
THE LINNEAN

Newsletter and Proceedings of the Linnean Society of London

Edited by B. G. Gardiner

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Editorial

This issue of *The Linnean* includes an article tracing the impact that Sir Richard Owen had on vertebrate palaeontology and comparative anatomy. It was written to celebrate the 150th anniversary of the naming of the Dinosauria.

Owen was the first Director (then called Superintendent) of the Natural History Museum when it moved to its present site in South Kensington. The tradition he started has been carried on by a long line of successors in the

Museum including: J. E. Gray, A. C. L. G. Günther, R. Bowdler Sharpe, G. A. Boulenger, W. H. Fowler, M. R. Oldfield Thomas, R. Lyddeker, A. Smith Woodward, C. W. Andrews, S. F. Harmer, H. W. Parker, D. W. Snow, M. A. C. Hinton, F. C. Fraser and T. C. S. Morrison-Scott.

This long history of enquiry into species identification, comparative anatomy and interrelationships of the higher tetrapods may seem arcane or anachronistic. Universities may have moved on to questions of extinction patterns, to biogeographic distribution, ecological relationships, pest control etc. And now the Natural History Museum, as a response to decreased government funding, has moved to plan its research under fashionable catch phrases (Corporate Plan 1990–95:— Biodiversity, Environmental Quality, Living Resources, Mineral Resources, Human Health, Human Origins). This plan also includes closing down certain areas of research — ironically one of these areas is non-primate Mammals (both fossil and Recent), while all other research is to be separated from curation with the introduction of collection managers who will not be specialists in the things they are looking after. New developments are fine but they must not endanger the Museum's chief strength — its international reputation in systematics and taxonomy. This reputation has been founded on collection-based research, undertaken by experienced Museum staff familiar with the specimens in their care. The world's most important collection, so carefully built by Owen and his dedicated successors, and the taxonomic research based upon them, provide the raw data on which process-orientated work is conducted. Systematic research is fundamental for analysing competing theories of biotic history.

We can only hope that increased government funding and a sense of importance and value for the Museum's collection and staff will prevent the precipitous decline of this unique institute, and that Richard Owen can continue to command proudly the stairway in the famous central hall.*

In this issue the controversy concerning the so-called Hardy-Weinberg equilibrium continues with the suggestion that selection may indeed be intermittent, but don't blink or you may miss it! We also have a biological crossword compiled by one of our new members.

* See STOP PRESS.

SOCIETY NEWS

Notes

Recent visitors to the Society's rooms will have rejoiced to see that the scaffolding which has disfigured Burlington House has been removed. The Society did not emerge unscathed from the experience; in December over £10 000 worth of damage was done to books in the Library, with associated damage to bookcases and the Meeting Room ceiling. Insurers have agreed to pay for the damage.

The pigeons have also moved on. Perhaps that is not the right word, since there is evidence that some have been eaten by rats, which have made an unwelcome appearance in the courtyard. In another place this problem was

solved by importing more rats, and it has to be said that it worked like a charm. Doubtless members will have an ecological explanation for this. The prevailing attitude amongst the mainly physical scientists who occupy the rest of the courtyard buildings was that any rat was one too many and as a result poison has been set for the rodents, even though most London rats are believed to be immune to it ('superrats'). Concern over the issue has led to the appearance in the courtyard of 'Eurobins' for refuse disposal, and a sharp rejoinder to anyone feeding the pigeons.

Mrs Shirley Theobald left the Society in March after six and a half years service as housekeeper. She has been replaced by Mrs Ekaterina Dimitrova, who will also act as Library Assistant. Cleaning of the Society's rooms has been put out to a commercial firm. Mrs Norma Leslie left in January, to keep bees in Guernsey and has been succeeded by Miss Marquita Baird, who has responsibility for meetings, room bookings and book sales. To past and newly appointed staff go our best wishes for their futures.

One Fellow has remarked that the office will shortly house only equipment with no room for human occupants. By equipment, we believe he means a fax machine, which doubles as an answerphone (071 287 9364), and a coffee machine. Nothing like the comforts of home! On the issue of telephonic communication, please note the new telephone number of the Society is 071 434 4479.

Grants

The Society's grants were advertised in February in *Nature*. This has led to a sharp increase in applications, and full details of successful grants will be published in the next issue of *The Linnean*. Members are asked to note that those not in full-time employment as biologists are entitled to apply for grants from the Appleyard Fund, the closing date for which is March 1991. The panel dealing with the Jill Smythies Prize for botanical artistry has asked that completed applications should be received by 30 September 1990 (not 31 December as advertised) to enable proper selection to be made. Finally we are indebted to Mr Roger Goodenough, F.L.S. for his continuing generosity to the Goodenough Fund with another donation of £200. The Society has received another £8000 from the estate of Professor Irene Manton.

The Gaia Debate

On Thursday, 15 December 1989, the Society debated the proposition that "the physical and chemical condition of the surface of the Earth, of the atmosphere and of the oceans is made fit by the presence of life itself, in contrast to the conventional wisdom that life adapted to planetary conditions". This is the Gaia hypothesis, and the Society was fortunate in having Professor James Lovelock, F.R.S. and Dr Andrew Watson proposing the motion, with Professor Brian Clarke, F.R.S. and Dr Ian Woodward opposing it. The Chairman, Professor Charnock, F.R.S. opened the proceedings with the mythological basis of Gaia, an ancient deity (the offspring of Chaos—Ed.) and closed them by saying that he did not think it was possible for anyone to sum up the debate. So where did the debate lead?

The proponents of the hypothesis cited a number of features of the Earth's surface which suggest that life has played a major part in the development of the

environment. The atmosphere is not in chemical equilibrium; its major gaseous components, nitrogen, oxygen, methane and carbon dioxide can all be derived from biological sources. The substantial contribution of microorganisms to the weathering of rocks is now well recognized. The extensive nature of life, both in terms of biomass and species, gives it a potential for environmental change. These are not now matters of great dispute. The debate centres on whether the biota are coupled to environmental changes, in other words feedback between the two. The need to explore such a coupling arises from the fact that the Earth's surface receives 25% more solar radiation than it did when life first evolved 3.5 billion years ago, yet the surface temperature has remained remarkably stable in that period. The level of oxygen, at 21%, has remained sensibly constant for 200 million years. Are these features the result of feedback between the biota and environment? Proponents of the Gaia hypothesis suggest they are. Biological sequestration of methane and carbon dioxide might invert any greenhouse effect, whilst photosynthesis and respiration could stabilize oxygen levels. That the biota should act in this way does not vitiate Darwinian evolutionary theory, merely adding an additional constraint to the struggle for survival. There is no need to postulate a driving force or purpose behind life for this to happen.

The hypothesis leads to certain predictions which are capable, though not readily, of being verified. The earliest of these was that there is no life on Mars, since its atmosphere is near to chemical equilibrium. This prediction, made in the 1960s, was verified by the Viking Lander in the 1970s. Secondly, the nature of feedback systems is such that, if sufficiently disturbed, they move rapidly to a new equilibrium; this must have happened when oxygen appeared in the atmosphere, and new species arose to utilize it. Evolutionary history is seen as long periods of homeostasis punctuated by sudden simultaneous changes in organisms and the environment, for which there is now strong evidence from the fossil record. Catastrophic changes may eliminate life itself, as may have happened on Mars, as a result of planetesmal collision. Thirdly, the weathering of rocks leads to carbon dioxide formation; the uptake of this by the biota will dampen any possible greenhouse effect. Finally, to support life on land there must have been some transfer of iodine and sulphur from the oceans to land, and marine organisms have been shown to do this through the biological production of volatile methyl iodine and dimethyl sulphide.

The hypothesis has a number of attractions. Taking a global ('top down') view of the biosphere allows the development of mathematical expressions and models to which control theory can be applied to examine the feedback and its predicted effects. The hypothesis also emphasizes the dangers of the current man-driven changes to the atmosphere, which may precipitate a sudden catastrophic change in the biosphere.

A simple model of the hypothesis is 'Daisyworld', an imaginary planet populated by two sorts of daisies, light and dark. The proportions of the two forms determines the reflectance of the planet's surface and act as a biological thermostat.

Proponents of Gaia felt that in this area reductionist biology had rendered a disservice to science as a whole. 'Bottom up' approaches to ecology, based on combinations of species, were limited in scope and did not lead to stable mathematical models.

Opponents of the hypothesis pointed firstly at the implied purpose inherent in

the idea, which was not a proper matter for scientific debate. There is no evidence that natural selection has this greater purpose driving it, even partially, nor that it can exercise the kind of foresight implied. What is the mechanism of this additional constraint on evolution? Where is it? Even without this, life is not good at reproducing itself — there are sufficient mistakes to allow for evolution, but insufficient to do away with inheritance. It is hard to see how a grander design could be accommodated. Models, such as Daisyworld, are common in ecological genetics, but they do not predict a single stable equilibrium, nor are the equilibria predicted necessarily consistent with the survival of species. Existing ecological theory was sufficient to account for the diversity and quantity of the biota and the Gaia hypothesis, whilst generating welcome interest beyond the scientific community in ecological matters was neither necessary or desirable.

In seeking to examine the predictive value of the hypothesis, it is possible to reconstruct both the climate and details of the biosphere over periods as short as 18 000 years and as long as 130 000 years. Because of changes in the Earth's attitude to the sun within these periods, hemispheric changes in temperature have taken place such that 18 000 years ago the Northern Hemisphere was 2°C colder and 130 000 years ago it was 2°C warmer. At neither period was there evidence of substantial changes in oceanic or terrestrial biota. If it was argued that the temperature changes were so small as to be within the noise of the biological control system, when did Gaia operate?

Contributions from the floor divided into those for whom the hypothesis had provided a welcome interest in current environmental problems and those who sought evidence for the existence of the biological control mechanism. Which species might be expected to show it most? What of purely physical phenomena in controlling climate, clouds, for example, or ocean currents. Neither of these could, it seemed, offer an explanation for the 300-fold reduction in atmospheric carbon dioxide since life began, nor the relatively constant surface temperature in the face of a 25% increase in solar radiation.

Clearly there must have been a time, when life was beginning, without Gaia. But evidence suggests that living organisms rapidly spread and increased in number, itself a precondition for a suitably massive response to changes in solar radiation. The question remains whether there was such a response by the biota to this and other changes. There is but one planet where this hypothesis can be tested, with all the statistical hazards that that implies. Perhaps Mars will provide the answer. Conditions suitable for life once existed on that planet, and life might have evolved, only to perish in some catastrophe. Fossil evidence from Mars might just establish this, and the truth of the proposition.

Kimberley

The Kimberley Expedition which formed part of the Bicentennial has led to a videorecording of 69 minutes length, which will, hopefully, make its way on to our television screens.

National Trust

Mr Charles Hutt, F.L.S. has resigned as our nominated member of the Council of the National Trust and has been replaced by Professor Robert Savage, F.L.S. of Bristol University. As both a biologist and geologist he will bring valuable expertise to the NT.

NCC

The Society has noted the prospective demise of the Nature Conservancy Council with unease, fearing for the future of its scientific work. The Society has suggested to Select Committees and others that this should be maintained on a U.K. basis, since there are too few posts to allow regional duplication. No reassurances on this have emerged so far.

Taxonomy

Letters in *The Linnean* have expressed concern for the future of U.K. taxonomy. Council is anxious to take these concerns forward by improving publication in this area and by coordinating the efforts of taxonomists both here and in Europe. On the former issue, applications for N.E.R.C. grants in the area, which the Society administers, and has advertised, have brought little response, although there may be good reaons for this.

Bye-Laws

The Bye-Laws of the Society were changed at a General meeting in February. Changes to the Draft Bye-Laws are listed below:

Add to *1.7* after "election," "the Bye-Laws and List of the Society,"

Add to *4.6* after "Society," "and the provision of Fellows' journals free of charge"

Delete the parenthetic clause in *7.1*

Add to *9.2* after "the President shall," "having first used his best endeavours to inform the person in writing of his intention,"

Delete 13.5 and *renumber* Section *13*

In *14.1* first sentence to read "There shall be a Botanical Secretary and a Zoological Secretary who shall be responsible to Council for the scientific business of the Society."

In *16.2* "Letters, Reports and Papers" to read "Papers, Reports and Letters"

In *17.4 replace* "receive" with "require"

Add to *18.1* after "printed," "and published"

Delete from *Appendix II* "and wishes to continue receiving a journal" and *add* after "the current rate," "including the cost of one journal."

Where the term "member" occurs in the Draft Bye-Laws, reference is made to Section 23.3.

These agreed Bye-Laws, free of typographical errors, will be printed and circulated in due course. They allow for the election of a President-Elect, who will serve on Council for one year before starting his or her substantive term of office. The first President-Elect will be Professor Jack Hawkes.

Christmas cards

The cards which the Society sells in its rooms feature botanical drawings in the Society's possession by Elizabeth Twining. These were produced by Waterstones, the stationers, who have been taken over. As a result the Society felt obliged to buy the entire stock of these cards. When they arrived, we found some Christmas cards amongst them, around 1500 in all, with a Twining drawing of Loranthaceae, from *Illustrations of the Natural Orders of Plants*

published in 1855. They contain the motif 'Best Wishes for Christmas and the New Year from'. They are certainly a cut above your usual Christmas stationery and are available to members for £6.50 a dozen, including postage and packing.

From the Archives
Problems with zoological specimens continued!

Kirkwall, Orkney
October 19, 1820

Sir,

Before Mr Gillies from Edinburgh left London, I had a letter from him, in which he mentioned your intention of visiting these islands in the course of last summer for the purpose of making a collection of our rara natura, which as he promised me an introduction gave me great pleasure; but as you did not come this way, I trust you will excuse me the liberty of addressing you, without a formal introduction. In this remote corner I am much at a loss, neither having the opportunity of hearing any interesting discoveries which may be made in Natural History, nor of communicating any thing curious that falls in my enquiries.

You will, therefore, I trust, excuse me for sending you a specimen of what I believe to be a new species of the pelicanus, at least it is one which I have not met with in my collection I have as you had the pleasure of seeing — it comes nearest to the *Pelicanus Graculus* of Linneaus, but there are, you will observe, some material differences both in its position and plumage. Its habits are much the same as those of the graculus.

I send you also a specimen of the *Procellaria Pelagica*, or Stormy Petrel and I presume to offer some particulars respecting the habits of the Bird, which appear to me to be new, and which I hope will not be unacceptable. — Passing thro' a piece of moss ground near the Shore, in a small holm or uninhabited ground one evening in the month of August last, I was surprised to hear a low humming noise, somewhat resembling the sound of a spinning wheel in motion, and which proceeded from among the turf at my feet — On enquiry of one of the Boatmen, I was informed that it was the common noise of the "Alinutips" (a small sea Bird that frequented the Islands when hatching). On examining a small hole in the adjacent ground I found the Bird and nest, and was much pleased to find that it was the Stormy Petrel, as to the place of whose hatching I hear there was some dispute — the nest was very simple, being little other than a few shells laid on the bare turf, and it contained two round white eggs, very large when the size of the Bird is considered. They were pure white, and I should have much pleasure in sending them to you along with it, but the Stupid Boatman got them broke on the way home. — When I seized the Bird she squirted out of her mouth an oily substance of a very rancid smell, and which I found it quite impossible to get cleaned out of my clothes. — I took her home, however, and having put her in a cage, I tried her to eat fish and worms of different kinds. — For four days, I discovered that she occasionally drew the feathers of her breast singly, across or rather through her Bill, and appeared to suck an oily substance from them. I immediately smeared her Breast with oil, and was delighted to see her greedily and immoderately suck the feathers. — This I repeated two or three times each day, and she constantly sucked the oil off in the same way as at first — in the

course of a week I placed a saucer containing oil in the cage beside her, when she regularly fed by dipping her breast into the saucer and then sucking her feathers as before. — and as soon as the Bird had fed sufficiently the breast became to appearance quite clean and dry. I kept her in this way during three weeks, and she appeared quite healthy and cheerful — after feeding she sat quiet on the bottom of the cage, sometimes making the same humming sound I had heard before and sometimes whistling very shrilly.—

When released from the cage and allowed to run along the floor, she spread out her wings as if to assist her in running, and when hungry would have pecked me very boldly, for a supply of food.— In the fourth week she pined and died and I made a rough preserving of it as you now see it.

I infer from what I observed of it that it obtained its food by skimming off any slime or fat substance with its breast from the surface of the water — and this is confirmed by the Islanders who are in the habit of seeing it during the breeding season and who have the same notion of it.—

from
Robert Scarth
(last page apparently missing)

Picture Quiz

Victor Albrecht von Haller (1708–1777) was the subject of our March quiz (*6*(2) : 5). He studied medicine under Duvernoy, Boerhaave and Albinus and in 1736 was appointed professor of anatomy at the new University of Göttingen. He gave up this position in 1753 and from 1758–1764 was the Director of the Bern Saltworks.

He was a brilliant investigator who not only demonstrated the specific functions of muscle and nerve fibres and thereby laid the foundation of modern neurophysiology but was also the first person to recognize the mechanical automatism of the heart. He also demonstrated that foetal growth is more rapid in its earlier stages and gave the first correct description of the rete testis (today designated Halleri). Nevertheless, his observations often led him to erroneous ideas. Thus, in his great work *Elementa Physiologia corporis humani* (8 vols, 1757–60), he endeavoured to show there was a special sensitive force of sensibility for neural action and a special irritability for muscular action, which supported his concept of a specific 'vital force'.

Haller also believed in the preformation theory and thought that the entire organism was present in the egg and that the ovary contained the ova of the following generation and this again the next generation and so on. He then calculated that when God created Eve, inside her ovaries he implanted the germs of 200,000,000,000 men. Moreover, though he did valuable work on chick growth (embryology), he failed to observe the infolding process so clearly demonstrated by Wolff in 1759. Consequently he vigorously opposed the concept of epigenesis stating "there is no such thing as development; no part of the animal body is formed before another; all were created together." His view was so persuasive that nearly 50 years were to pass before Oken (1806) demonstrated afresh the process of epigenesis, while a further ten years were to pass before Baer

(1827) showed that the human ova, which is just visible to the naked eye, was enclosed in the Graafian follicle.

Haller was an accomplished botanist who, despite rejecting the constancy of species and Linnaeus's sexual system of classification, produced an elegant treatise on cryptograms and a major study of the Swiss flora.

For much of his life he combined his scientific work with public service. He was active in such local administrative affairs as education, orphans and sanitation while he also found time to codify the common law of the district in which he lived (the Aigle).

Who? (Clue—It was he who first suggested that the skull was a modified backbone). Solution by October to the Editor.

There is little doubt that his high work rate was fuelled by driving ambition and a sense of duty perhaps only partly impaired by his addiction to opium which he took to alleviate insomnia.

There were two correct answers to the January portrait of Goethe from Karl Mägdefrau and Kai Larsen with the latter providing us with Goethe's 1797 criticism of Newton: "Leidlich hat Newton gesehen und falsch geschlossen am Ende blieb er ein Brite; Verstocht schloss er, bewies er so fort".

Advance notice

The 7th International Symposium on the Studies of Early Vertebrates to be held in Miguasha, Québec, Canada from 9 to 22 of June 1991 will be hosted by

the Ministère du Loisir, de la Chasse et de la Pêche from the Government of Québec. The Parc de Miguasha oversees the world famous Escuminac Formation which contains exceptionally well-preserved fishes and plants of Late Devonian age.

The Symposium will address various disciplines that deal with Paleozoic vertebrates (e.g. anatomy, phylogeny, paleoecology, and biogeography). The two field excursions include fossil fish sites in eastern Québec, New Brunswick, and Nova Scotia.

For further information please contact: Dr Daniel Vézina, paléontologue Coordonnateur scientifique, Ministère du Loisir, de la Chasse et de la Pêche, 270, Miguasha ouest, C.P. 183 Nouvelle, Québec, Canada G0C 2E0.

Meetings

Annual Regional Meeting 1990, 25, 26 and 27 September

The Present State of the Biosphere: Monitoring, Conservation, Management.
Evolution: Co-evolution, Evolutionary Biology, Phylogenetic Reconstruction.

This three-day symposium will be held at the University of Reading. Latecomers should contact Dr S. L. Jury, University of Reading — 0734 318169.

Programme

Next year's programme is complete, as far as major meetings of the Society are concerned. Fliers for some of these will be found in these pages, but for some this has not proved possible to arrange, particularly for those early in 1991.

Grasses of Arid and Semi-Arid Regions

27 February–1 March 1991

The Linnean Society is to sponsor this meeting to bring together experts in their field to consider the role of grasses in the containment and retrieval of deserts.

The areas of interest to be considered will include recession and advance of grass populations in response to climatic and other factors, longevity of grass clones, drought tolerance of propagules, experimental transfer of indigenous and exotic species, components of persistence and spread, significance of C_3 and C_4 photosynthesis, salt tolerance, genetic variation among grasses of arid and semi-arid environments, apomixis, germ plasm storage and retrieval, components of designed vegetation and techniques for establishment.

The meeting will be at Burlington House and will include papers by internationally distinguished experts.

Further details will be announced later by the Linnean Society. Additional information is available from the convenor of the meeting: Dr G. P. Chapman, F.L.S., Wye College (University of London), Ashford, Kent TN25 5AH.

The Labiatae
2–5 April 1991 at Kew

and a meeting to celebrate Professor William Stearn's 80th birthday, which will be held in Spring 1991. Organizers are Dr S. L. Jury and Miss Gina Douglas.

Annual Regional Meeting 1991, 24, 25 and **26 September**
Evolutionary patterns and processes
This three day symposium will be held at University College, Cardiff. Organizer Dr Diane Edwards, Dept. of Geology.

On 25 October 1990, at the first evening meeting of the Society in its rooms in the 1990/91 session, elections will be held for Fellows, Associates and Student associates; these will also take place at an evening meeting on 17 January 1991 and at the Anniversary Meeting on Friday 24 May 1991. Admissions will take place at those meetings and Society meetings on 26 September (in Reading), 1 November 1990, 27 February and 18 April 1991. The first reading of Certificates of Recommendation for the election of Foreign Members and Fellows *honoris causa* will be at the meeting on 17 January 1991.

Sixth Form Lecture Programme

These lectures, although primarily intended for sixth form students following an 'A'-level biology course, may be of interest to Fellows. Provided there is spare capacity, Fellows are welcome to attend and should contact the Executive Secretary about two weeks before a lecture to find out whether all tickets have been taken up.

If any Fellow knows of a school which might be interested in being put on the mailing list for lecture programme details, please could he/she give details to the Executive Secretary.

Details of these and all other meetings of the Society can be obtained from the Executive Secretary, Linnean Society of London, Burlington House, Piccadilly, London W1V 0LQ.

Correspondence

Dept. of Plant Taxonomy,
Wageningen Agricultural University,
The Netherlands

30.1.90

Dear Editor,

Your educating article on Linnaeus and Tobacco in *The Linnean* (*6*(1):15) failed to address one pertinent point. What was Linnaeus' favourite smoke? Could it be that he filled his Dutch clay pipe with Dutch tobacco? This problem

is all the more pressing as from 1 January 1990 herbaria are rated in this country as public facilities where smoking is prohibited. Your illustration now serves as indicating some private offices as a sanctuary.

Personally I prefer Troost (Dutch for comfort), but this is an illegitimate pre-Linnaean brand of 1750. At least one colleague is loyal to a competing factory, Douwe Egberts, that was established in 1753.

Yours sincerely,
D. O. WIJNANDS

Gonville and Caius College
3.4.90 Cambridge

Dear Editor

There is a simple solution to the problem pointed out by Mr Pedley (*The Linnean* 6(2):11), which is that, as an Australian, he could not be a Foreign Member (*Bye-Laws*, Section 4), and he would also not be eligible for election as a Fellow *honoris causa*, since he is neither a British subject nor a person usually resident in the United Kingdom (Section 5.7).

This would be to do away with Foreign Membership as a separate category altogether, so that any scientist of sufficient distinction, British or foreign, home and overseas, would be eligible for election to a Fellowship *honoris causa*, with some consequent increase in the present limit of 25 in this class (Section 5.1).

There could still be a class of Honorary Members, for "distinguished personages . . . which shall not exceed four, besides such members of the Royal Family as may express a wish to belong to the Society" (Section 3).

Yours etc.,
CHARLES GOODHART

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9 Selwyn Gardens,
5.4.90 Cambridge CB3 9AX

Dear Professor Gardiner,

Future of the Linnean Society

Regarding the letter by Drs Erzinclioglu and Fraser (*The Linnean*, 6(2):9) I am writing to let you know that the proposals outlined in their letter strike me as prudent and timely. They have made eight specific suggestions which I hope will be debated and then *acted* upon. Can a timetable for airing these matters, establishing appropriate decision goals and implementing the strategy now be formulated please?

Yours sincerely,
MIRANDA WESTON-SMITH

Agricultural Attache,
33 Highgate West Hill,
London N6 6NL

12.3.90

Dear Professor Hawkes,

Thank you very much for your letter of 27 February 1990 and the publication commemorating the centenary of the birth of the academician N. I. Vavilov (see *Biological Journal of the Linnean Society*, *39*(1).

On behalf of our Ambassador and myself I would like to pass on to you and Professor D. R. Harris our gratitude for your high-minded work, both in the arrangement of the symposium and its subsequent publication.

It really is a pleasure to have this excellent publication about our distinguished countryman here in Great Britain.

I think that all Soviet scientists will be grateful to you and Professor Harris for your kindness and understanding of a subject so dear to us.

I would like to inform you that I am sending this publication to the V. I. Lenin All-Union Academy of Agricultural Sciences and I hope that many many Soviet people will come to know about it.

Thank you once again.

With best wishes,
Yours sincerely,
NIKOLAY ZHILTSOV

Bolus Herbarium,
University of Cape Town,
Republic of South Africa

30.3.90

Dear Professor Gardiner,

The latest copy of *The Linnean* has just arrived here, as always with useful news of the Society's past and present activities. It must be a big job editing it and I would like you to know how much, as a Fellow living overseas, one appreciates receiving it.

A minor problem has occurred in the report of last year's Conversazione on page 23 of the latest issue. I am cited as the exhibitor of the material on '*Kimberley, Australia 1989*'. While I may have been seen engrossed in it during the evening, I cannot claim to be its exhibitor.

In fact I had put up a rather minor exhibit in the library relating to my findings to be reported later this year in the *Biological Journal*, on a new unifying theory for methods of systematic analysis. The exhibit, which may have seemed rather dull as it lacked illustrations, was cryptically entitled '*Grouping — instinct, art and science*'.

Yours sincerely,
A. V. HALL

Leigh Laboratory,
The University of Auckland,
New Zealand

2.2.90

Dear Professor Gardiner,

I was interested in the extract from the Executive Secretary's article on spiritualism and A. R. Wallace's involvement with it. However, having read it twice, I fail to see a direct connection with the reproduction of Wallace's pencil sketches of petroglyphs from the Amazon.

My wife and I have been very interested in rock art for a number of years — there are actually a number of aspects of interest to a biologist such as the paintings and engravings of at least locally extinct mammals in Australia and the illustrations of mythical monsters in New Zealand. At the present in rock art circles there is considerable discussion going on at present over a recent paper suggesting that a number of non-representational motifs are entoptic in origin — that is they represent figures seen in trances, and are very similar to the visions seen under the influence of anaesthetics and hallucinatory drugs.

It is many years since I read Wallace's *A Naturalist on the Amazons* and so cannot recall any references to rock art. However, I would appreciate details of the site and date of Wallace's drawings and whether there are any others in his manuscripts in the Linnean Library.

Yours sincerely,
DR F. J. TAYLOR

Footnote: As editor I normally select the various illustrations used in *The Linnean*. The petroglyphs referred to were chosen to show our archival holdings and to demonstrate how Wallace's anthropological interests were overtaken by his spiritualist leanings.

During 1849 Wallace made copies of Amazonian picture writing which he found in several localities including the serras of Montealegre (paintings of man and animals), on rocks below the village of Serpa on the banks of the Amazon (roughly cut human faces), on an island in the mouth of the Rio Branco (scraped figures of men and animals) and at St Isabel, St Jozé and Castanheiro and the upper Rio Negro in Venezuela (more scraped figures of humans and animals). All of these illustrations and notes were subsequently lost, when on the voyage home the brig *Helen* caught fire and sank 100 miles from Bermuda.

The petroglyphs we figured (*6*(1):4) were from the granite rocks of the River Uaupés (drawn in 1850) and sent home beforehand with part of a travel diary and a paper on the umbrella bird.

If You Can't Come Back Last Week, Come Tomorrow

Whoever said evolution happens everywhere all the time? Even Darwin's metaphor of natural selection "daily and hourly scrutinising, throughout the world, the slightest variations" was constrained by "opportunity". In fact, both selection and drift can be intermittent, and a demonstration that gene frequencies are currently in Hardy-Weinberg equilibrium and are the same now as they were 28 years ago says little about what happened in between. But the intriguing question, as Clarke *et al.* (1990) and Vane-Wright (1990) suggest, is

whether the attempt to measure selection is so intrusive as to affect the measurement itself. I doubt that any general answer can be given to this question, since there are so many different methods for measuring selection, and the same method may have different effects on different organisms, or even on the same organisms under different circumstances. Some methods are more intrusive than others, and some may have no effect at all. For these reasons, it is unlikely that we have here "a biological equivalent of Heisenberg's indeterminacy principle".

That said, there is no doubt that the mark-release-recapture (MRR) techniques which Clarke *et al.* and Vane-Wright specifically question, are highly intrusive. Animals are caught by force, handled and marked, released and then recaptured and maybe marked again. Unfortunately there is a positive correlation between statistical reliability and the amount of disturbance, since accurate population and survival estimates depend on obtaining substantial numbers of multiple recaptures. And the mathematical logic of MRR techniques requires that none of this affects the behaviour of the animal. It is not surprising that there has been debate on the trauma caused by capture, handling and marking, and how this may affect the estimates. How can such an intrusive technique be used to measure selection pressures in the wild? Can we only be "sure of a correct answer . . . when no selection is detected"?

The first point to note is that there is a big difference between the detection of selection and its accurate measurement: it is possible to be confident of the former while making no strong claims for the latter. Second, many applications of MRR techniques attempt to detect differences in survival rate between classes of individuals with recognizably different genotypes. As long as there is no systematic variation between classes in the degree of trauma caused or in their reactions to it, then the ability to detect differential survival is unimpaired.

This second point deserves more discussion. The degree of trauma caused is largely under the control of the investigator, but there may be correlations between genotypes and behaviour which affect reactions to it. For example some genotypes may have higher activity levels than others and may be more prone to leave an area in which they have been disturbed. Worse yet, activity levels may be affected by environmental conditions, as is usually the case, for example, with sunshine and ectotherms, thus compounding the problem. What matters here, however, is that such correlations and environmental effects are not beyond investigation: they can be independently determined and their effects on MRR estimates can be predicted and taken into account (as can those of other violations of MRR assumptions).

Furthermore, if an MRR investigation is sufficiently prolonged, then comparisons between different time periods are possible and these can provide controls for comparisons between genotypes. For example, suppose that differential survival, with respect to genotype, is detected during part of the study period only so that during the rest of the time there are no differences in survival. Such a result makes it unlikely that there are any systematic differences in genotype responses to capture, as these should normally be present throughout the study period.

Lastly, the question of trauma arises with respect to its effects on behaviour following release and on the probability of recapture. Data obtained from first capture samples is therefore free from traumatization bias, and can be used to

assess evidence from recapture data. An obvious example is when a decline in the frequency of a genotype (calculated from first captures) coincides with a decline, relative to other genotypes, in its survival rate (calculated from recaptures). There is then independent evidence for a genuine selection event, evidence which is untainted by bias due to capture and marking trauma.

These points can be illustrated by data from an MRR investigation of a Ghanaian population of the mimetic butterfly, *Hypolimnas misippus*. This involved daily sampling over a period of almost five months (March to July). The butterfly was scarce in March and very abundant in late April and early May, after which population levels settled down to intermediate levels. From early May to early June there was a period of low survival relative to other periods. This was revealed by a drop in daily Jolly MRR survival estimates, severe overestimation of population sizes by the Fisher-Ford MRR method, and a significant decline in the recapture rates for the commonest and non-mimetic morph, f. *misippus*. At the same time, there were significant changes in the proportions of colour pattern morphs: f. *misippus* declined in frequency while good mimics (f. strong *alcippoides*) increased from 12% to 25%. Moreover, the fore and hind wing colour pattern combinations (determined by unlinked genes) showed significant disequilibrium during this period, the mimetic combination being over-represented and that of f. *misippus* being under-represented. Subsequently in June and July, all these parameters returned to their previous levels. I interpreted these results as indicating intermittent predator selection favouring rare and mimetic phenotype combinations, stimulated by the high population levels in April and early May.

Was all of this an artefact of the MRR technique employed, or was there a genuine selection event? I believe the latter for the following reasons. First, although all of the evidence relating to survival rates is dependent on recapture data and is therefore susceptible to traumatization bias, it is not at all clear why such bias should have operated only in May or only in the other months: the periods of high survival serve as a control in this respect for the period of low survival. If recapture probability for f. *misippus* was lowered by capture and marking trauma in May, why didn't this happen in March, April, June and July? Second, there is no general evidence from extensive mark recapture data (over 2000 butterflies captured and marked) that f. *misippus* normally reacts any differently to capture, marking and handling than do the other colour pattern morphs. Third, data relating to morph frequency changes and linkage disequilibrium were based on first capture samples alone and were therefore free of traumatization bias. Yet they were precisely coincident with the decline in survival rate, and both the frequency changes and the disequilibrium were what would have been predicted from the observed patterns of this decline. The probability that joint occurrence of all three events was due to chance is less than one in a thousand.

If there is a question mark against a predator selection interpretation, it is that what is called survival rate in MRR studies refers not to survival in the sense of remaining alive (as is required by the selectionist hypothesis) but survival in the sense of remaining in the population. The results described above could all have been due to the differential emigration of the *misippus* form, although it is by no means clear why this should have been restricted to May. In Gordon (1987), I use the somewhat weak argument of parsimony to reject this possibility, since an

emigration hypothesis requires special pleading whereas the predation hypothesis fits the facts without *ad hoc* shoe-horning. However, as Mallet & Barton (1989) point out, the evidence for selection for mimicry will always be incomplete unless there are direct observations of differential predation in action. What is needed is further investigation: it would not be helpful to succumb to a counsel of despair and to abandon MRR methods.

A final lesson from the *Hypolimnas* recapture data is that selection may indeed be intermittent. Samples taken only in March and in July would have revealed no change and given no clue to the events in May. This brings us back to the point I made at the beginning: the observations on *Panaxia dominula* tell us very little about what happened in the 26 years for which we have no data. There is no alternative to continuous monitoring if selection is either to be detected in action or demonstrated to be absent. In the meantime, perhaps the best strategy to pursue with the rediscovered Wirral colony is to monitor by larval sampling for a reasonable period and then to switch to, or also to adopt, MRR.

REFERENCES

MALLET, J. & BARTON, N. H., 1989. Strong natural selection in a warning-colour hybrid zone. *Evolution, 43:* 421–431.

CLARKE, C. A., CLARKE, F. M. M. & COOK, L. M., 1990. Gene frequency in an artificial colony of the Scarlet Tiger Moth *Panaxia dominula* (L.) after 28 years. *The Linnean, 6*(2): 13–16.

GORDON, I. J., 1987. Natural selection for rare and mimetic colour pattern combinations in wild populations of the diadem butterfly, *Hypolimnas misippus* L. *Biological Journal of the Linnean Society, 31:* 1–23.

VANE-WRIGHT, R. I., 1990. Editorial. *The Linnean, 6*(2): 13–16.

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The History Of The Petal

The English language owes to botany the useful and delightful word 'petal' and one cannot help wondering how it was possible to manage without it until comparatively recent times.

Our word, as everyone knows, came to us via the Latin 'petalum' from the Greek 'petalon' meaning a leaf. Even in this ancient origin there is some interest for 'petalon' was one of those words that evolved, as a noun, from a verb and the original verb meant 'to unfurl'. A 'petalon' was 'something which unfurls'.

We can see how awkward it is not to have a word for petal in English if we turn to a well-known quotation from Shelley:

Rose leaves, when the rose is dead,
are heaped for the beloved's bed;

It seems pretty clear that Shelley meant rose petals rather than foliage leaves. The beloved would not be all that compliant on a pile of most rose leaves. It seems fairly certain that the word petal was unknown to Shelley and indeed I cannot remember coming across it in any of his works.

Coming on a bit in time, we find Tennyson using the word 'petal' in a very well-known quotation from the Introductory Song to *The Princess*: "Now sleeps the crimson petal, now the white".

At this point I consulted Professor W. T. Stearn (who wouldn't!) in search of someone a little earlier than Tennyson and he sent me Coleridge "within the petals of a rose" in 1793.

To try to trace the first appearance of petal in English prose (other than scientific or semi-scientific usage) would be a daunting task. Not so many people would have read the *Species Plantarum* or similar botanical works and it seems probable that the transition from botany to common parlance was via horticulture.

The *Oxford Dictionary of English Etymology* (ed. C. T. Onions, 1966) attributes the first use of 'petalum' in modern Latin to Fabio Colonna in 1649 adding that the word occurs in mediaeval Latin meaning a metal plate (Isidore).

The first use of 'petal' in botanical English was (with thanks once more to Prof. Stearn) by Ray in 1682. Linnaeus used 'petala' and 'petalum' in *Hortus Cliffortianus* in 1738 and no doubt the word was well established in British botany by the time of the *Species Plantarum* in 1753.

Goethe is credited with being the first to point out that petals are transformed foliage leaves (in *Versuch die Metamorphose der Pflanzen*, 1790) but Professor G. Benl of Munich kindly informed me that petals were already known as Blütenblätter or Blumenblätter (flower-leaves) in German before the time of Goethe.

In Goethe's *Urfaust* (1770–75) and Faust Erster Teil (1770–1806) there occurs the incident when Gretchen is playing the girlish game of "He loves me; he loves me not" pulling off one by one the 'Blumenblätter' of a 'Sternblume' (*Aster*). That the 'petals' here happen to be florets, since the plant was a Composite, is quite accidental. Whether this was the first generally known publication of the word 'Blumenblätter' I don't know and in any case the Faust dates of publication are complicated.

Shelley's 'beloved' would have been luckier in Germany: she would have had a much more comfortable bed!

A. W. EXELL

Come Back, Mendel . . . (2)

Once upon a time, as a recent paper points out (Weissman *et al.*, 1990), the principles of molecular biology were straightforward. DNA imparted, via a transcript of messenger RNA, the information to enable cells to make proteins in the form of a universal three-letter code, whereby three components of the DNA, nucleotides, corresponded to one amino acid in a protein. Moreover it was assumed that a 1000-nucleotide stretch of DNA coded for a 333 amino acid protein, the principle colinearity of gene and protein. All nucleated cells were further assumed to contain the same complement of DNA—they were totipotent. The $64,000 question was how a cell regulated the transcription of DNA to produce the proteins it needed when they were needed.

Even in the halcyon days of the 1960s, there was evidence around that all this was not necessarily so. As long ago as 1887, Theodor Boveri described the elimination of chromatin in the somatic cells of *Parascaris equorum*, a process now

known to be widespread in invertebrates. In *Ascaris suum* as much as a quarter of the DNA of somatic cells is eliminated in this way.

Such things need raise no eyebrows. Ninety-five percent of our DNA is reckoned to be junk, an accumulation of duplicated and mutated genetic material. It contains the remains of genes which have ceased to be useful in protein synthesis or its control (pseudogenes), but which may undergo further mutation to produce a new phenotype, so accounting for saltatory evolution, although more prosaic explanations of this are possible. It is certainly true that the DNA eliminated in *Ascaris* cells is repetitious junk (Muller *et al.*, 1982), although how *Ascaris* knows this remains a mystery.

The genetic code is no longer universal. Protein synthesis involves messenger RNA coming together with amino acids, which are joined to specific transfer RNAs which can read the genetic code on the messenger RNA. Prior to this, the transfer RNAs must be joined to the correct amino acids, a task delegated to enzymes called aminoacyl-tRNA synthetases. Mutations of these remarkable enzymes can change their specificity (Normanly *et al.*, 1986; Moras, 1990), i.e. alter the genetic code, which is believed to have happened in a limited way in mitochondria.

Colinearity has gone the way of earlier ideas, at least in eukaryotes. The original RNA message is cut up and some of the bits (exons) reassembled (spliced) into shorter transcripts which direct protein synthesis. Other bits (introns) are discarded (Gilbert, 1978). The whole process is more complicated than this; cells can reassemble pieces of the original RNA message in various ways to produce different transcripts, which lead to several proteins from the same piece of DNA. The controlling mechanism for this is also obscure. The situation is further complicated by the presence of mobile genetic elements, or transposons, in DNA which can move about from one part of the DNA to another. Transposons are responsible for some quirks of inheritance, particularly in plants such as maize (McClintock, 1957).

Two other parasites, *Trypanosoma brucei* and *Leishmania tarentolae*, have furnished additional problems for the molecular biologist. These protozoa boast whip-like flagella, which are powered by energy from spectacular mitochondria called kinetoplasts. DNA in the kinetoplasts codes for a protein, cytochrome oxidase, which is at the end of the respiratory chain, converting oxygen to water. Examination of the DNA reveals that the coding sequence for cytochrome oxidase is incomplete, requiring the insertion at many points along its length of some hundreds of nucleotides (Benne, 1986). This actually takes place in the messenger RNA transcript, by a process called editing, for which a hypothetical organelle, the editosome, has been postulated (Weissman *et al.*, 1990). Where does the editosome derive the necessary information from? Unsurprisingly, the answer seems to be more DNA. Perhaps it is not so much junk, after all.

Which brings us back to Mendel. It will be recalled that *inter alia* he studied the inheritance of the wrinkled character of peas, which was recessive to the dominant round variety. A recessive characteristic implies normally that there is some defect in a gene, in this case the gene coding for a starch-branching enzyme, leading to sugar and water accumulation, and so shrinkage when dry. But matters are not so simple. The wrinkled gene contains 25% *extra* DNA, which is associated with a particular exon for the enzyme. This addition to the exon alters the enzyme's coding sequence resulting in its inactivity (Battacharyya, 1990).

The extra DNA appears to be a transposon, of which there are some thirty copies in pea DNA. But if it is a *mobile* genetic element, why has it stayed around long enough to allow not just Mendel to obtain his results, but others to repeat them over a century later? Apparently, the transposon has been changed by mutation and become immobilized (Fincham, 1990). Mendel might have been forgiven a wry smile.

REFERENCES

BATTACHARYYA, M.K. *et al.*, 1990. *Cell, 60:* 115–122.
BENNE, R. *et al.*, 1986. *Cell, 46:* 819–826.
BOVERI, T., 1887. *Anatomischer Anzeiger, 2:* 688–693.
FINCHAM, J.R.S., 1990. *Nature, 343:* 208–209.
GILBERT, W., 1978. *Nature, 271:* 501.
McCLINTOCK, B., 1957. *Cold Spring Harbor Symposium on Quantitative Biology, 21:* 197–216.
MORAS, D., 1990. *Nature, 344:* 195–197.
MULLER, F. *et al.*, 1982. *Nucleic Acids Research, 10:* 7493–7510.
NORMANLY, J. *et al.*, 1986. *Nature, 321:* 214–219.
WEISSMAN, C., CATTANEO, R. & BILLETER, M. A., 1990. *Nature, 343:* 697–699.

JOHN MARSDEN

Clift, Darwin, Owen and the Dinosauria

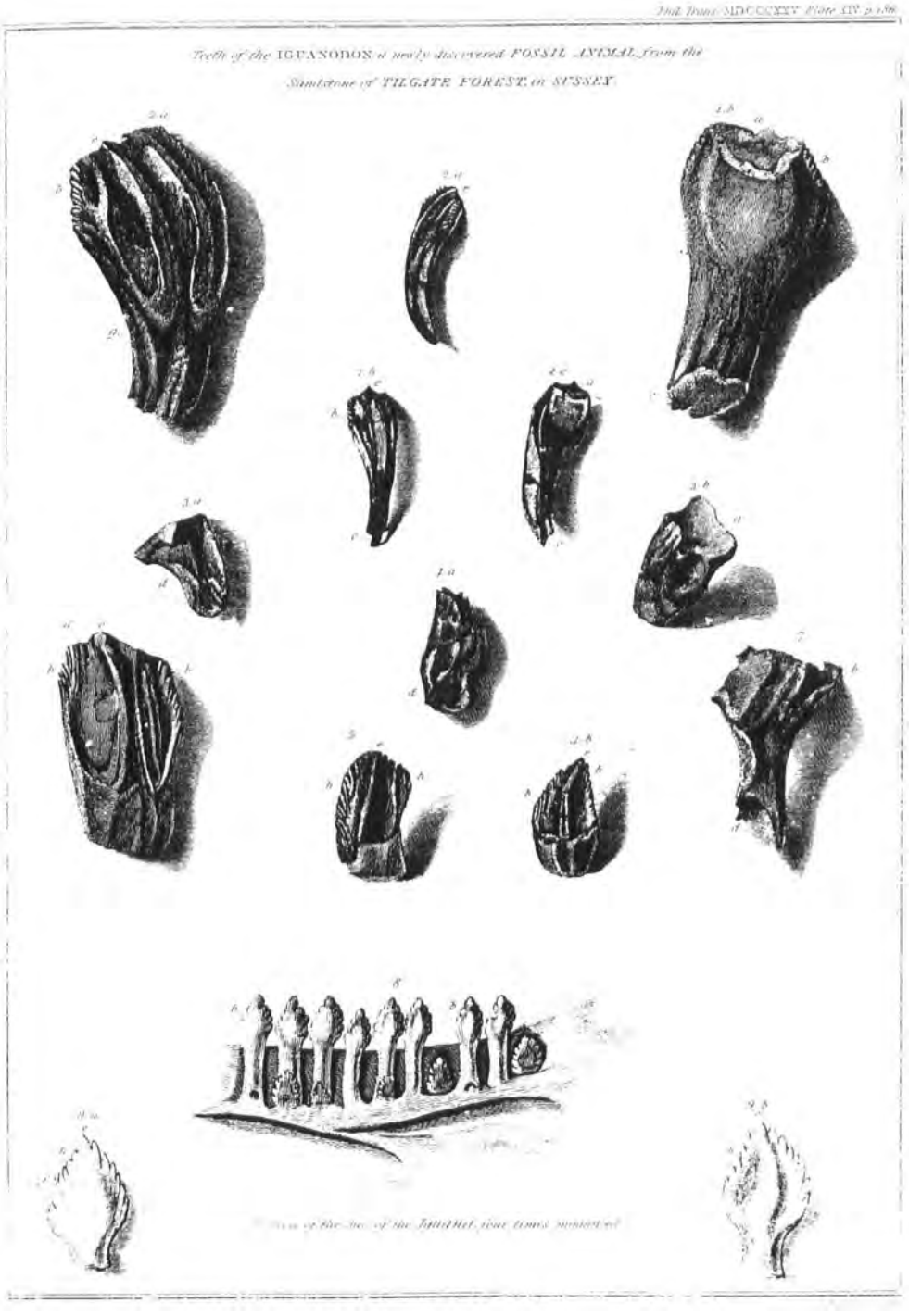
William Clift (1775–1849), the youngest of seven children, was brought up in poverty. However, through local patronage he had the good fortune to be apprenticed to John Hunter serving as his dissection assistant and recorder. Hunter taught him to dissect and mount specimens and provided him with professional lessons in drawing and calligraphy. Unfortunately Hunter's sudden death in 1793 deprived Clift of surgical training. The government subsequently bought Hunter's collections, comprising hundreds of zoological specimens including fossils and anatomical dissections of organs and bodies, both normal and pathological, and placed them in trust with the Royal College of Surgeons, London. Clift was retained as curator of the collections by Hunter's executors, Baillie and Evarard Home, and in 1806 moved the collections from Hunter's former home to the College of Surgeons where he became administrator of the Hunterian Museum, as the collections were known. Under Clift's charge the Museum attracted worldwide interest as he reshaped both the purpose and method of museum display.

Clift became an acknowledged authority in comparative anatomy and was particularly prominent in the study of fossil vertebrates, developing techniques for mounting, casting and reproducing fossil skeletons and thereby helping to lay down the principles on which the study of palaeontology is based.

In October 1819 William Clift spent a month in Paris where he met and dined with the great Baron Cuvier, attended lectures on human anatomy by Portals and talked with de Blainville. Afterwards he corresponded regularly with Cuvier on fossil remains from the Thames gravels (elephant, rhinoceros, hippopotamus, deer, etc.) and on Stamford Raffles' specimens of the dugong, tapir, etc.

Meanwhile in 1822 Mrs Gideon Mantell found several large fossil teeth in a pile of stone (which was being used for road repair) from a local quarry near

Cuckfield. Her husband, the Sussex doctor Gideon Mantell (1790–1852), a keen amateur palaeontologist, collected further remains from the quarry and nearby rocks in Tilgate Forest. At about the same time the Reverend William Buckland



Iguanodon from Mantell (1825). Magnification ×3.

discovered some exceedingly large fossil bones in the Stonesfield Slate, near Oxford.

Buckland showed his fossil remains to William Clift who recommended they be sent to Baron Cuvier in Paris. Cuvier concluded that from their size and proportion they belonged to an animal some 40′–50′ in length, with a bulk equal to that of an elephant 7′ high and partaking of the structure of the crocodile and maybe the monitor lizard. Buckland later (Feb. 1824) described it as the *Megalosaurus* (= *M. bucklandi* Mantell, 1827) or great fossil lizard of Stonesfield. Interestingly he noted in his paper that other material of the same species came from Tilgate Forest and was to be found in the collection of Gideon Mantell.

Megalosaurus from Buckland 1824.

Mantell also showed his fossil teeth to William Clift, writing in 1822 "I resolved to avail myself of the obliging offer of Mr Clift, (to whose kindness and liberality I hold myself particularly indebted) to assist me in comparing the fossil teeth with those of the recent lacertae in the Museum of the Royal College of Surgeons". Buckland then persuaded him (Mantell) to send the original fossil teeth collected by his wife to Cuvier for his comments. Lyell took the material to Paris for Mantell and left it at the Museum Office. Cuvier decided that the teeth were certainly unknown but probably belonged to an order of herbivorous reptile (letter in BMNH from Cuvier to Mantell dated 20 June 1824). Mantell subsequently described the material in February 1825 as *Iguanodon* (= *I. anglicum* Holl 1829), "since like the teeth of the recent *Iguana* the crown of the tooth is acuminated, the edges strongly serrated and the outer surface ridged". The drawing (see previous page) and subsequent reconstruction of the *Iguanodon* was the work of Clift who drew it with a horn on its snout (we now know that this was the spike developed on the thumb).

In the late 1820s Mantell found the remains of another large, armoured reptile in the Tilgate Forest area of Sussex which with the help of William Clift he described and named *Hylaeosaurus* in 1832 (actually published 1833).

6. Coracoids and omoplates of the Hylæosaurus, the newly discovered fossil reptile of Tilgate Forest.

Hylaeosaurus from Mantell (1833).

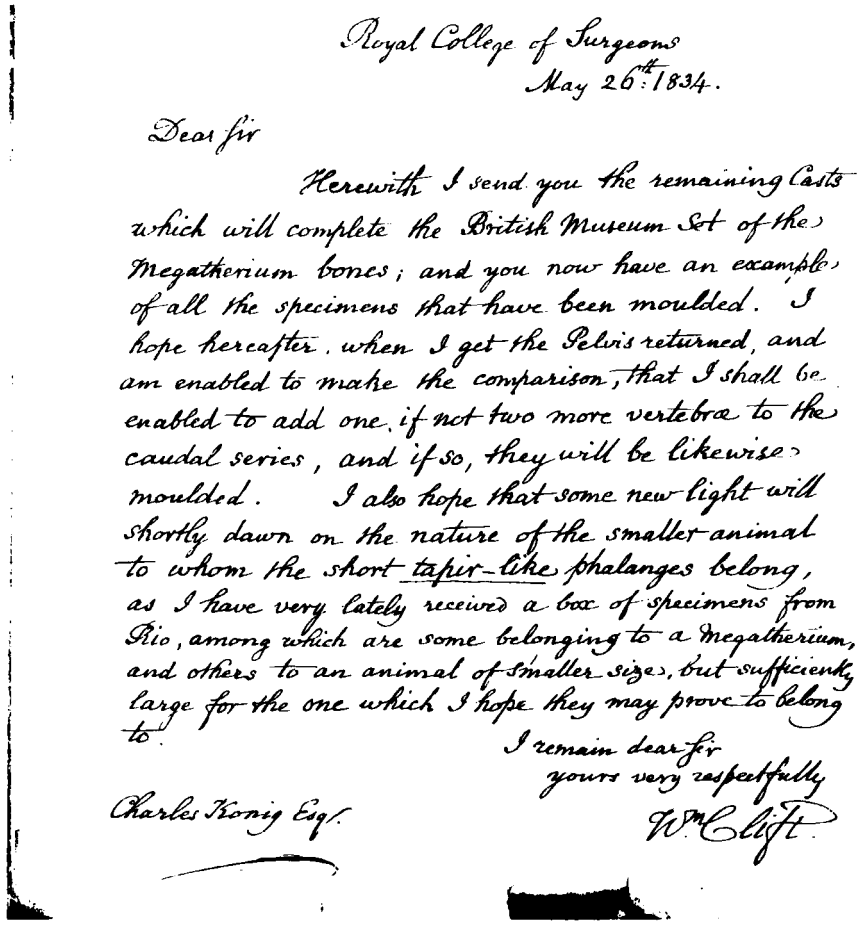
That same year (1832) the collections at the Royal College of Surgeons were enhanced by the addition of the fossil remains of a *Megatherium* discovered on the banks of the River Salado near Punta Alta, Argentina and presented by Woodbine Parish — His Majesty's Consul at Buenos Aires. This specimen was the first, large fossil mammal to be seen in Great Britain and it aroused considerable interest[1]. Accordingly that summer the President of the British Association, Rev. W. Buckland gave a lecture on the remains of the South American *Megatherium* to the Oxford Meeting (1832). His talk was skilfully illustrated with drawings by William Clift.

William Clift's ticket for the 1833 British Association Meeting.

[1] The only known specimen (i.e. which had been figured) of *Megatherium* was in the Royal Museum, Madrid. It had been collected from the banks of the River Luxon and sent to Madrid by the Marquis of Loreto (Viceroy of Buenos Aires) in 1789 and published on in 1796 by Garriga and Bru. It was named by Cuvier in 1796 and described by him in 1812.

At the same point in time Mr Charles Darwin was in Argentina collecting fossil material from near Bahia Blanca (where he found his first *Megatherium* on 23 September 1832) and Punta Alta ("in the gravel the remains of gigantic animals were extraordinary numerous" — and where on the 8 October he found a jawbone of *Megatherium*). In November 1832 he had the good fortune to meet Mr Oakley who had collected Woodbine Parish's *Megatherium* and who not only gave him directions but was also able to verify which of the bones belonged to *Megatherium*. Later that same month Darwin wrote to Caroline: "I have been wonderfully lucky with fossil bones — some of the animals must have been of great dimensions: I am almost sure some of them are quite new; this is always pleasant, but with antediluvian animals it is doubly so — I found the parts of the curious osseous coat, which is attributed to the *Megatherium*". At the end of November 1832 Darwin sent home two casks of fossil bones and marine shells by packet from Montevideo.

The larger portions of the *Megatherium* from the casks were sent on by Henslow to Clift at Surgeon's Hall (= Hunterian Museum) and were subsequently exhibited by Buckland and Clift at the next British Association Meeting in Cambridge in 1833. A second paper on *Megatherium* was presented to



Royal College of Surgeons
May 26th 1834.

Dear Sir

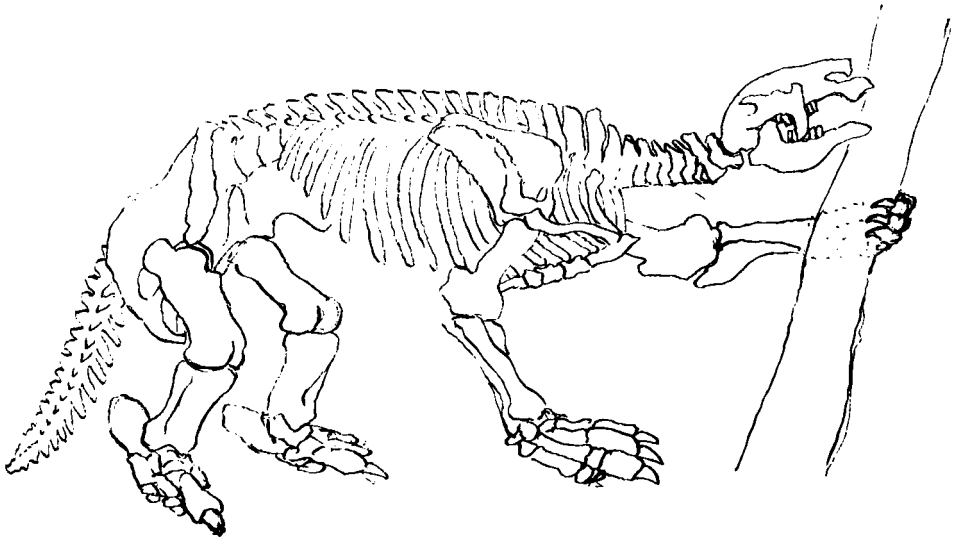
Herewith I send you the remaining Casts which will complete the British Museum Set of the Megatherium bones; and you now have an example of all the specimens that have been moulded. I hope hereafter, when I get the Pelvis returned, and am enabled to make the comparison, that I shall be enabled to add one, if not two more vertebræ to the caudal series, and if so, they will be likewise moulded. I also hope that some new light will shortly dawn on the nature of the smaller animal to whom the short tapir-like phalanges belong, as I have very lately received a box of specimens from Rio, among which are some belonging to a Megatherium, and others to an animal of smaller size, but sufficiently large for the one which I hope they may prove to belong to.

I remain dear Sir
yours very respectfully
Wm Clift

Charles Konig Esq.

the same meeting by Walter Adams who commented that Woodbine Parish's specimen was presently being prepared and mounted by Mr Clift. The remaining fossils from Darwin's 1832 consignment were forwarded by sea from Plymouth to the Royal College of Surgeons in April 1834. Darwin's second consignment of fossils (said to contain part of a head of *Megatherium*) dispatched from Buenos Aires in August 1834 was likewise forwarded to Clift[2].

In 1830, just before the *Megatherium* material had reached London, Baron Cuvier visited the Royal College of Surgeons to renew his acquaintance with William Clift and to examine the collections. Whilst there he was entertained by



Owen's drawing of *Megatherium* 1834.

Clift's assistant, Richard Owen[3]. Cuvier was much impressed and invited Owen to visit him at the Jardin des Plantes the following summer (1831). There Cuvier introduced him to Henri-Marie Ducrotoy de Blainville, Humboldt, Geoffroy Saint-Hilaire (whose lectures he attended — noting Geoffroy placed his fossils in an explicitly transformist context and praised Lamarck's two laws), Dutrochet, Chaptal, Latreille and Jussieu. This visit had a profound influence on Owen's outlook and his subsequent publications on fossil vertebrates reflect both the Cuverian conceptual as well as methodological approach; whilst the use of

[2] Darwin had taken with him on the *Beagle* a copy of Thomas Falkner *A Description of Patagonia*, Hereford 1774. In it (p. 55) there are descriptions of the bones of giant armadillos — apparently common along the banks of the rivers Carcarania and Parana, Argentina.

[3] In 1827, at the age of 23 Richard Owen (1804–92) was appointed assistant to William Clift at the Hunterian Museum. One of his tasks as honorary prosector to the Zoological Society was to dissect and describe the various animals which died in the London Zoo; and as a consequence of his diligence he soon became a capable comparative anatomist (see for example Darwin's letter to Henslow, January 1834). He repeated many of John Hunter's experiments and dissections: in 1831 he dissected an orang utang, a beaver, an accouchy, a Tibet bear and an armadillo, and in the following year a kangaroo, a seal, a tapir, a crocodile, a toucan and a flamingo. He also made preparations of human abnormalities at the London Hospital ranging from cancer of the penis to liver tubercles. In 1836 his note book records 920 preparations!

homologies as well as the archetype concept (implicit in St Hilaire's work) he developed in his lectures, where he endeavoured to demonstrate that there was a unitary basis to the science of comparative anatomy[4]. His contact with Cuvier also seems to have shown him the importance of fossils in completing the 'Temple of Nature' and by 1832 he was writing in the *Penny Cyclopaedia* and *Magazine* on "the Great Skeleton of the *Megatherium*". He also corresponded with Woodbine Parish and in 1835 corrected the proofs of his article on *Megatherium* pointing out that it was unlikely to have died out through eating the agave or American aloe[5]. Owen made his own drawings of *Megatherium* as early as 1834 and in 1861 he published a definitive memoir on *The Megatherium or Giant Sloth of America* for which the Royal Society gave him a grant of £100 out of their total grant for 1861 of £1,000!

When Darwin's fossils began to arrive at the Royal College of Surgeons, Owen quickly realized the potential of these collections and endeavoured to meet Darwin as soon as possible on his return to England (landed 2 October 1836). This he accomplished as the following letters testify:

Lyell to Owen:

> My Dear Sir,
>
> Mrs Lyell and I expect a few friends here on Saturday next 29th (Oct. 1836), to an early tea party at eight o'clock, and it will give us great pleasure if you can join us.
>
> Among others you will meet Mr Charles Darwin, whom I believe you have seen, just returned from South America, where he has laboured for zoologists as well as hammer-bearers.

Darwin to Henslow, 30 October 1836

> "Mr Owen seems anxious to dissect some of the animals in spirit and besides these two (Lyell & Owen), I have scarcely met anyone who seems to wish to possess any of my specimens."

By December Owen had persuaded Darwin to deposit all his fossil material in the Hunterian Museum.

Darwin to Owen, 19 December 1836:

> My Dear Sir,
>
> I have done exactly as you recommended me . . . I, at one time, began to think that the fossil bones would be troublesome to me, and as of little service,

[4] Owen was not an anti-evolutionist — he considered species as exemplifying the continuous operation of a natural law, in which they (species) had an innate tendency to deviate from the parental type. This he imagined to be the most probable nature or way of operation of the secondary law, whereby species have been derived from one another (*Anatomy of Vertebrates, 3:* 807, 1868). See also Pt 2: *Linnean*, 7(1).

[5] The Peruvian Indians have a tradition that the *Megatherium* bones belonged to giant men which were destroyed by God for the crime of sodomy (Falkner, 1774: 55). It has also been suggested that these giant edentates were wiped out by man (viz Darwin). Certainly human remains, tools and pleistocene mammals (including *Megatherium*) are found in association at Arroio Seco, Argentina. The *Megatherium* bones at this site have been dated at 8390 years BP but the marks on them were doubtfully made by man (*Ciencia Hoje 1989, 9:* 44).

> as some branches of my collection are likely to be . . . but now I look back to the trouble I had in procuring them with great satisfaction, I do assure you, I feel very grateful to you for having given me such great assistance . . .

Owen wrote in his notebook for 1836: "Amongst the additions to the Hunterian Museum requiring space for their instructive display were the fossil remains of the new kinds of quadrupeds brought home by Charles Darwin in the *Beagle* — I was charged with the description of these fossils".

On 19 April 1837 Owen gave his first description of a fossil vertebrate — appropriately, one of Darwin's new specimens[6]. The paper on the cranium of *Toxodon platensis*, presented to the Geological Society won him the Wollaston Medal for his "services to the Fossil Mammalia collected by Mr Darwin". There then followed a series of masterly descriptions of the South American fossils interspersed with papers on *Plesiosaurus* and the Stonesfield Slate mammals (1838). In the next ten years (1838–1847) he published 152 papers of which 76 were palaeontological.

In April 1837 Owen was appointed Hunterian Professor of Comparative Anatomy and began gradually to relinquish his medical practice. At about the same time he became a close friend of Gideon Mantell who supplied him with much interesting fossil reptilian material including teeth of *Iguanodon* for sectioning. He also corresponded with Agassiz who sent him plates of his fossil fishes as and when they were published (see Mrs Caroline Owen's diary April 1837), and was on intimate terms with both Lord Cole and Phillip Egerton, the distinguished fossil collectors. Indeed after the Birmingham Meeting of the British Association for the Advancement of Science (1839) he stayed at Florence Court in Fermanagh with the Coles.

At about this time (1837) Owen conceived the idea of producing a definitive work on British fossil reptiles and accordingly put the proposal to the British Association for the Advancement of Science in 1838, aided by his father-in-law, William Clift (Owen married Caroline Clift on 20 July 1835). The British Association granted him £200, "for the promotion of our knowledge of British Fossil Reptiles, to be administered through Greenough, Lyell and Clift". Owen immediately started visiting the various museums and private collections throughout the U.K. and it is said that his indefatigable pursuits of fossils clearly raised him above his contemporary fellow workers. Nevertheless, it turned out to be a costly venture and the following year he returned to the British Association for more money. By this time (1839), like his father-in-law, he was a member of Council; on this occasion they granted him £81.17.3d. Owen later claimed that the whole work on *British Fossil Reptiles* cost him £1,000 to produce and in a letter to his sister he mentions that if he could get two hundred paying subscriptions the rest of the money would be assured. However, in his diary for that period he wrote "I could not have ventured to have proposed to myself the *British Fossil Reptilia* as a subject of continuous and systematic research without

[6] The *Toxodon* head was found in Sarandis — a small stream entering the Rio Negro, 12 miles north-west of Montevideo. It had apparently been originally embedded in white argillaceous earth and was discovered in the bed of the rivulet after a sudden flood had washed down part of the bank, Darwin wrote, "The head had been kept for a short time in the neighbouring farmhouse as a curiosity. When found the head was quite perfect — but the boys knocked the teeth out with stones, and then set up the head as a mark to throw at — but when I arrived it was lying in the yard. I bought it (on November 26th 1833) for the value of eighteen pence . . . The inhabitants (of another farm) told me that they had made gate-posts of some leg bones, and I myself saw two groups *in situ* of the remains of a mastodon projecting from a cliff".

the aid and encouragement which the British Association has liberally granted to me for that purpose".

Part I of *British Fossil Reptiles* was delivered in the form of a report (pp. 43–126) to the British Association Meeting at Birmingham in August 1839. This part which dealt with the Enaliosauria (lizards of the sea): *Plesiosaurus* and *Ichthyosaurus* took Owen just one and a half hours to deliver. Preprints, published privately by Richard & John E. Taylor, London, were handed out at the meeting.[7]

Part II of *British Fossil Reptiles* was delivered on Friday 30 July 1841, to the next British Association Meeting held in Plymouth. This report (pp. 60–204) which lasted over two and a half hours (and for which he received a standing ovation) dealt with the Crocodilia, Dinosauria, Lacertilia, Pterosauria, Chelonia, Ophidia and Batrachia. Preprints, this time with a title page, again published privately, were handed out as before.

Thus the Dinosauria came into being in 1841 when Owen included within that group *Megalosaurus*, *Hylaeosaurus* and *Iguanodon*. The Dinosauria he defined as fearfully great lizards characterized by a large sacrum of five anchylosed vertebrae interlocked by the alternating position of neural arch and centrum and referred to them as the gigantic crocodile-lizards of the dry land. He concluded that they had given way to carnivorous and herbivorous mammals and that in the method of tooth succession *Megalosaurus* most closely resembled mammals. Twenty-seven years later Huxley (1868) deduced, from the occipital articulation, that they were "most nearly intermediate between birds and reptiles" and this is the popular view today. Since Owen's time it has been demonstrated that *Hylaeosaurus* and *Iguanodon* belong to a monophyletic group, the Ornithishia characterized by the form of the pelvic girdle and the presence of a predentary (no skull has yet been found of *Hylaeosaurus*). *Megalosaurus*, on the other hand, has been removed to the Saurishia. Recently (1982) I have endeavoured to show that the Dinosauria as a whole is a monophyletic group and is the sister-group of the Crocodilia.

[To be continued.]

REFERENCES

BUCKLAND, REV. W., 1824. XXI. Notice on the *Megalosaurus* or Great Fossil Lizard of Stonesfield. *Transactions of the Geological Society [2], 1:* 390–396.

GARDINER, B. G., 1982. Tetrapod classification. *Zoological Journal of the Linnean Society, 74:* 207–232.

HUXLEY, T. H., 1868. On those animals which are most nearly intermediate between birds and reptiles. *Annals and Magazine of Natural History, (4), 1:* 220–224.

MANTELL, G., 1825. VIII. Notice of the *Iguanodon*, a newly discovered fossil reptile, from the sandstone of Tilgate Forest, in Sussex. *Transactions of the Royal Society, 115:* 179–186.

MANTELL, G., 1827. *Illustrations of the Geology of Sussex. A general view of the Geological relation of the south eastern part of England; with figures and descriptions of the fossils of Tilgate Forest.* London: Lupton Relfe. IX+92 pp.

MANTELL, G., 1833. Chapter X. Observations on the fossil remains of the *Hylaeosaurus*, and other Saurian reptiles discovered in the Strata of Tilgate Forest, in Sussex. (Originally read before the Geological Society of London, Dec. 5 1832 — but withdrawn). In *The Geology of the South East of England:* 289–333. London. XIX+415 pp.

OWEN, R. 1837. A description of the Cranium of the *Toxodon Platensis*, a gigantic extinct mammiferous species referrable by its dentition to the *Rodentia* but with affinities to the *Pachydermata* and the *Herbivorous Cetacea. Proceedings of the Geological Society [2], 51:* 541–542.

B.G.G.

[7] On Nov. 1 1840 Owen received a letter from Sir Robert Peel informing him that he had advised Queen Victoria to put Owen on the Civil List with an annual pension of £200 (the total funds allocated for those engaged in Science that year was £300).

Library

Our worst fears during the work on the exterior of the building were realized just before Christmas when heavy rain over a weekend found its own way down via the Library due to blocked gutters. We suffered water damage and some mould growth in both the Reading Room and the Library Annexe. Luckily most books dried out without too much damage but approximately 150 items are still with the conservators for treatment or rebinding. Because flooding occurred over a weekend, some items had already dried out sufficiently for photographs on art-paper to have stuck together and these cannot be salvaged other than by prising the pages apart. We are attempting to replace where possible but one or two of the "institutional histories" which suffered the worst damage are no longer in print. We would be most grateful if any Fellows or other sources can help in obtaining the following:

British Museum (Natural History), *War Memorial Record*, London, 1922.
Brussels, Jardin Botanique, *Le Jardin Botanique national de Belgique, 1870–1970*, Brussels, 1970.
Singapore, The Botanic Gardens, *The Botanic Gardens, Singapore, an illustrated Guide*, Singapore, [1927?].
Tromsø, Tromsø Museum, *Tromsø Museum gjennom 75 ar, 1872–1947*, 95 pp. Tromsø, 1947.

Some other items may be temporarily unavailable whilst conservation work is done or whilst replacement copies are on order.

We would like to thank all those who helped cope with this flood, either through physically moving and sorting wet books, or through loan of equipment and materials. We are also indebted to all who gave advice on what steps to take to minimize damage.

Staff changes in the Society now mean that Mrs E. Dimitrova will be helping in the Library during the times the Librarian is absent, although her other duties as housekeeper will on occasions take priority over the Library. The time to avoid is between 13.30 and 14.30 when there is a chance that both of us may be absent. Voluntary help from Mrs Sylvia Elias has reduced some of the items awaiting cataloguing and with the addition of assistance from Bruce Ritchie on the computer, we should have both catalogued and filed cards for recent accessions.

Donations

Our usual thanks to all those who let us have copies of their publications, reprints or older items they no longer want. Apart from all those listed here special thanks must also go to Mr D. G. Fry for a large number of Russian language natural history books now being sorted and catalogued. We have also just received ten boxes of books and back issues of journals from the Fauna and Flora Preservation Society which should bring some of our runs of journals up to date. Richard Fitter is also still keeping us supplied with wildlife conservation journals and reports. Other donations include:

Dr S. I. Ali — Nasir, E. & Ali, S. I., *Flora of Pakistan*, No. 190,

	Rubiaceae, by S. Nazimuddin & M. Qaiser. 145 pp. illustr. Karachi, 1989.
Balkema	Rookmaker, L. C., *The zoological exploration of Southern Africa*, 1650–1790. 368 p. illustr. some col. Balkema, Rotterdam, 1989.
R. E. R. Banks	British Museum (Natural History), Natural History Museum, Department of Library Services, *Accessions List*, February. BMNH. London, 1990.
C. Kate Bertram	Bertram, C. Kate *Lucy Cavendish College, Cambridge, a history of the early years.* 88 pp. Lucy Cavendish College, Cambridge, 1989.
F. H. Brightman	Hallegraeff, Gustaaf M., *Plankton, a microscopic world.* 112 pp. illustr. map, E. J. Brill, Leiden, 1988.
Dr H. M. Burdet	Geneva, Conservatoire et Jardin Botanique, *Flore de Paraguay*, ed. R. Spichiger, Bixaceae and Mayacaceae by F. Morela. Jardin Botanique, Geneva, 1989.
	Jeanmonod, D. & H. M. Burdet, eds, *Complements au Prodrome de la flore Corse:* Caprifoliaceae, by J. Gamisans. 19 pp. maps, Conservatoire et Jardin Botanique, Geneva, 1990.
	Spichiger, R. & Ranella, L., *Flora del Paraguay*, Anacardiaceae, by J. de Dioz Munoz. 84 pp. illustr. maps, Conservatoire et Jardin Botanique, Geneva, 1990.
Dr J. M. Camarasa	Camarasa, Josep M., *El botanic Joan Minuart (1693–1768).* 45 pp. illustr. Sant Celoni, 1986.
	Camarasa, Josep M., *Botanica i botanics del paisos Catalans.* 268 pp. Enciclopedia Catalana, Barcelona, 1989.
Cambridge University Press	Pritchard, H., *Modern methods in orchid conservation, the role of physiology, ecology & management.* 173 pp. Cambridge University Press, Cambridge, 1989.
Carcanet Press	Turner, William, *A new Herball*, edited by George T. L. Chapman and Marilyn N. Tweddle. 326 pp. illustr. Carcanet Press & Mid Northumberland Arts Group, Manchester, 1989.
M. Cooper	Cooper, J. E. & Greenwood, A. G. eds, *Advances in the study of raptor disease* (Proceedings of an International Symposia). 178 pp. illustr. Chiron Books, Keighley, 1981.
P. Davis	Newcastle, Hancock Museum, *An atlas of the butterflies of Northumberland and Durham*, by N. J. Cook. (Special Publication No. 5) 71 pp. maps, Northumberland Biological Records Centre, Newcastle, 1990.
D. R. Elleray	Abbott, R. Tucker & Zim, Herbert S., *Seashells of the world.* 160 pp. col. illustr. Golden Press, New York, 1964.
	Freeman, David, *What seashell is that?* 66 pp. col. pl. Purnell, Cape Town, 1969.
	Friend, Hilderic, *British earthworms and how to identify them.* 64 pp. illustr. Epworth, London, n.d.
Environment Council	Environment Council, Who's Who in the environment, ed. by Sarah Cowell. 337 pp. London, 1990.

Dr W. C. Evans	Trease, George Edward & Evans, William Charles, *Pharmacognosy*, 13th edition. 832 pp. Baillière Tindall, London, 1989.
Prof. C. Favarger	Duckert-Henriod, M. M. & Favarger, C., *Contribution à la cytotaxonomie et la cytogéographie des Poa de la Suisse*, Index des nombres chromosomique. (Mém. Soc. Helv. des Sciences Naturelles, Vol. 100). 130 pp. illustr. map, Birkhäuser Verlag, Basel, 1987.
J. Gillett	Spalding, George H., *Lasca Miscellanea*, an Index to "A Botanist in Southern Africa" by J. Hutchinson. 58 pp. (+mss. notes). California Arboretum Foundation, Arcadia, 1953.
Prof. H. Goerke	Goerke, Heintz, *Carl von Linne, arts, naturforscher, systematiker*. 236 pp. illustr. Wissenschaftliche Verlag, Stuttgart, 1989.
V. Gordon	Gordon, V., *Prawnography*. 192 pp. illustr. Bloomsbury, London, 1989.
B. R. & P. R. Grant	Grant, B. Rosemary & Grant, Peter R., *Evolutionary dynamics of a natural population, the large cactus finch of the Galapagos*. 350 pp. illustr. University of Chicago Press, Chicago, 1989.
Prof. G. V. Gukov	Gukov, G. V., [*Che imya ti nosish rasmenie*]. 302 pp. illustr. Chabarovsk, 1989.
Inger Hansen	Wallerstrom, Ingrid, *Linne och hans familj* (I. Carl Linnaeus, Smalanning tar lakarexamen och gifter seg). 314 pp. Parometern Tryk, Kalmar, 1980.
Prof. J. G. Hawkes	Grzimek, Bernhard, *Encyclopedia of mammals*, Vols. 2 & 3, 648 pp. & 643 pp. col. illustr. maps, McGraw Hill, New York, 1990.
	Hawkes, J. G., *The potato: evolution, biodiversity and genetic resources*. 259 pp. illustr. maps, Belhaven Press, London, 1990.
	Lemmens, J. H. M. (and others), *Plant resources of South-East Asia: basic list of species and commodity groupings*. Version 1. 148 pp.+35 sections, Pudoc, Wageningen, 1989.
	Maesen, L. J. G. van der & Somaatmadje Sadikin, eds, *Plant resources of South-East Asia* 1, Pulses. 103 pp. illustr. maps, Pudoc, Wageningen, 1989.
	Siemonsma, J. S. & Wulijarni-Soetjioto, N. eds, *Plant resources of South-East Asia* (Proceedings of the first PROSEA symposium). 337 pp. illustr. Pudoc, Wageningen, 1989.
	Westphal, E. & Jansen, P. C. M. eds, *Plant resources of South-East Asia*, a selection. 322 pp. illustr. map, Pudoc, Wageningen, 1989.
Imperial Biological Laboratory	Hirohito, Emperor of Japan *Flora sedis Imperatoris Japoniae*. 546 pp, illustr. in colour. Hoikusha Publications, Osaka, 1989.

R. W. J. Keay	*Nigerian Field*, Index to volumes 1–50 (1930–1985). 285 pp. A. Rowe, Chippenham, 1989.
	Keay, R. W. J., *Trees of Nigeria*, revised edition. 476 pp. illustr. Clarendon Press, Oxford, 1989.
Prof. G. Kunkel	Kunkel, G., *Arbustos y arbolillos en jardines Almerienses*, 2nd ed. 71 pp. illustr. Almeria, 1990.
Maureen Lambourne	Lambourne, Maureen, *John Gould's Birds of Great Britain.* 259 pp. illustr. in col. Bloomsbury Books, London, 1986.
	Lambourne, Maureen, *John Gould — birdman.* 112 pp. illustr. some col. Osberton Publications, Milton Keynes, 1987.
Leipzig, Botanischer Garten	Leipzig, Karl Marx University, Botanischer Garten, Catalogus Herbarii Lipsiensis, Plantae neotropicae II. by P. Gutte (and others). 92 pp. Karl Marx University, Leipzig, 1989.
Prof. G. Ll. Lucas	Bowden, Jean K., *John Lightfoot, his work and travels.* 254 pp. illustr. Bentham Moxon Trust & Hunt Institute, Kew, 1989.
	Kew, Royal Botanic Gardens, *The Herbarium handbook*, by Leonard Forman and Diane Bridson. 214 pp. illustr. Royal Botanic Gardens, Kew, 1989.
Prof. A. D. J. Meeuse	Meeuse, A. D. J. ed., *Flowers and fossils.* 95 pp. illustr. CIP Koninklije Bibliotheek, Delft, 1990.
Missouri Botanic Gardens	Faherty, William Barnaby, *A gift to glory in: the first 100 years of the Missouri Botanic Garden.* 234 pp. illustr. Harris & Friedrich, Ocean Park, Washington, 1989.
Museums Association	Jones, Peter Hope, *The natural history of Bardsey.* 149 pp. illustr. maps, National Museum of Wales, Cardiff, 1988.
Nordic Gene Bank	Nordic Gene Bank, *The European almond catalogue.* 32 pp. NGB. Alnarp, 1989.
	Nordic Gene Bank, *The European apricot catalogue.* 60 pp. NGB. Alnarp, 1989.
	Nordic Gene Bank, *The European cherry catalogue.* 146 pp. NGB. Alnarp, 1989.
	Nordic Gene Bank, *The European peach catalogue.* 100 pp. NGB. Alnarp, 1989.
	Nordic Gene Bank, *The European plum catalogue.* 88 pp. NGB. Alnarp, 1989.
	Nordic Gene Bank, *The Nordic barley catalogue.* 162 pp. NGB. Alnarp, 1989.
Oman Bird Record Committee	Oman Bird List, Ed. 3. 22 pp. 1990.
Oxford University Press	Kruuk, H., *The social badger, ecology and behaviour of a group-living carnivore.* 155 pp. illustr. OUP, Oxford, 1989.
	Lovelock, James, *Gaia, a new look at life on earth.* 157 pp. map, OUP, Oxford, 1989.
	Lovelock, James, *The ages of Gaia, a biography of our living earth.* 252 pp. illustr. OUP, Oxford, 1989.
G. Pilleri	Pilleri, G., Biosca, J. & Via, L., *The tertiary Sirenia of*

	Catalonia. 98 pp. illustr. Brain Anatomy Institute, Ostermundigen, 1989.
Sandra Raphael	Raphael, Sandra, *An Oak Spring sylva*. 145 pp. illustr. some col. Oak Spring Garden Library, Uppersville, Va. 1989.
Royal Botanic Garden	Kew, Royal Botanic Gardens, *Catalogue of the living plant collections*, part 2, by Mrs P. Ives. 163 pp. RBG, Kew, 1989.
Henrietta Ryan	Haskell, Francis (and others), *Il museo Cartaceo di Cassiano dal Pozzo*. 105 pp. illustr. some col. Olivetti, Italy, 1989.
A. J. Silverside & E. H. Jackson	Botanical Society of Edinburgh, *A check list of the flowering plants and ferns of East Lothian*, by A. J. Silverside and E. H. Jackson. 49 pp. Bot. Soc. Edinburgh, Edinburgh, 1988.
P. Stanbury	Holland, Julian, *Microscopes and microscopy, instruments and related items in the Macleay Museum*. 52 pp. illustr. Macleay Museum, Sydney, 1989.
Systematics Association	Systematics Association, *Prospects in systematics*, edited by D. L. Hawksworth. (Special Volume No. 36) 457 pp. Clarendon Press for Systematics Association, Oxford, 1988.
	Systematics Association, *Electrophoretic studies on agricultural pests*, edited by Hugh D. Loxdale and J. den Hollander (Special Volume No. 39) 497 pp. Clarendon Press for Systematics Association, Oxford, 1989.
	Systematics Association, *Evolution, systematics and fossil history of the Hamamelidae*, edited by Peter R. Crane and Stephen Blackmore. (Special Volume Nos. 40 A & B.) 2 vols. Clarendon Press for Systematics Association, Oxford, 1989.
	Systematics Association, *The Chromophyte Algae: problems and perspectives*, ed. J. C. Green, B. S. C. Leadbeater and W. L. Diver. 429 pp. illustr. Clarendon Press for Systematics Association, Oxford, 1989.
P. Tuley	Bhatt, Dibya Deo, *Natural history and economic botany of Nepal*. 238 pp. illustr. Orient Longmans, New Delhi, 1977.
	Booth, A. H., *Small mammals of West Africa*. (West African Nature Handbooks) 68 pp. col. illustr. Longman, London, 1960.
	Cansdale, G. S., *West African snakes*. (West African Nature Handbooks) 74 pp. col. illustr. Longman, London, 1961.
	Cockrill, W. Ross, ed., *The husbandry and health of the domestic buffalo*. 993 pp. illustr. FAO, Rome, 1974.
	Colonial Office, *Agriculture in the West Indies*. 280 pp. illustr. HMSO, London, 1942.
	Davies, Howell, *Tsetse flies of Northern Nigeria, a handbook for junior control staff*. 211 pp. illustr. Gaskiya Corp. Zaria, n.d. (1962).
	Elgood, J. H., *Birds of West African towns and gardens*. (West African Nature Handbooks) 66 pp. col. illustr. Longman, London, 1960.

	I.A.A.A., *Modern insect control, nuclear techniques and biotechnology*. 479 pp. illustr. I.A.A.A. Vienna, 1988.
	ICRISAT, *Biotechnology in tropical crop improvement*. 152 pp. illustr. ICRISAT Patanchan, 1988.
	Interim Mekong Committee, *Environmental impact assessment, guidelines for application to tropical river basin development*. 123 pp. Bangkok, 1982.
	International Rice Research Institute, *Genetic manipulation in crops*, proceedings of an international symposium, Beijing, 1984. 446 pp. illustr. Cassell Tycooly, London, 1988.
	Jack, H. W. *Rice in Malaya* (Bull. 35, Dept. of Agriculture, Federated Malay States). 96 pp. illustr. map, Department of Agriculture, Kuala Lumpur, 1923.
	Morton, J. K., *West African lilies and orchids* (West African Nature Handbooks). 71 pp. col. illustr. Longman, London, 1961.
	New Delhi, Council of Agricultural Research, *The mango handbook*. 210 pp. illustr. some col. Indian Council of Agricultural Research, New Delhi, 1967.
	Payne, W. J. A., *Cattle production in the tropics*. Vol. 1: breeds and breeding. 336 pp. illustr. Longmans, London, 1973.
	Tea Research Institute of East Africa, *Tea growers handbook*. 152 pp. illustr. some col. English Press, Nairobi, 1969.
Prof. J. T. Williams	Subramanian, D., *Cytotaxonomical studies of South Indian species of angiosperms*, Thesis submitted for award of degree of Doctor of Science in Botany, Annamalai University (unpaged). 1986.
University of Windsor, Ontario	*The W. G. Benedict herbarium collections*, Department of Biological Sciences. 109 pp. Windsor, Ont. 1989.
J. K. Winther	Copenhagen, Fredningsstyrelsens, Havbundsundersogelser, rastoffer og fredninsinteresser, *Lille Baelt: oversigt & Roskilde Fjord: oversigt*. 2 vols, maps, charts, Fredningsstyrelsens, Copenhagen, 1986.
Prof. H. Zwolfer	*Evolutionsprozesse im Tierreich: herausgegeben von Bruno Streit*. 292 pp. illustr. map, Birkhäuser Verlag, Basel, 1990.

Accessions

Arraudeau, M. A. & Vergara, B. S., *A farmer's primer on growing upland rice*. 284 pp. illustr. IRRI & FITFCR, Manila, 1988.

Barnes, R. S. K. (and others), *The invertebrates, a new synthesis*. 582 pp. illustr. Blackwell Scientific, Oxford, 1988.

Bergey, *Manual of systematic bacteriology*, Vol. 1 ed. John G. Holt. 964 pp. illustr. Williams and Wilkins, Baltimore, 1984.

Bergey, *Manual of systematic bacteriology*, Vol. 2 by P. H. A. Sneath (and others). 1599 pp. illustr. Williams and Wilkins, Baltimore, 1986.

Brisbane, Queensland Museum, *A time for a museum, the history of the Queensland Museum 1862–1986*, by Patricia Mather (and others). 366 pp. illustr. Queensland Museum, Brisbane, 1986.

Cannon, L.R.G., *Turbellaria of the world.* 136 pp. illustr. Queensland Museum, Brisbane, 1986.

Cannon, L. R. G. & Silver, H., *Sea cucumbers of Northern Australia.* 80 pp. illustr. some col. Queensland Museum, Brisbane, 1987.

Conferences, Scottish Chough Protection Group, *Proceedings of an International Workshop on the conservation of the Chough, Pyrrhocorax pyrrhocorax.* 112 pp. illustr. maps, Tarbert [1989].

Currie, W. Bruce, *Structure and function of domestic animals.* 443 pp. illustr. Butterworth, Boston, 1988.

Elsenberg, John F., *Mammals of the neotropics, the Northern neotropics:* Vol. 1. 449 pp. illustr. maps, University of Chicago Press, Chicago, 1989.

Farrelly, David, *The book of bamboo.* 332 pp. illustr. Sierra Books, San Francisco, 1984.

Glatston, A. A., ed., *Red panda biology.* 187 pp. illustr. some col. S.B.P. The Hague, 1989.

Hall, Leslie S. & Richards, G. C., *Bats of Eastern Australia* (Queensland Museum booklet No. 12). 66 pp. illustr. maps. Queensland Museum, (Brisbane) 1979.

Howard, Richard A., *Flora of the Lesser Antilles*, Vol. 4 pt. 1, Dicotyledonae. 673 pp. illustr. Arnold Arboretum, Jamaica Plain, Ma. 1988.

Jacomet, Stefanie, Brombacher, Christop & Dick, Martin, *Archaobotanik am Zurichsee.* (Berichte der Zuricher denkmalpflege. Monographien No. 7) 348 pp. illustr. maps, Orell Fussli, Zurich, 1989.

Jangoux, Michel & Lawrence, John M., *Echinoderm studies: 3.* 383 pp. illustr. Balkema, Rotterdam, 1989.

Kensley, Brian & Scholte, Marlyn, *A guide to the marine isopod crustaceans of the Caribbean.* 308 pp. illustr. Smithsonian Institution Press, Washington, 1989.

Macleod, R. M., Friday, J. R. & Gregor, C. *The corresponding societies of the British Association for the Advancement of Science*, 1883–1929. 147 pp. Mansell, London, 1975.

Malaysia, Forest Research Institute, *Tree flora of Malaya*, Vol. 4. 549 pp. illustr. maps. Longmans Malaysia, Kuala Lumpur, 1989.

Meybeck, Michael, Chapman, Deborah & Helmer, Richard, *Global freshwater quality, a first assessment.* 306 pp. maps. Blackwells, Oxford, 1989.

Murty, A. V. S. Samba & Subrahmanyam, N. S., *A textbook of economic botany.* 875 pp. illustr. Wiley Eastern, New Delhi, 1989.

Mutis, J. C., *Flora de la Real expedicion, T.9, microspermae, Orchidaceae* III. 56 col. pl, 4 b/w. Ediciones Cultura Hispanica, Madrid, 1985.

Oka, H. I., *Origins of cultivated rice.* 254 pp. 1 col. pl. Scientific Societies Press, Tokyo, 1988.

Pachego, Anthony L. & Smith, Susan L. *Marine parks and aquaria of the United States.* 164 pp. illustr. American Littoral Society/Lyons and Burford, New York, 1989.

PARIS, Foyer Socio-éducatif Lycée Camille See, *L.A.G. Bosc d'Antic.* 197 pp. illustr. C.D.U. et SEDES, Paris, 1989.

Petherbridge, Guy, *Conservation of library and archive material and the graphic arts.* 328 pp. Butterworth, London, 1987.

Obituary

Stanley Wilson Greene B.A., Ph.D., F.L.S. (1928–1989)

Stanley Greene died suddenly at his home in Bilthoven, Holland on 14 June 1989, following a heart attack. He was 61. His premature death represents a sad loss to botany and particularly to bryology and bryologists, throughout the world.

Stanley Greene was born in Co. Cork, Ireland and undertook his early training at Trinity College, Dublin where he obtained a first class B.A. degree in Natural Sciences in 1951. His first appointment was as a Demonstrator in Botany at the University College of North Wales, Bangor, from 1951–55. Here he developed a strong interest in bryophytes through collaboration with Professor P. W. Richards. From 1963 onwards he directed the botanical programme of the British Antarctic Survey, at first on an honorary basis but from 1969–73 as full-time Head of the Botanical Section. During this decade he established the Botanical Section as an internationally recognized 'centre of excellence' in research, with strong encouragement from Professor J. Heslop Harrison of Birmingham, and Sir Vivian Fuchs, the Director of BAS.

In 1973, Stanley transferred to the Institute of Terrestrial Ecology, moving with the BAS Herbarium and five of his staff to the ITE Experimental Station at Penicuik, near Edinburgh. He was appointed Head of ITE's sub-division of Plant Biology in 1975, and remained at Penicuik until accepting a N.E.R.C. Readership in Botany at the University of Reading in 1981. He retained this post until retirement in 1987. In January 1989 he moved from Reading to Holland where he married his second wife, Paula Gradstein just a few months before his death.

Stanley Greene's personal research interests were principally in bryophyte taxonomy and floristics, and in the bibliography of bryology. He undertook extensive fieldwork on the sub-Antarctic island of South Georgia, around McMurdo Sound in continental Antarctica, and in Patagonia, as well as in Alaska by way of bipolar comparison. The results were reported in numerous papers, which also include significant contributions to vascular plant floristics in Antarctic regions.

The bibliographic work gradually assumed increasing importance during the later part of Stanley's career, and in 1988–9 he published, jointly with Dr Alan Harrington, *The Conspectus of Bryological Taxonomic Literature* (J. Cramer, Berlin). This work of some 600 pages comprises two volumes, the first arranged taxonomically and providing an index to monographs and regional reviews, and the second arranged geographically as a guide to national and regional literature. Almost 20 years in gestation, *The Conspectus* will be of incalculable value to bryophyte taxonomists in the years to come.

Stanley Greene's administrative achievements stemmed from his forceful personality, determination and perseverence. He will be fondly remembered as a convivial friend, marked by outstanding qualities of enthusiasm, generosity and loyalty. Sincere condolences are offered to his wife and family on their sad and unexpected bereavement.

An extensive list of publications by Stanley Wilson Greene will accompany an Obituary in *Journal of Bryology*, *16*, 1990.

R. E. Longton

STOP PRESS

Rt. Hon. Richard Luce, MP,
Office of Arts and Libraries,
Horse Guards Road,
London SW1P 3AL

7 June 1990

Dear Mr Luce,

Funding for Taxonomic Research
at the Natural History Museum

I write to you on behalf of the Council of the Linnean Society of London, to express our concern at the low level of funding for taxonomic research at the Natural History Museum.

The recent publication of the Corporate Plan for 1990–1995 by the Director and Trustees of the Natural History Museum has served to emphasize the problems. The Museum obviously is a dual function institution with clear educational responsibilities to produce modern public displays of the highest quality. However, of course the Museum is also one of the premier research institutes in the world for the study of the basic diversity of living organisms, both past and present. Its name is known and respected worldwide as the repository of the primary data base for the study of the earth's flora and fauna, in the form of its enormous and unique collections. The scientists employed by the Museum have a responsibility to curate these collections, to add to them, and to carry out original research on them.

The now widely recognized importance of the diversity of living organisms and of their conservation to our future and to that of our children makes this area of scientific endeavour particularly timely and significant. The Museum's new Corporate Plan seems to us to be an effort to reconcile the irreconcilible. It will just not be possible to continue the scientific work of the Museum at the level required if it is to maintain its preeminent position in the world, given the present level of funding.

I write to request that every effort be made to increase the budget for basic research at the Natural History Museum. This is a matter of great urgency if some of the existing expertise is not to be lost. It might be appropriate if some special grant could be made from the Department of Education and Science for this unique aspect of the work of the Museum staff.

I am sending copies of this letter to both Sir Walter Bodmer, Chairman of the Trustees, and Dr Neil Chalmers, Director of the Museum. Thank you for your attention. I look forward to your response.

Yours sincerely,
PROFESSOR M. F. CLARIDGE
President,
Linnean Society of London