society’s calendar are in the enclosed brochure.

We have also retained the “Programme Card” style on the back of the events brochure so you have all the dates of meetings currently confirmed for 2009. We are extremely pleased that so many people offer to give lectures and host meetings at the Linnean Society so please do keep an eye on the website and in the events brochures for information about events which we may add to the existing list! 874 people are currently benefiting from up-to-the-minute news about our events and other events taking place in the UK and abroad through *Linnean News*. Please do take the opportunity to visit our website and sign up to this electronic link so that we can keep you updated!

Also enclosed with this issue is a flyer for a field trip to the Gower Peninsula which is being co-ordinated with the Geological Association. This follows the very successful trip to Gotland in 2007 and should be a good trip, but places are limited. Based on the interest received for this visit, we hope to organise more such field meetings so please do express interest!

Thank you again for your warm welcome. Please do contact me if you have ideas and suggestions relating to particular aspects of the Strategic Plan, possible speakers for meetings, or comments about anything the Society is (or should be!) doing.

I look forward to meeting many more of you in 2009 and wish you a very Happy New Year!

RUTH TEMPLE
Executive Secretary

THE LINNAEAN TERCENTENARY BRONZE MEDAL



Specially commissioned to celebrate the Tercentenary of the birth of Carl Linnaeus, this limited edition bronze medal is now available to Fellows of the Linnean Society of London to purchase at a price of £50 plus P&P*. Featuring art work by award winning artist Felicity Powell, only 300 of these beautiful medals (one for each year of the Tercentenary) have been produced.

Contact Kate Longhurst to order:

T. +44 (0)20 7434 4479 Ext 13 E. kate@linnean.org

Obverse: Linnaeus’ drawing of Andromeda from his Lapland journey.

Reverse: Ehret’s original illustration for Linnaeus’ *Systema Naturae* arranged in a spiral from a profile of Linnaeus.

*£5 in the UK. For overseas orders please contact Kate Longhurst.

Development News

The Linnean Society holds 168 of Linnaeus's original fish specimens in the Linnaean Collection Store. The collection constitutes a scientific and historical reference of extraordinary value, containing many type specimens named by Linnaeus including the John Dory or Apostle fish *Zeus faber* Linnaeus. Linnaeus observed fishes when travelling around Sweden and is thought to have directly collected 49 of the extant 168 London specimens, assiduously writing up his findings in many published accounts. The material comprises mostly dried half skins incorporating one-half of the head skeleton, but also includes some whole specimens.



Professor David Cutler PLS (second from left) with Prof. Gordon McGregor Reid PPLS (far left) and representatives from the Japanese Embassy and the Worshipful Company of Fishmongers at the launch of the digitized fish collection.

This collection has now been fully documented and the Society launched the digitised images and associated data online at the Society on the evening of November 6th. Each specimen was digitally photographed by specialists at London's Natural History Museum. The supporting descriptive data, extracted from a paper written by Mr Alwyne Wheeler FLS in 1985 by Ms Kathie Way FLS, Honorary Curator of the Society's Linnaean Zoological Collections and Ms Julia Bruce FLS, has been integrated into the Society's Repository, hosted by the University of London Computer Centre.

Our sponsor, His Majesty the Emperor of Japan HonMLS was represented at the launch by Mr Sumio Kusaka, Minister and Consul-General from the Japanese Embassy together with Mr Takashi Katae and Mr Tetsuya Murakami, and our sponsor, the Worshipful Company of Fishmongers was represented by Mr Clive Askew. The completion of this phase was made possible by a contribution from the Fellows' Tercentenary Fund, and we would like to thank everyone for their generous support.

Following an introduction by the President, Professor David Cutler PLS, Professor Gordon McGregor Reid PPLS and Chair of the IUCN/Wetlands International Freshwater Fish Specialist Group addressed the participants on the continuing importance of the collection and the problems facing declining fish populations due

to overexploitation. For example, the once common European eel (*Anguilla anguilla*) of Linnaeus, 1758, is now assessed as Critically Endangered on the IUCN Red List of Threatened Species (2008). This species is threatened by overexploitation, by an introduced parasite and by dams which block migration routes. It is estimated that there has been an eel population loss of over 80% in the past three generations (60 years) based in part on a massive decline in juvenile recruitment (more than 95% reduction in 24 years). This is reflected in a catastrophic drop of 76% in the commercial eel catch between 1968 and 2005. Rates of species extinction are increasing among all fishes. He commented that “from Linnaeus’s time to the present day, scientific names and descriptions constitute the vital first step in beginning to understand the biology of fishes and how to sustainably manage this incredibly important global resource.” Julia Hoare, the Society’s Consultant responsible for the Linnaean Collections Online Project, gave a demonstration on how to access and use this important new resource. Access to the system is through the Linnean Society website and can be found at www.linnean.org under ‘Linnaean Collections Online’. Specimens



Two whole specimens of the short snouted seahorse, *Hippocampus hippocampus* L. in the Linnaean collection.

of a further 85 fish species are held in the collections of Uppsala University.

The launch of the fish specimens received international coverage and has been reported in numerous publications and science blogs. A launch for the second phase of the insects is planned for February 2009 with a final set of data and images being made available during the summer of 2009. Funds from the Fellows Tercentenary Fund are supporting the next phase of capturing the images of the Shell collection and the associated data which it is hoped will allow a further tranche of specimens to be available on-line by the summer of 2009.

We closed our Tercentenary Appeal at the end of November. The amount collected and pledged by Direct Debit is £88,026.24 and with Gift Aid of £12,852.79 the total amount is £100,879.03. We should like to thank all our Fellows for their generous contributions! The money raised by the Fellows not only directly supports our development projects but strengthens our case with external funding bodies.

We are now steadily developing and submitting approaches for capital projects now that our building plans have been approved by Westminster City Council in November. If you have any recommendations for funding opportunities relating to any of our projects, please do let me know at elaine@linnean.org.

ELAINE SHAUGHNESSY

Head of Development

Library

We are pleased to report that our water-damaged books have at last returned from Harwells, where they had been frozen and then thawed and air-dried to prevent mould growth. The books were all carefully examined on return and we were delighted to discover that a good number of them were in excellent condition and could be returned to the shelves with a minimum of further treatment. As is so often the case, the older volumes with excellent quality paper had suffered very little text-block damage; it was the more recent titles using heavily filled paper that had suffered more. Once we have a definitive list of those books we wish to replace, we shall publish it in hopes that some of the titles may be languishing on your book-shelves and yearning to be rehomed!

A total of 530 people visited the Society on Saturday 20th September during this year's London Open House weekend. Plenty of staff and Collections Committee members were on hand to talk about the building, the recent renovations, the Society's history (especially the reading of the Darwin/Wallace papers), the portraits and the collections. During the afternoon, we were surprised and pleased to meet descendents of the Rev. John Lightfoot FRS, FLS (1735-1788). He was one of the Founder Members of the Linnean Society and was botanist and chaplain to the Duchess of Portland. The family was keen to see his portrait, which usually hangs on the staircase, but which had been removed for safekeeping during the building works. Luckily, our Conservator, Janet Ashdown, was on hand to find and unwrap the portrait so that it could be admired and photographs taken for the family album.

In mid-October the Society hosted the annual partners meeting of the Linnaeus Link Project. 22 delegates attended, representing institutions in Sweden, the USA, Germany, Switzerland and the UK. The lively two-day meeting covered a wide range of topics and sparked all sorts of ideas that can be developed over the next year into our future strategy. For those delegates staying on in London for the weekend, a trip to Down House was arranged. The weather was perfect for the visit, being autumnal but beautifully sunny, and an enjoyable and instructive day was had by all.

Directly after the launch of the new edition of Gavin Bridson's book *The history of natural history: an annotated bibliography*, this year's book sale took place and almost £400 was raised for Library funds. Our thanks go to all those who have donated books during the course of the year.

Our recent overseas visitors have included a Swedish descendent of Abraham Bäck, friend and correspondent of Linnaeus, who was researching his forebear's history. We also had a visit from Annika Windahl-Pontén who was one of the main organizers of the Linnaean Tercentenary celebrations in Uppsala in 2007. Groups visiting the Library and Collections Store have included The London Explorers' Club and two sets of history of science students. We have also arranged visits for three groups of botanical artists, one led by Ann Swan, an RHS gold medal winner specialising in pencil and coloured pencil drawings.

Wende Guastamachio, has recently joined us as a volunteer. She is currently undertaking an MA in Paper Conservation at Camberwell College of Arts, and is helping Janet with various binding projects. Our other volunteers continue to work hard at transcribing letters, sorting domestic and personal archives and inputting information into the Fellows database and we are very grateful for the huge contribution they make to the work of the Library.

LYNDA BROOKS

Librarian

Donations September – November 2008

Cyril Aydon FLS: Aydon, C. *A brief guide to Charles Darwin*. 326p. London: Robinson, 2008. ISBN 9781845297206.

Eva Becht: Bergqvist, Karin. *Carl von Linné: pojken som inte slutade samla*. [29]p. Stockholm: Natur och Kunde, 2007. ISBN 9789127105935.

Leonie Berwick: Brafman, D. and Schrader, S. *Insects and flowers: the art of Sibylla Merian*. [52]p. Los Angeles, CA: The J. Paul Getty Museum, 2008. ISBN 9780892369294.

Dr Arthur E. Bogan FLS: Williams, J.D., Bogan, A.E. and Garner, J.T. *Freshwater mussels of Alabama and the Mobile Basin in Georgia, Mississippi and Tennessee*. 908p. Tuscaloosa, Ala.: University of Alabama Press, 2008. ISBN 9780817316136.

Lynda Brooks FLS: Addyman, Marie. *William Turner: father of English botany*. 44p. Morpeth: Castle Morpeth Borough Council and Friends of Carlisle Park, 2008. Bain, Ian. *The workshop of Thomas Bewick*. (rev. ed.) 112p. Stocksfield: Thomas Bewick Birthplace Trust, 1989.

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Jyll Bradley FLS: Bradley, Jyll. *Mr Roscoe's garden*. [ca. 168]p. Liverpool: Liverpool University Press, 2008. ISBN 9781846311666.

Jeff Bull FLS: Garnett, O. *Lytes Cary*. 16p. London: National Trust, 2001.

John Burton FLS: Beck, W.H. *A guide to Saskatchewan mammals*. 52p. Regina, Sask.: Saskatchewan Natural History Society, [ca. 1960]. *Special publication 1*.

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Cronan, J.M. *The mammals of Rhode Island*. 133p. [Providence] R.I.: Rhode Island Department of Agriculture and Conservation, Division of Fish and Game, 1962.

De Vorsey, L. [ed.]. *De Brahm's report of the general survey in the southern district of North America*. 325p. Columbia, SC.: University of South Carolina Press, 1971. ISBN 087249229x.

Hansen, Thorkild. *Arabia Felix: the Danish expedition of 1761-1767*. 381p. London: Collins, 1964.

Harper, F. *Land and fresh-water mammals of the Ungara Peninsula*. 178p. Lawrence, Kan.: University of Kansas, Museum of Natural History, 1961.

Hoffmeister, D.F. *Mammals of Arizona*. 602p. Arizona: University of Arizona Press, 1986. ISBN 0816508739.

Johns, C.A. *Flowers of the field*. Rev. ed. 356p. London: Routledge & Kegan Paul, 1949.

Larrison, E.J and Johnson, D.R. *Mammals of Idaho*. 166p. Moscow, Idaho: University Press of Idaho, 1981. ISBN 0893010707.

Lyon, M.W. *Mammals of Indiana*. 384p. New York: Arno Press, 1974. ISBN 0405057474.

Newton, A.P. [ed.]. *Thomas Gage, the English-American: a new survey of the West Indies, 1648*. 406p. London: George Routledge & Sons, 1928.

Taylor, W.P. and Davis, W.B. *The mammals of Texas*. 79p. Austin, Tex.: Game, Fish and Oyster Commission, 1947. *Bulletin no.27*.

Michael P. Costeloe: Costeloe, M.P. *William Bullock: connoisseur and virtuoso of the Egyptian Hall*. 244p. Bristol: University of Bristol, 2008. ISBN 9780955240645.

Prof David Cutler PLS: Evert, R.F. *Esau's plant anatomy*. 3rd ed. 601p. Holboken, NJ: Wiley-Interscience, 2006. ISBN 9780471738435.

Gina Douglas FLS: Kerr, Ian. *The birds of Holy Island...96p*. Holy Island: Ian Kerr, 2007. ISBN 0954488008.

Dr Aljos Farjon FLS: Kolbek, J. [et al]. *Distribution and phytocoenology of selected woody species of North Korea (D.P.R.K.)*. 340p. Pruhonice: Institute of Botany, Academy of Sciences of the Czech Republic, 2001. ISBN 8086188108.

Dr Arthur Hollman FLS: Kukkonen, I. *Flora Suomen suurkasvio*. 2 vols. Porvoo:

Werner Söderström Osakeyhtiö, 1994. ISBN 9510196657.

Prof Gren Lucas OBE FLS: Fitter, R. *Wildlife for man*. 223p. London: Collins, 1986. ISBN 0002194422.

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Dr E.C. Nelson FLS: Atkinson, I.A.E. *Vegetation map of Tongariro National Park, North Island, NZ*. 1:50000. 27p + map. Wellington, NZ: New Zealand Department of Scientific and Industrial Research, 1982.

Goldblatt, P. and Manning, J. *Cape plants*. 743p. Cape Town: National Botanical Institute of South Africa and Missouri Botanical Garden, 2000. *Strelizia* 9. ISBN 0620262362.

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Valerie Oxley: Oxley, Valerie. *Botanical illustration*. 192p. Ramsbury: Crowood Press, 2008. ISBN 9781847970510.

Dick Passmore: Passmore, Dick. *Power to the city*. 126p. Exeter: Little Silver Publications, 2008. ISBN 0954447255.

G.S. Proudlove: Proudlove, G.S. *Subterranean fishes of the world*. 299p. Moulis: International Society for Sunterranean Biology, 2006. ISBN 9782952708401.

Prof T.K. Shrestha FLS: Shrestha, T.K. *Ichthyology of Nepal*. 390p. Kathmandu: Himalayan Ecosphere, 2008. ISBN 9789937206532.

Southampton Centre for Underutilised Crops: El-Siddig, K. [et al]. *Tamarind: Tamarindus indica L.* (rev.ed.). 188p. Southampton: Southampton Centre for Underutilised Crops, 2006. *Fruits for the future 1*. ISBN 0854328599.

Azam-Ali, S. [et al]. *Ber and other jujubes*. (rev.ed.). 289p. Southampton: Southampton Centre for Underutilised Crops, 2006. *Fruits for the future 2*. ISBN 0854328580.

Bin Osman, M. and Milan, A.R. *Mangosteen: Garcinia mangostana*. 170p. Southampton: Southampton Centre for Underutilised Crops, 2006. *Fruits for the future 9*. ISBN 0854328173.

Haq, N. *Jackfruit: Artocarpus heterophyllus*. 192p. Southampton: Southampton Centre for Underutilised Crops, 2006. *Fruits for the future 10*. ISBN 0854328394.

Annona species: field manual for extension workers and farmers. 27p. Southampton: Southampton Centre for Underutilised Crops, 2006. *Practical manual no.5*. ISBN 0854328165.

Tres especies de Zapote en America Tropical: manual de campo para extensionistas y fruticultores. 23p. Southampton: Southampton Centre for Underutilised Crops, 2005. *Manual practico no.6*. ISBN 085432836x.

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Smartt, J. and Haq, N. [eds]. *New crops and uses: their role in a rapidly changing world.* CD-ROM. Southampton: Southampton Centre for Underutilised Crops, 2008. ISBN 9780854328918.

Prof Hugh Torrens: Buckman, J. *An address ... to E. Holland ... Chairman of Council of the Agricultural College, Cirencester.* [Photocopy]. 14p. Cheltenham: Norman, Steam Printer, 1862.

Prof J.M. Webster FLS: Webster, J.M. [et al] eds. *An anecdotal history of nematology.* 299p. Sofia: Pensoft, 2008. ISBN 9789546423245.

More from the archives

From time to time reports of freakish animals have reached the Linnean Society. Here are four examples, all concerning horns of one sort or another.

In November 1791, when the Society was only three years old, James Hoy, of Gordon Castle, Scotland wrote as follows: 'It is a general character of deer that the females of every species, except the rein-deer, are destitute of horns: a singular instance to the contrary occurred here in September last: a hind, the female of *Cervus Elaphus*, was shot by the Duke of Gordon, which had one horn, perfectly similar to the horn of a stag of three years old; it had never had a horn on the other side of its head, for there the place where it ought to have been was covered over by the skin quite smooth. It did not seem to have ever produced a fawn: and upon dissecting it, the ovarium on the same side with the horn was found to be schirrous.' *Cervus elaphus* is the red deer and schirrous means like a hard swelling or tumour. The letter was read at the meeting of 6 December 1791 and printed in a slightly modified form in the *Transactions* (II, 356).

Hoy's letter is referred to in a paper by William Yarrell read to the Society in March 1856, entitled 'On the influence of the sexual organ in modifying external character' with the additional information that the skull and horn are 'preserved in the armoury at Gordon Castle with a label appended detailing the particulars.' On the same page Yarrell refers to the great anatomist John Hunter's 'Observations on the Animal Oeconomy' (published in 1786), quoting his view that 'where the male and female among animals are distinguished by a difference in their external characters,

by depriving either sex of the influence of the true sexual organ they will seem to approach each other in outward appearance.’ Interestingly, although on Hunter’s death in 1793 there was a funeral ceremony at St Martin’s-in-the-Fields, his body was reburied in Westminster Abbey in 1859, just three years after Yarrell’s paper.

Henry, Earl of Gainsborough, wrote to the Society in July 1791. Part of his letter records an incident ‘which occurred to me this summer, under my own eye and my own property. A horn was found growing out of a ewe sheep, exactly placed upon the loin, but not inserted into any of the vertebrae it adhered to the flesh of the animal, and was not discovered until the ewe was sheared. The ewe was what in this country is called a four or five sheared sheep but this excrescence was never observed in any prior shearing. She was of the common breed of this part of the country which are generally without horns. Another circumstance I wish to mention is that of a lamb of the black and white Spanish breed. This little creature had at the apex of each horn (they are all horned) a little pencil of wool growing out of the horn and firmly attached to it.’

In September, 1798, Thomas Marsh wrote to James Sowerby on a similar theme: ‘A sheep from Bromham, Bedfordshire. hornless on the head, was killed at Mr Buttons, Bedford, on the tenth of this month which had a horn (now in my possession) on the left side of the neck, near the upper part of the shoulder blade, about eleven inches in circumference at the base. and about four inches long. The horn weighed about sixteen ounces and was full of a very white, fibrous, fatty and sweet smelling substance, evidently of a nature to have afforded much increase of horn if the sheep had lived some years longer. The horn came readily off with the skin, as it adhered solely to it; it was taken off, in my presence, with its covering of natural skin, which wholly covered the base of the horn and concealed its contents until excision was made with a knife. The sheep was two years old and had produced a lamb.’ Marsh added ‘Pray lay my letter before the Linnean Society at their next meeting, as I hope the contents will be found worthy of their notice’ but Sowerby does not seem to have done so.

The narwhal (*Monodon*) is a whale of Arctic seas. Only the male has the single (rarely there are two) straight, spirally twisted horn or tusk, which can be as long as 300 cm and is the only tooth. Its function is unknown. In November, 1821, a letter concerning a narwhal was sent by W.R. Whatton to the Secretary of the Linnean Society (who at that time was Alexander McLeay). It reads: ‘I have the honour of submitting for the consideration of the Linnean Society a circumstance respecting the genus *Monodon* of the seventh order of Mammalia of the Syst. Naturae of Linne, which was made known to me a short time since. In the last summer the Hull whaler William Torr, Capt. Dannell, was beset in the ice in the north seas for a considerable period during which situation she took a female of this genus with a tooth in the upper jaw, perfect, and in every respect like those of the males, though not so large. The sex of this animal was satisfactorily identified in cutting up, and by two foetus taken out of the body which are in my possession. Whether this single instance will be sufficiently contradictory of the opinion that females of this genus have no horn I must leave to the learned Society to determine; the fact, however, may be relied on as authentic’. The letter was read at the meeting of 20 November 1821 and a very brief summary of it appeared in the *Transactions* (13. 620).

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‘Tree and Leaf’: A Different Angle

By Peter J. James FLS

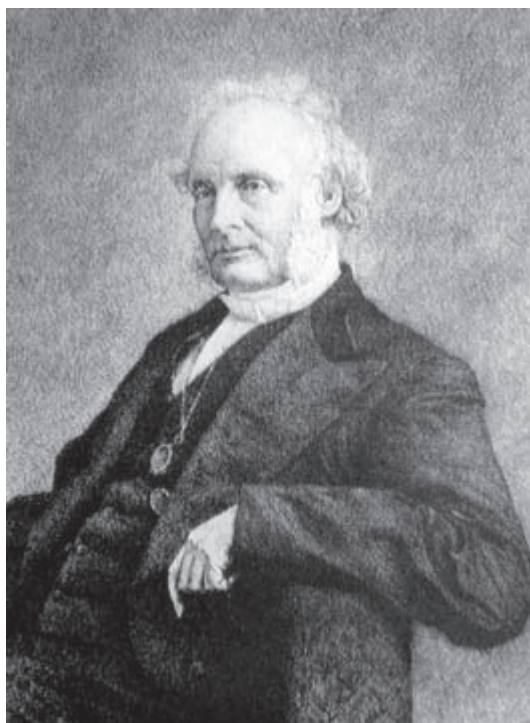
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Early Summer 1851. In a small Kentish village, a country gentleman was busy putting the finishing touches to his book on barnacles. On the Rio Negro another man was collecting butterflies. Carl Linnaeus would have fully understood and approved of the work of both men but the activities of the third would probably have pleased him even more.

The Rev. Dr. James M'Cosh (1811-1894), Minister of the Free Church of Scotland, was walking through the woods of N.E. Scotland brandishing an enlarged version of a crystallographer's goniometer with which he preceded to measure branching angles of trees and shrubs. The results of his measurements were to lead him to a remarkable theory, but the work of the barnacle and of the butterfly man has rendered M'Cosh's approach to nature historically invisible. In order to understand how the Darwin-Wallace paradigm shift eclipsed M'Cosh's work and why that work can now be re-examined, we must look briefly at the state of Natural History in the 1850s.

In the three decades between 1830 and 1860 there flourished a school of thought whose acolytes styled themselves ‘Philosophical Naturalists’ and whose stated aim was to discover the laws of organic nature equivalent to Newton's laws which governed the inorganic world. Since, in Aristotelean terms, they were concerned with ‘formal’ rather than with ‘final’ causes, they regarded as superficial the work of William Paley and the philosophy behind the Bridgewater Treatises, whose Natural Theological approach focused on final causation or teleology. This attempt to transcend mere empirical observation is reflected in their adopted label:- namely the ‘Transcendentalist’ approach.

The spirit of this ‘Transcendentalist’, Romantic or Idealist approach can be traced back to the *Naturphilosophie* of Immanuel Kant but, as Evelleen Richards astutely pointed out, the ‘... very ambiguity’ of *Naturphilosophie* ‘rendered its concepts malleable to the purposes of those who appropriated and employed them in nineteenth century biology’.



Portrait of Rev. Dr James M'Cosh

In its travels from Jena and Gottingen via Paris, London, Edinburgh and across the Atlantic to the states, *Naturphilosophie* underwent a great many changes but, soliton-like, two themes did survive. The first was the belief in ‘Unity of Type’ and the second was the value of interpreting sense data within a framework of *a priori* categories. Neither of these was welcomed into the mainstream of British Baconian empiricism. Indeed, within the spheres of Natural History and Medicine the clashes between the Natural Theologians and the Philosophical Naturalists were both fierce and acrimonious, often taking on political and institutional dimensions. James M’Cosh, however, perceived a route to reconciliation. As his biographer put it, he was destined to unwind ‘... recent Kantian threads off the old spindle of Scottish realistic philosophy’. By 1851 he felt able to state that ‘This controversy should now be regarded as settled in the discovery of both principles’ since both ‘...run through every part of the works of God’. This reconciliatory approach is reflected in the title of M’Cosh’s major work on natural history, co-authored by the underated George Dickie, *Typical Forms and Special Ends in Creation*, first published in 1855. Indeed, this title and the note, in Greek, at the bottom of the title page, *Typos and Telos*, ‘structure’ and ‘function’, say it all because one of the great difficulties with *Naturphilosophie* and its descendants was how to relate *a priori* categories to empirical observations. What possible guarantee was there that abstract mental constructs had the remotest connection with the real world? James M’Cosh knew of just such a guarantee.

Along with marine aquaria, ferneries, orchids and microscopes, the Victorian middle classes were devoted to their Euclid. Abstract constructs his axioms might have been but, nevertheless, they enabled the Empire to be mapped, the wheels of industry to turn and that epitome of geometry, the ‘bio-inspired’, (we would now say), Crystal Palace to be built. M’Cosh saw, in geometry, the prime tool for the analysis of organic form or, to use Goethe’s term, ‘morphology’. In fact M’Cosh was to adopt another of Goethe’s concepts, that of the ‘Urpflanze’ or plant ‘archetype’. The true origins of this concept he traces back to Linnaeus’ ‘Cortex-Medulla Theory’ as elaborated in his thesis *Prolepsis Plantarum* (1760). This theory was a much more dynamic view of the living plant than Linnaeus is often given credit for and upon which he based his *Materia Medica*. Although M’Cosh quotes Schleiden’s rather disparaging remarks on Linnaeus’ ideas as being ‘...taken from the most limited point possible, from the examination of a plant of our climate...’, Linnaeus himself would surely have approved of M’Cosh’s efforts to expand this philosophical approach. For M’Cosh, none of the historical precedents went far enough because he was looking for ... ‘a more enlarged conception of its [the plant’s] nature to a unity’ or a ‘Higher Teleology’. Again, geometry was M’Cosh’s analytical tool of choice. It was in his search for that ‘enlarged conception’ that James M’Cosh was measuring branching angles that Summer morning.

For him, the plant ‘consisted essentially of a stem, sending out other stems similar to itself at certain angles ... The whole tree with its branches thus comes to be of the same general form as every individual branch, and every branch with its branchlets comes to be the type of the whole plant in its skeleton and outline’. M’Cosh based his theory on the data collected from some 200 species of arborescent and it predicted ‘...a morphological analogy between the stems and ribs or veins of a leaf and in his first publication on this subject (*Bot. Gazette*, 1851) he presents a mass of what he

considers to be supporting evidence. In this M'Cosh does indeed go further than Goethe, who saw the plant body as essentially stem *and* leaf. Agnes Arber, in her classic study, *The Natural Philosophy of Plant Form* (1950), comments that the artificial distinction between stem and leaf '...was fostered, no doubt, by the observation of autumnal leaf-fall.' This echoes Schleiden's critique of Linnaeus. However, Arber, who is one of the few who seems to have read M'Cosh's work, sees his proposal as following in the steps of Nehemiah Grew (1672), Lorenz Oken (1810) and adumbrating her own 'Partial Shoot Theory'.

M'Cosh, however, saw himself as a pioneer moving towards a 'Higher Teleology' for the 'Vegetable Kingdom' which, if established would serve to unify botany just as Richard Owen's 'Archetype' had unified vertebrate Comparative Anatomy. While the vertebrate archetype could undergo a series of affine transformations, plants transformed themselves by iterative or modular growth. M'Cosh, however, saw far more than this. First, he asks us to view a deciduous tree in Winter, preferably by 'pale moonlight' and secondly to compare this image with that of the venation of its leaf. '...We may observe', says M'Cosh, '...the tree in its outline tends to assume the form of the leaf'. He lists and elaborates eight points by which this analogy could be definitively established. For him, however, the most telling argument is based on geometry and is the comparison between the angles which the branches make with the main stem and the angles between the midrib of the leaf and its secondary veins. Although M'Cosh attaches great importance to these quantitative arguments he also notes the fact that those trees with petiolate leaves have a tall, unbranched trunk with a crown of foliage whereas trees 'feathered from the base' bear sessile leaves. So M'Cosh shows, to his own satisfaction, a geometrical Q.E.D. which clearly demonstrates that '... the plant thus becomes a unity with innumerable interesting diversities'.

M'Cosh first presented his findings to the world of Natural History in the *Transactions of the Edinburgh Botanical Society* in 1851 and, later the same year, expanded his ideas into an all-embracing philosophy of nature as applied, not only to Linnaeus' three kingdoms and Cuvier's four Embranchments but also to the Scriptures. This work drew the approval of M'Cosh's fellow Free Churchman and renowned geologist, Hugh Miller. He, it was, who encouraged M'Cosh to produce the full-scale work, *Typical Forms*, already mentioned. In the Autumn of 1851 M'Cosh was appointed to the Chair of Logic and Metaphysics at the newly founded Queen's University, Belfast. It was here that he was to meet his co-author, the Professor of Natural History, George Dickie.

So far, M'Cosh had based his reasoning on plants with reticulated leaves, which the botanist, John Lindley, calls 'Exogens'. M'Cosh delivers his *coup de grace* argument, however, when he turns his attention to Lindley's 'Endogens' or what we would call, the monocotyledons: These plants, he says '...send off no branches, and the leaves of these plants have their veins parallel or nearly parallel to the stem, and have no ramified venation.' There are, however, exceptions: Lindley's 'Dictyogens', with which M'Cosh is able to prove his rule. Within the families Smilacaceae and the Dioscoraceae there are genera such as *Smilax* and *Tamus* which are perennial branching shrubs or climbers. They also, and this was, for M'Cosh, the *experimentum crucis*,

have reticulate leaf venation and a vascular tissue distribution similar to that of the Dicots. From this, M'Cosh argues that reticulate leaf venation and the arborescent habit are indissolubly linked and that the one is an iterative copy of the other. This 'curious circumstance', says M'Cosh is a 'confirmation of our theory'. Indeed, he claims that, '...throughout the Vegetable Kingdom the parts are similar to one another, and in nice accordance with the whole'. Here M'Cosh touches a nerve by clearly expressing a pre-Mandelbrotian definition of a 'Fractal'.

In the Autumn of 1852 the British Association for the Advancement of Science met, conveniently, in Belfast and M'Cosh presented a paper entitled *On the Morphological Analogy between the Disposition of the Branches of Exogenous plants and the Venation of their leaves*. Its reception was, predictably, mixed. Some were sceptical of M'Cosh's ideas. Others hailed them as a triumph of the a priori method while M'Cosh himself, said that his approach was rigorously Baconian!

All this and more was gathered together in the magisterial *Typical Forms*, which was, however, to be M'Cosh's 'Swan Song' in matters of Natural History because, during a visit to Berlin in the Summer of 1858, he discovered that much of his work had been anticipated by the German botanists, Alexander Braun, Karl Schimper and by no less a personage than the ageing and illustrious Alexander von Humboldt to whom M'Cosh presented a copy of *Typical Forms*. On discovering this loss of priority M'Cosh admitted to '...a slight mortification' and decided to devote '...less time to my botanical researches, as I knew that the interesting views which I had presented would be preserved'. They have indeed been preserved but *not* in M'Cosh's name.

Typical Forms went through two editions and eight printings, the last being as late as 1880. M'Cosh himself was appointed, in 1868, President of New Jersey College, now Princeton, and he left Europe and Natural History behind. He was to remain in America until his death in 1894 and, during this time, he returned to his first loves. Ethics and Moral Philosophy.

On June 17th, 1858, M'Cosh sat down to write to his wife about his meetings with the botanical luminaries in Berlin. The next day, June 18th, a letter arrived for the barnacle man from the butterfly man, now in Ternate. The rest is history. On the evening of July 1st the Darwin-Wallace paper was presented to the Linnean Society of London. 'The subject' said Huxley, 'was too novel and too ominous for the old school to enter the lists'. However, by the time Darwin's *Origin* was published, in the November of the next year, the battle lines had been drawn. The Paleyites naturally rejected any suggestion that the purpose-built organic world could have come about by chance. M'Cosh, however, from his perspective of a 'Higher Teleology' and, irrenicist that he was, embraced Darwin's 'Descent with Modification' but accepted that his own, and Dickie's, arguments, as presented in *Typical Forms*, had suffered as a result of the *Origin's* publication.

William Sloane, M'Cosh's biographer suggests that the reconciliation of Darwin and M'Cosh was not, in fact, difficult if *Typical Forms* were '... tranformed into types and phyla by heredity of our own day; and its Special Forms are very like Darwin's 'Survival of the Fittest', but giving prominence to the principle of design, which Darwin so carefully eliminated'. Despite this special pleading it was clear that once Darwin had redefined the archetype as a living, breathing ancestor, '... by a feat of legerdemain,

which seems to have passed unnoticed,' as Agnes Arber puts it, much of the analysis based on the pre-Darwinian archetype had lost its credibility. So, although M'Cosh's 'Higher Teleology' may now, to us, seem superannuated, the empirical observations on which it was founded can now be reworked within a new paradigm.

The seeds of a renaissance of the M'Coshian approach are contained in M'Cosh's own answer to a criticism of his work made by Prof. George Allman at the 1852 BAAS meeting. Allman pointed out that leaves and branches were '...altogether dissimilar organs;...' and therefore, the sort of analysis M'Cosh was advocating was quite meaningless. In fact, M'Cosh had addressed this very point in his 1851 paper. Branches, he said, extend from the axis in three dimensions whereas veins in a leaf extend from the midrib in only two. These extremes are, however, connected by the transitional condition in which branchlets '... often lie in one plane'. However, if the spaces between these planar branchlets become filled with parenchyma, then the tree and the leaf would become a morphological unity. Zimmermann's 'Telome Theory' of eighty years later, with its planation and webbing mechanisms to explain the evolution of the macrophyll, echoes M'Cosh's tree/leaf unity. It is now widely accepted that venation patterns are true reflections, when correctly interpreted, of the evolution of the leaf and that radiality and dorsiventrality are but extremes of a continuous spectrum. In fact, it is simply the timing of the KNOX gene expression!

In the last three decades there has been an explosion of interest in branching patterns in general and in tree architecture in particular. It is, perhaps, significant that Henry Horn, appropriately a Princeton Professor, entitled his 1971 work *The Adaptive Geometry of Trees*. In this Horn deals with the relationship between leaf distribution and crown architecture. The term 'Adaptive' echoes M'Cosh's 'Special Ends' while 'Geometry' reflects his use of 'Typical Forms'. 'Typos and Telos' again, but reversed to highlight the post-Darwinian emphasis. The geometry was, however, still that of Euclid, but things were about to change.

The change had begun during M'Cosh's early years at New Jersey College when a group of mathematicians in Continental Europe had begun to question some of the sacred axioms of Euclid. This questioning ultimately gave rise to the recognition of 'undifferentiable curves' which were the ancestors of Benoit Mandelbrot's 'Fractal Geometry' of the 1980's. Fractals, in the last twenty five years have transformed the way in which we look, at natural forms in general and organic forms in particular. It has allowed us to reinterpret branching patterns, both temporal and spatial, in a manner which allows us to quantify their self-similarity and thus to provide the rigorous analysis which M'Cosh was striving for but, lacking the appropriate geometry, was unable to achieve. With his recognition of iterative growth, however, he was closer than he knew.

Fractal trees, with their distinctly 'organic' appearance, can now be generated using a variety of algorithms. This, however, as Philip Ball has pointed out, '...raises a problem of another order altogether. A tree is a form with a purpose. How is it possible for a mathematical equation to generate an image of an organism which, in reality, is the result of evolutionary and developmental processes and, furthermore, demonstrates purposeful design and behaviour?' The 'Formal' versus 'Final' causation conflict again which M'Cosh thought he had solved!

The ‘Pandora’s Box’ of ‘Evo-Devo’ goes some way to providing a neo-M’Coshian approach to an answer. ‘Special Ends’ or adaptations have been relegated to the ‘Spandrels of San Marco’ and ‘Typical Forms’ have become the ‘Genetic Tool Kit’ in the form of genetic switches and regulatory networks. These chemical ‘algorithms’ have provided the mechanism which underlies Henri Milne-Edward’s observation, as quoted by Darwin, ‘...nature is prodigal in variety, but niggard in innovation’. All this has even had an impact on historiography; Ron Amundson, in his ‘Changing Role of the Embryo in Evolutionary Thought; Roots of Evo-Devo’, persuades us that we should abandon what he calls ‘Synthesis Historiography’ in order to gain a better understanding of pre-Darwinian biology which was ‘... not antiscientific or mystical’. Fractal geometry and genetic switches seem to provide a key to a more sympathetic revaluation of M’Cosh’s work within this context and, as the late Fritz Rehbock put it, establish a ‘new *Naturphilosophie* for the twenty first century’.

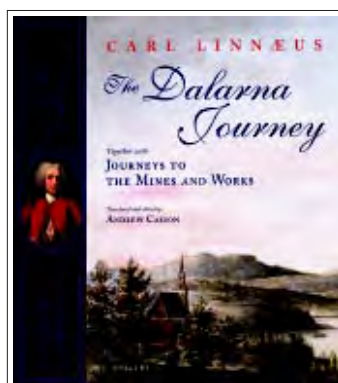
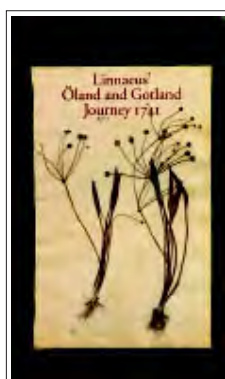
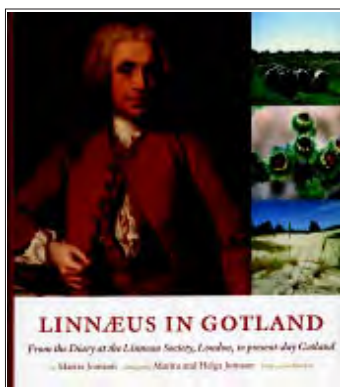
Ian Stewart, in his contribution to *The Colours of Infinity*, states that, ‘The leaves and branches of trees are fractal, and this may be why they make better barriers to the wind than a simple flat fence’. These words would surely have put a spring into the steps of the Rev. Dr. James M’Cosh as he walked through that ‘Fractal’ forest that Summer morning to his ‘... parish work, and addressed the people with additional zest from having such proofs of the order of the works of the God I served’

This study is dedicated to the memory of Fritz Rehbock who first encouraged me to seek acquaintance with the Rev. Dr. James M’Cosh.

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**Two Naturalists in Africa:
Sheffield Airey Neave (1879-1961) and
James Jenkins Simpson (1881-1937)
with particular reference to their work on
insects and ticks from 1910 to 1915**

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Introduction

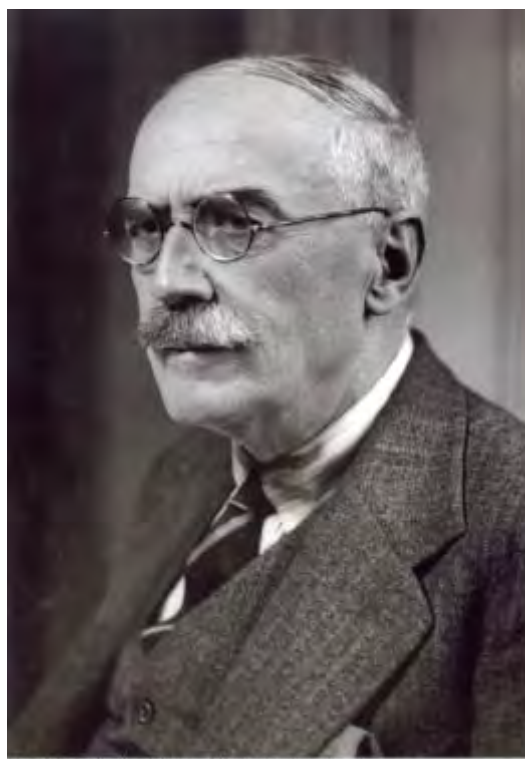
Towards the end of the nineteenth century, a different kind of biologist was emerging in Britain, in many ways unlike the amateur naturalist who had been the tradition in this country. This new breed was university trained and taught by the increasing number of scientists being employed by universities. This professionalization or, as Allen (1998) prefers to refer to it, “academicization” of science, produced an increasing number of graduates trained for careers in specialist fields. Although opportunities were limited some careers were developing abroad, especially in the Colonies. The role of arthropods in the transmission of disease was confirmed and opportunities in this area were developing. In the case of Neave and Simpson, the subjects of this study, both had specialized in zoology.

The Naturalists

Sheffield Airey Neave was born on the 20 April 1879, the son of Sheffield H. M. Neave and grandson of Sheffield Neave, a Governor of the Bank of England (Hall, 1966). After Eton (1892-1898) he entered at Magdalen College, Oxford in 1898, was in the University Athletics team and obtained a Third in Natural Sciences (personal communication Robin Darwall-Smith). In 1918 Neave was awarded the degree of DSc by his university.

Prior to his work for the Entomological Research Committee, Neave had collected and published (Neave 1907, 1910a) work on African vertebrates and invertebrates (and especially butterflies) from three expeditions he made to Rhodesia and the Congo Free State between 1904 and 1908. He was the naturalist to the Geodectic survey of Northern Eastern Rhodesia (1904-1906). Following this, in 1907, he was entomologist to the Katanga Medical Commission (Anon, 1961-1970) in the Katanga region of the Congo Free State. He returned for a third expedition in 1908. Records indicate that Neave made collections of ticks in North-East Rhodesia (Zambia) (Kierans, 1985) and reported on the butterflies of Northern Rhodesia (Neave, 1910a). He travelled, often accompanied by some 50 or more local Africans, and wrote how preserving

Portrait of Sheffield Airey Neave
(by kind permission of the National
Portrait Gallery).



arthropods differed from similar work in temperate climates.

Neave's early travels in Africa resulted in collections of insects, molluscs, fish, amphibians, reptiles, birds and mammals most, if not all, subsequently identified and reported either by him or by other specialists. Several of the animals were new to science and bear his name. "He published at least five frequently cited papers on African butterflies between 1903 and 1912 and made two large collections, from Lake Victoria (Uganda) and Northern Rhodesia/Nyasaland (now Zambia/Malawi) respectively. Some of his collections are in the Hope Department at Oxford" (personal communication David Smith).

The results of more than four years travel on the Congo-Zambesi watershed was read at the Royal Geographical Society in London in November 1909 and later published (Neave, 1910b), where he attempted to show how the watershed influenced the distribution of the animals and plants found. At this stage in his career he was clearly a naturalist with broad interests. He also wrote about his travels in the Luangwa Valley, in the North-Eastern region of Rhodesia (Neave, 1910-1911, BER 1:303-317).

James Jenkins Simpson, was born on the 24th November 1881, the son of an Elgin gardener. Educated in Elgin West End School (note 1), he became a pupil teacher there for four years and was briefly a student at the Aberdeen Free Church Training College (note 2). He graduated MA from Aberdeen University in 1904 taking the customary broad range of subjects including botany, chemistry, mathematics, latin, logic and natural philosophy (note 3). In 1906 he achieved a BSc, with special distinction in chemistry and zoology (note 4) and the Nicol Prize for a collection of marine animals (note 5). From this time, Simpson was a Carnegie Research Scholar and Fellow at Aberdeen; he was later awarded the degree of DSc by Aberdeen University.

Simpson's career began in 1906, with his appointment by the Indian Government (HM India Office) to investigate the Pearl Oyster Fisheries of the Mergui Archipelago of Southern Burma and the Moskos islands (Simpson and Rudmose Brown, 1911). He then undertook work in Portuguese East Africa for the Nyassa Company reporting on the condition of the pearl oyster fisheries and on marine economic products (Rudmose Brown and Simpson, 1907 and Simpson, 1908). Several of his early publications were

on soft corals and starfish (Thomson, Henderson, Ritchie, and Simpson, 1907, Thomson, Henderson and Simpson, 1906-1909, Thomson, Simpson and Henderson 1909 and Simpson and Rudmose Brown, 1910). His head of department at Aberdeen, Thomson, with whom he worked and had early joint publications, was described in the following way, "Sir Arthur Thomson will be remembered as one of the great naturalists of the... twentieth century. The titles of many of his works were household words, as were those in collaboration with that other remarkable man, Sir Patrick Geddes" (Wightman, 1963).

The Entomological Research Committee (Tropical Africa)

Entomology brought their careers together. In 1909 both men were appointed by the Colonial Office to the Entomological Research Committee (Tropical Africa) to carry out work relating to the role of insects and ticks in the transmission of disease. By the time the Entomological Research Committee was established, several arthropod borne diseases of man and his domesticated animals were already known. Indeed it was stated that, "the cause of the almost complete closure of Africa...until quite recent times...has been the existence of disease-and death-carrying insects and ticks" (Shipley, 1910-1911, BER foreword 1:1-6).

The collection, identification and documentation of insects and ticks had become an important issue. The discovery of the role of arthropods in the transmission of disease created enormous interest generally and at the British Colonial Office in particular. It became obvious to government that one of the major obstacles to the colonisation and development of the tropics, especially Africa, was the disease carrying properties of these arthropods. Interest in the potential of the African colonies as new markets for trade and as a source of raw materials as well as the health care of colonial officials and growing international competition, meant that action had to be taken. As Warboys (1983) has expressed it "economic interest coincided with the success of germ theory generally, and specifically with the major diseases of the tropics" and the recent discoveries made was "a means of promoting imperial policy". The concerns were not just the health of the white man in the tropics but also the profits which could be made in Africa if such diseases could be eliminated.

Both men had by then proven practical experience of zoological work in Africa, had what could be described as an 'adventurous spirit' and although young, had established themselves in zoological research. The Committee sent them to Africa, just prior to the First World War, to make extensive collections of insects and ticks and carry out biological observations in the field. They were expected also to identify other people, locally based, who might continue the same work when they had returned to Britain. These in the main were resident medical officers, scientists and colonial administrators who were encouraged to make collections and observations of their own.

As a result of an informal meeting of zoologists in London on the 26th March 1909, the Entomological Research Committee (Tropical Africa) was formally established in June of that year. Arthur Shipley (note 6) had prepared a paper giving some idea of the scope of the intended work and what was hoped would be achieved for the development of research on insects and ticks in the British colonies and

Protectorates in East and West Africa. The committee thus began “the first systematic collection and study of insects and other arthropods injurious to man, animals, and crops in Africa” (Keirans, 1985). The formation of the committee was widely reported in, for example, *The British Medical Journal* (Anon, 1909a) and *Nature* (Anon, 1909b).

Not everyone at the Colonial Office fully understood what was expected of them, especially an untrained and unsuspecting junior administrator, as Parkinson (1947) describes “After a month or so in the Colonial Office, I was told by my principal clerk that I was to be secretary to a newly created committee on entomological research. At first, I felt sure this was a mistake for etymological research, as etymology seemed much more suitable a subject for a “classic” than insects about which I knew nothing at all. But no: entomology it was ...”

The scientific secretary of the committee was to be G.A.K. Marshall (note 7), who later became Director of the Bureau. Prior to his appointment it was stated that “We do not want...any elaborate expensive scheme to start with. As a beginning, all we want is one table, one chair and one good man” (Parkinson, 1947).

The work of the two travelling Naturalists

The objects of the Committee as stated were, “to stimulate an interest in the study and observation of insects in general, and of noxious insects in particular, throughout the colonies, and thus gradually to organise a band of collectors and observers who will accumulate the information needed to enable the various administrations to cope with the numerous insect pests which cause disease and death amongst human beings and animals, and devastate the crops” (Anon 1912, ERC report correspondence Cd.6429). The first report noted that “The Committee has been fortunate in securing the services of two well-known and experienced entomologists, Mr S.A. Neave and Mr J.J. Simpson” (Shipley, 1910-1911, BER foreword 1:1-6) to be known as “Travelling entomologists” (Anonymous 1913, ERC report Cd. 7050-22 and Anonymous 1915, Imperial Bureau of Entomology No. 834 Cd. 7622-25).

As Simpson (1911-1912b, BER 2:301-356) later pointed out “Prior to the formation of the Entomological Research Committee... very few specimens and only isolated records reached England from the various African Colonies but since that time numerous officials ...have made systematic surveys”.

Neave was sent to East Africa and Simpson to West Africa. Their main work was to collect but not to identify the arthropods although limited work on life histories was sometimes carried out. This work was done at home by specialists in the various groups, for example Austen (1910-1911, BER 1: 275-290) on Tabanid flies. Neave later published notes on the life-histories of some members of this family (Neave, 1914-1915, BER 5:287-320). Large collections of African ticks were named at Cambridge by Nuttall (note 8) and Warburton (note 9) both of whom were members of the Committee. These two workers, published widely on ticks during the period under consideration and many of these ticks were African species (Nuttall, 1905; Nuttall, Warburton, Cooper and Robinson, 1908; Nuttall and Warburton, 1911; Warburton, 1912 and Nuttall and Warburton, 1915).

Neave and Simpson collected blood sucking Diptera, including mosquitoes, Tsetse flies and Tabanids, bed-bugs, fleas and lice as well as ticks. In addition to their

collecting, they were to study the habits, habitats and life histories (for example Neave (1914-1915, BER 5: 287-320) but the work was not always completed because of time constraints. They were also instructed to find officials or other residents who would be interested and willing to collect and record, and to supply them with the necessary apparatus for the work.

By 1912, Neave had completed a preliminary survey of the East African Protectorates, Nyasaland, Uganda, parts of North-East Rhodesia and German East Africa. Neave travelled using native porters and found native collectors invaluable, especially boys aged between 12 and 15. He operated a payment by results method, with additional pay for special insects, later writing that, "The secret of successful insect collecting in Africa lies largely in the careful organization of equipment and native assistants" (Neave 1912, BER 3: 275-323). By studying the records of their collecting sites, it is possible to follow the journeys made by Neave and Simpson in some detail.

Simpson spent two tours in West Africa. In a lecture after his return, Simpson described the reaction, from those who knew him, on hearing he had been posted there, "West Africa: the white man's grave! You cannot go there" he had been told. According to Simpson the country had an evil reputation, "synonymous with the last resort of the impecunious, the stranded and hopelessly depraved. It had been said that there were three officials for every post in West Africa – one dead, one dying, and one going out" (Simpson, 1912-1916).

His first tour was to Nigeria in 1910 where he spent the first seven months of that year, and to the Gambia. The second visit was to the Gold Coast and Sierra Leone. Simpson believed that it was important to educate 'the natives' in the connection between insects and disease so that the number of insects could be reduced, with a consequent benefit to themselves and to their herds. In addition to collecting, Simpson made geographical surveys but time limits prevented experimental work or studies on life histories.

The importance and success of this work depended upon careful collecting together with painstaking observation and recording. Neave later wrote, "If entomological workers are to be of the greatest possible assistance to medical science, it is their duty to collect all available data about all blood sucking organisms" (Neave, 1912, BER 3: 275-323).

The publications of the Committee

A pamphlet on "Instructions to Collectors" (Anon, 1909, pamphlet ERC) prepared by the Committee was issued by the Colonial Office in 1909 and amended and updated by Simpson (1911-1912a, BER 2:187-239) two years later. Intended mainly for locally based people with little or no experience of such work, it deals with information about killing, preserving, labelling, packing and collecting the various groups of insects and ticks. Referring to ticks for example, the emphasis is laid on collecting "a liberal supply" of all sizes, searching for males, careful removal in order not to damage the mouthparts as "headless examples are useless for study" and "care must be taken not to mix the parasites of different animals (eg. sheep and cattle) ... from the same place" (Simpson, 1911-1912a, BER 2:187-239). The appendix also deals with the habitats

and behaviour of ticks. Neave and Simpson provided the collecting equipment and instructions and of course collected themselves, but it was the residents who were left to work out the life-histories.

The *Bulletin of Entomological Research*, issued by the Committee, began in 1910 and was followed in 1913 by the *Review of Applied Entomology* which was issued in two parts, one dealing with agricultural entomology and the other with medical and veterinary entomology. The Bureau also took over the work of preparing the Insect Section of the *Zoological Record*.

The initial survey carried out by the “Travelling entomologists” was regarded as a success and the Committee were “more than satisfied with the results so far achieved” (Anon, 1912, ERC Cd. 6429). By 1914 over 100,000 specimens had been collected “containing much material which is new to science and examples of species which previously were not represented in any collection in this country” (Anon, 1912, ERC Cd. 6429). An indication of the total mass of arthropod material that had arrived from Africa was recorded in the year 1913-1914 when it was reported that 256 separate consignments had been received from 75 African contributors, made up of a total (from all countries) of 109,000 arthropods of which 4265 had been identified. (note 10).

Later careers

In 1913 Neave was appointed Assistant Director of the Bureau of Entomology and Simpson was later “invalided home, and is now recuperating in this country” (Anonymous, 1915, Imperial Bureau of Entomology No. 834 Cd. 7622-25). Thus the work of the first two “Travelling Entomologists” (Anonymous, 1915, Imperial Bureau of Entomology No. 834 Cd. 7622-25) came to an end. Neave moved into scientific administration and Simpson became Acting Director of the Entomological Research Committee at the British Museum (Natural History) before moving to museum work at Cardiff then Liverpool.

Neave was not only a very successful field naturalist (note 11) but also an extremely able administrator (note 12). He was appointed Assistant Director of the Imperial Bureau (later Institute and then Commonwealth Institute) of Entomology in 1914 and served until 1941, succeeding Guy Marshall as Director in 1942 and retiring in 1946. He was President and Special Life Fellow of the Royal Entomological Society of London, giving his Presidential addresses in 1935 and 1936, the latter on the relations between mankind and the insect world, and wrote their Centenary History (Neave, 1933). He was also Honorary Secretary of the Zoological Society (1942-1952) He died at Chelmsford, Essex on December 31st 1961 at the age of 82. (Anonymous, 1962).

During the First World War Simpson joined the West African Frontier Force to work on tropical diseases and their carriers. He was appointed Keeper of the Department of Zoology, National Museum of Wales in 1919. In 1926 he became Curator (Director) of the Public Museums of Liverpool but resigned from this post two years later, on the grounds of ill health. His final museum post was in Turkey where he went to organise the Department of Ocenography and Marine Biological Research, in order to help advance the fishing industry in that country. His death at the age of fifty five, took

place in unusual circumstances. While travelling from Greece, he was reported as missing from the ship Kyrenia and presumed drowned. (Anonymous, 1936a, b, and 1937).

The two travelling naturalists were adventurous, scholarly men whose contributions were important and accomplished well.

Achievements of the Committee and Conclusions

The aim of the Committee was to make as complete a study as possible of the insects and ticks involved in the transmission of disease to man, other animals and crops in tropical Africa and this was achieved. An enormous amount of work both in Africa and in Britain took place over a short period of time, involving the collection, documentation, identification, geographical surveys, the study of habits and habitats and the disease implications of an enormous array of arthropods. Resident officials became involved and were taught how to collect and preserve arthropods of medical and veterinary importance and many people in the British parts of tropical Africa became involved in obtaining information about these arthropods.

Collections for educational purposes were made available to universities and provincial museums in England. In the case of provincial museums, Birmingham, Leicester and Warrington initially received collections. Further collections were later sent to the Birmingham Natural History and Philosophical Society and to Bedford College for Women, London University (now Royal Holloway).

Carnegie Studentships were established specifically to work on insects of economic importance and the Imperial Bureau of Entomology, the successor of the Entomological Research Committee, covered a wider remit throughout the Empire, as Imperial conferences were held for entomologists from the Empire.

Apart from the field-work of these naturalists, perhaps the most important and lasting legacy was in the area of publication. The *Bulletin of Entomological Research* and the *Review of Applied Entomology* which arose directly from the work of the Entomological Research Committee, have continued to give summaries of the current literature available as well as to publish relevant work in these fields.

Acknowledgements

Librarians and archivists at the Universities of Aberdeen, and Leeds: Magdalen College, Oxford; Elgin and Central Reference Library, Aberdeen; The Grampian Education Archives; museums at Cardiff, Liverpool and Eton College. The following individuals also helped us; George Fussey, Penny Hatfield, Michael Palmer, Don Macfarlane, Nora Macmillan, Callum Smith-Burnett, David Smith.

Notes

1. Death of Dr J.J. Simpson. 4th December 1936, reported in the *Elgin Courant*, Elgin Library, Scotland.
2. Records of Aberdeen Free Church Training College 1901-1903. Northern College of Education, Aberdeen Archives.
3. Aberdeen University Calendars 1904-1905.
4. Record of the Arts Classes 1901-1905. Aberdeen University, 1951.

5. Aberdeen University Calendar 1905-1906. The Nicol Prize was established by J.W.H. Trail in memory of an earlier Aberdeen scientist, James Nicol. Nicol was Professor of Natural History and Geology from 1853 to 1878.
6. Arthur Shipley, one of the driving forces behind the formation of the Committee, served as a member and wrote, in the new journal, *Bulletin of Entomological Research*. Sir Arthur Everett Shipley (1861-1927). see *Oxford Dictionary of National Biography* (2004) 50 356-367.
7. Sir Guy Anstruther Knox Marshall (1871-1959). *Nature* 183: May 16, 1959, 1364.
8. George Henry Falkiner Nuttall (1862-1937) Obituary Notices of Fellows of the Royal Society 1936-1938: 493-499.
9. Obituary of Cecil Warburton (1854-1958). *Nature* 182:1771.
10. Report on the Imperial Entomological Conference. June 1920 [Cmd.835] Table 1, page 16.
11. *The Times*, London 6th January 1962. Francis Hemming.
12. *The Times*, London 8th January 1962. Lord Zuckerman.

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Note The publications of both men in Africa and the Entomological Research Committee are mainly in two journals and these have been cited in the text as, BER *Bulletin of Entomological Research* and ERC *Entomological Research Committee*.

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Forgotten Papers

In 1966, Dr. Stanfield Rogers published in *Nature* (212, 1220-1222) a paper entitled Shope Papilloma Virus: A Passenger in Man and its Significance to the Potential Control of the Host Genome. In essence what Rogers and his colleagues had established was that, of a group of 22 people who had worked with the Shope papilloma virus (SPY: a tumour virus in rabbits), 11 possessed abnormally low levels of arginine in the blood stream caused by an arginase which was elaborated from the virus genome. Some of those investigated had been working with the virus for over 30 years; all were in good health.

Non-viral arginase is distinguished from the viral enzyme in a number of ways, both immunologically and biochemically. The viral enzyme has a high level of helical structure and does not require divalent ions (manganese).

Non-viral arginase is a constituent of the Krebs urea cycle, the earliest biochemical cycle to be discovered way back in 1932. The urea cycle is responsible for getting rid of excess nitrogen from the body as urea (insoluble uric acid in birds). Marine and freshwater vertebrates and insects are more varied in their disposal of surplus nitrogen. In brief, ammonia, carbon dioxide and an amino acid called ornithine combine to form arginine, which under the influence of arginase disproportionates to ornithine and urea. Four other enzymes are involved in the cycle; inborn errors of metabolism have been described for all five enzymes, but generally the defect is one of degree – some enzyme activity persists, which enables physicians to treat the high level of ammonia in the blood stream by reducing protein in the diet to the bare minimum compatible with survival and growth.

Nevertheless children are born with a complete absence of arginase, giving rise to severe argininaemia (high level of blood arginine). Such children do not long survive, dying of ammonia toxicity to the central nervous system and other problems. Around 1970 a baby with a complete absence of arginase was born in a New York hospital. Its future was grim; the physicians were, however, aware of the work on the arginase of SPY and the child was given an injection of the purified virus. Sadly, it did not survive and the outcome of the experiment is nowhere recorded, although Rogers is in the Internet record in 1970 for an oral comment, also unrecorded. He and colleagues showed subsequently (1973) correction of the defect in arginaemic cell cultures by SPY. It is interesting to contemplate what might have happened had this early attempt at human genetic modification been successful. One suspects it might have spared humanity a lot of emotional baggage at the present time.

ROGERS S., LOWENTHAL A., TERHEGGEN H.G., COLUMBO J.P., 1973. Induction of arginase activity with the Shope papilloma virus in tissue culture cells from an argininemic patient. *Exp. Med.* 137: 1091-1096.

JOHN MARSDEN

The Linnean Society

Programme

22 Jan*	Thurs. 6:00pm	TEA: THE DRINK THAT CHANGED THE WORLD John Griffiths FLS	Evening Meeting
12 Feb	Thurs. 4:30pm	PRESENTATION OF THE DARWIN-WALLACE MEDALS Medal Presentation and Reception: Fellows only; tickets required.	
19 Feb	Thurs. 6:00pm	DECLINING BEE POPULATIONS – WHAT ARE THE CAUSES? Norman Carreck	Evening Meeting
3 Mar	Tues. 6:00pm	LAUNCH OF ‘LETTERS TO LINNAEUS’ Sandra Knapp FLS	Evening Book Launch and Reception
19 Mar	Thurs. 6:00pm	DARWIN’S ‘SACRED CAUSE’ James Moore FLS	Evening Meeting
16 Apr	Thurs. 6:00pm	SECOND ANNUAL BIODIVERSITY POLICY LECTURE John Beddington	Evening Meeting Tickets required
14 May	Thurs.	THE FUTURE OF PLANT GENETIC RESOURCES †Sandra Knapp FLS	Day Meeting in Honour of Jack Hawkes
21 May*	Thurs.	ANNIVERSARY MEETING David Cutler PLS	Afternoon Meeting
18 June	Thurs 6:00pm	FORENSIC ECOLOGY – ITS CONTRIBUTION TO CRIMINAL INVESTIGATION Patricia Wiltshire FLS	Evening Meeting
25-26 June	Thurs. – Fri.	BIODIVERSITY, INFECTION AND GLOBAL HEALTH: FUTURE TRENDS AND POLICY RELEVANCE †Vaughan Southgate FLS and David Molyneux Joint two day meeting with the RSTMH	
9 July	Thurs.	CONVERSAZIONE	
17 Sept.	Thurs. 6:00pm	THE “IRRITABLE POWER” OF CARNIVOROUS PLANTS: MARY TREAT, CHARLES DARWIN, AND THE LANGUAGE OF FLOWERS Dawn Sanders FLS and Tina Gianquitto	Evening Meeting

† organiser

* Election of new Fellows

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

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