PALAEONTOLOGY NEWSLETTER

The Newsletter for members of the Palaeontological Association
Number 37 1998

http://www.nhm.ac.uk/paleonet/PalAss/PalAss.html

Newsletter copy

Information, whether copy as such or *Newsletter* messages, review material, news, emergencies and advertising suggestions, can be sent in writing to Dr Sue Rigby, Dept of Geology and Geophysics, Grant Institute, West Mains Road, Edinburgh EH9 3JW; fax 0131 668 3184; email `suerigby@glg.ed.ac.uk`. It would be helpful if longer items of copy could be sent on a $3^1/_2$" disk with text in Microsoft Word, WordPerfect or ASCII format. Disks clearly marked with the owner's name and address will be returned as soon as possible.
The *Newsletter* is produced by Meg Stroud, and printed by Edinburgh University Printing Services.

Deadline for copy for Issue No. 38 is 22nd May 1998.

Palaeontological Association on the Internet

The Palaeontological Association has its own pages on the World Wide Web, including information about the Association, and copies of the *Newsletter*. Site-keeper Mark Purnell can be reached by email at `map2@leicester.ac.uk`. The locator is:

`http://www.nhm.ac.uk/paleonet/PalAss/PalAss.html`

Advertising in the Newsletter

Advertising space in the *Newsletter* will be made available at the rates given below to any organisation or individual provided the content is appropriate to the aims of the Palaeontological Association. Association Members receive a 30% discount on the rates listed.

All copy will be subjected to editorial control. Although every effort will be made to ensure the bona fide nature of advertisements in the *Newsletter*, the Palaeontological Association cannot accept any responsibility for their content.

£75 for half a page £130 for a full page

These rates are for simple text advertisements printed in the same type face and size as the standard *Newsletter* text. Other type faces, line drawings etc. can be printed.

Rates for distribution of separate fliers with the Newsletter:

1100 copies for worldwide distribution	£230
850 copies for worldwide distribution exclusive of North America	£200
600 copies for U.K. circulation only	£150

Front cover: Median section through *Iteria cabaretiana* (d'Orbigny); a nerineoidean gastropod from the Upper Kimmeridgian of the Jura (France). Graphics by Mark Purnell, after a drawing by Mike Barker from an acetate peel. Text graphics by Mark Purnell and Lori Snyder.

PALAEONTOLOGY NEWSLETTER

The Newsletter for members of the Palaeontological Association
No. 37

(The Palaeontological Association is a Registered Charity)

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Reminder

The deadline for copy for Issue no 38 of the *Newsletter* is **22nd May 1998**

PRESIDENT'S EDITORIAL

It is a great honour for me to have been appointed to be President of the Palaeontological Association, and I would like to thank the past President, Prof Dianne Edwards, and the Committee for the trust so invested in me.

When I first joined the Association in 1960, it was a small concern, and I remember that the number of people attending the Annual Meeting in December 1964, the first I went to, was no more than 35. Compare this with the 202 delegates at Cardiff in December 1997, a sure testament to the sustained growth of our society, and its promise for the future. Until now, the Association has been run entirely by unpaid volunteers, by busy hard-working individuals who have taken on the onerous duties of office bearers and editors, in addition to all their other work. They have performed sterling service for the Association. But in the academic and other fields, the ever-increasing amount of teaching and administration, and all the extra pressures upon us, have brought us to a level where we cannot any longer run our society on a volunteer basis alone. At the Extraordinary General Meeting of 15th December, delegates voted unanimously for the proposal that we should have, for the first time, a paid Executive Officer. The Association has the funds to take this forward, and the easing of the burden upon some, at least, of our office bearers will be considerable. This is a most important step, and we shall all benefit from it.

At the same time, we are increasing the number of parts per volume of *Palaeontology* to six rather than four, there will be three *Newsletter* issues per year, and we hope to launch more Field Guides and Special Papers. Moreover, there will be new medals and awards from the Sylvester-Bradley and Hodson Funds, and an Amateur Palaeontologist award. All these new developments indicate a very vigorous and active Association, and long may it so remain. Moreover, the Palaeontological Association is a friendly body; it is not divided into cliques or in-groups, and the excellent work done over the years by the members of Council and others has made it so.

For no less than nine years membership subscriptions have remained the same, and they should stay at that level until the millennium. We have received our journal for much less than it is worth. Obviously there will have to be, in due course, an increase in subscription rates, and it will be a jump to a new level. But as before, we intend that this will be sustainable for several years: amongst other things it is much easier on the Treasurer if we do it this way.

Whereas I am honoured to be taking over as President of the Palaeontological Association at a time of considerable, and necessary, change, I find our Society in a flourishing condition. The fact that this is so, financially and otherwise, is largely due to the commitment and enthusiasm of our members, and especially those who have given up so much of their own time to serve the Association in so many ways. The Palaeontological Association was founded forty years ago. It is in better shape now than it ever has been. Long may it continue!

Euan Clarkson,
Edinburgh

ASSOCIATION MEETINGS PROGRAMME

AGM & Annual Address

Linnean Society, Piccadilly, London; Wednesday 18th March 1998

The 41st AGM will be held in the Lecture Theatre of the Linnean Society of London at 2.30 pm.

The AGM will be followed immediately by the Annual Address:

Evolutionary Ecology of Mid-Palaeozoic Marine Faunas

given by Prof. C. Brett, University of Rochester, New York, USA.

At approximately 4pm there will be a wine reception.

Both the AGM and Annual Address are open to all interested parties.

Progressive Palaeontology '98

University of Plymouth, England; Wednesday 27th May 1998

All palaeontology research students (and their supervisors) are invited to this one day conference in the Department of Geological Sciences at the University of Plymouth. Short talks and posters about your work are welcome, especially from first year postgraduates. Further details are available from Gary Aillud and Mark Hylton, Department of Geological Sciences, University of Plymouth, Drake Circus, Plymouth, Devon, PL4 8AA (tel 01752 233121, fax 01752 233117, e-mail `gaillud@plymouth.ac.uk` or `mhylton@plymouth.ac.uk`). More information is also available on the conference website at:

`http://www.science.plym.ac.uk/DEPARTMENTS/GEOLOGY/PROGPAL/progp98.htm`

Annual Meeting

University of Portsmouth; 16-19 December 1998

The Annual Meeting will be held on 16th-18th December, with field excursions on the 19th. It is organized by Drs Mike Barker and David Loydell, Department of Geology, Burnaby Road, University of Portsmouth PO1 3QL (tel 01705 842245, fax 01705 842244, e-mail `Mike.Barker@port.ac.uk`, `David.Loydell@port.ac.uk`).

ASSOCIATION BUSINESS

The Palaeontological Association

Annual Report for 1997

Membership & subscriptions

Membership totalled 992 on 31st December 1997, an increase of 14 from the previous year. There were 677 Ordinary Members, a decrease of 2; 101 Retired Members, an increase of 1; 214 Student Members, an increase of 15; and 223 Institutional Members, a decrease of 5 from last year. Total Individual and Institutional subscriptions to *Palaeontology* through Blackwell's agency numbered 411, down from 412. Subscriptions to *Special Papers in Palaeontology* numbered 105 individuals, a decrease of 5, and 99 institutions, a decrease of 2. A further 65 purchases are made on a regular basis through Blackwell's.

Sales of Field Guides to Fossils

Sales were as follows: *Fossil Plants of the London Clay* – £141; *Fossils of the Chalk* – £696; *Zechstein Reef Fossils and their palaeoecology* – £106; *Fossils of the Oxford Clay* – £717; *Fossils of the Santana and Crato Formations of North East Brazil* – £266; *Plant Fossils of the British Coal Measures* – £554; *Fossils of the Upper Ordovician* – £1,109. The *Atlas of Invertebrate Macrofossils* yielded £25 in income and is now out of print. *The Fossil Record 2* yielded £66 in royalties and *Palaeobiology: A synthesis* yielded £182.

Finance

Volume 40 of *Palaeontology* was published at a cost of £86,396. *Special Papers in Palaeontology* 57 and 58 were published at costs, respectively, of £4,589 and £7,520. *'A Cumulative Index to Palaeontology Volumes 26-39 (1983-1996) and to Special Papers in Palaeontology Numbers 1-55 (1967-1996)'* was published at a cost of £8,000.

The Association is very grateful to Prof. F. Hodson for the final of four covenanted gifts of £1333.34.

Grants from general funds to external organisations, for the support of palaeontological projects, totalled £2,800.

Publications

Four parts of Volume 40 of *Palaeontology* were published during 1997, together comprising 1,109 pages. *Special Papers in Palaeontology* 57-58 were published.

The Association is grateful to Cambridge University Press, the National Museum of Wales and the University of Birmingham for providing storage facilities for publication backstock.

Council is indebted to The University of Edinburgh Printing Services for assistance with the publication and distribution of *Palaeontology Newsletter*.

Meetings

Five meetings were held in 1997, and the Association extends its thanks to the organizers and host institutions of all these meetings.

a. Fortieth Annual General Meeting and Address. 12th March. Held in the Flett Lecture Theatre of the Natural History Museum. The address, 'Hydrothermal vent communities from the origin of life to present day diversity', was given by Prof. J.R. Cann FRS (University of Leeds). Sylvester-Bradley Awards were made to Dr O. Bogolepova (University of Uppsala), Dr S.J. Braddy (University of Manchester), and Dr M. Parkes (Dublin). The eighth Amateur Palaeontologist Award was made jointly to W. Fone (Stafford) and J. Tilsley (Sheffield). The meeting was attended by 42 people.

b. Progressive Palaeontology. 21st May. An open meeting for presentations by research students held in the Department of Earth Sciences, University of Leeds and organized by Peta Hayes. The meeting was attended by 43 people.

c. Lyell Meeting: 'Celebration of the bicentenary of Charles Lyell and James Hutton'. 30th July – 9th August. The meeting to co-celebrate the two bicentenaries was held in London and Edinburgh, with the programme focusing on their achievements and impact on modern thinking.

d. Review Seminar: 'Fins, fangs and phylogeny – the origin and early evolution of vertebrates'. 5th November. Organized by Dr M.P. Smith, Dr I.J. Sansom and Dr P.C.J. Donoghue in the Lapworth Museum, University of Birmingham, and attended by 86 people.

e. 41st Annual Meeting. 15th–18th December. Held at the University of Wales Cardiff and organized by Dr C.M. Berry and Prof. D. Edwards. The President's Award was made to J. Dean (University of Cambridge & Natural History Museum, London) for her talk on the 'Morphological and palaeobiological diversification of the earliest ophiuroids [Echinodermata]'. The first Council Poster Prize was awarded to A. O'Dea (University of Bristol) for his poster entitled 'A new technique for investigating palaeoseasonality'. The meeting included field excursions to the Ordovician of Builth Wells and the Triassic of the Barry and Penarth area. 202 people attended the meeting.

Council

The following members were elected to serve on Council at the AGM on 12th March 1997:

President:	Prof. D. Edwards FRS
Vice Presidents:	Dr P. Doyle, Dr P. D. Lane
Treasurer:	Dr T.J. Palmer
Membership Treasurer:	Dr M.J. Barker
Institutional Membership Treasurer:	Dr J.E. Francis
Secretary:	Dr M.P. Smith
Newsletter Editor:	Dr S. Rigby
Marketing Manager:	Dr A. King
Publicity Officer:	Dr M.A. Purnell
Editors:	Dr B.M. Cox, Dr D.A.T. Harper, Dr A.R. Hemsley, Dr R.M. Owens, Dr D.M. Unwin, Dr R. Wood
Other Members of Council:	Mr F.W.J. Bryant, Dr P. Pearson, Dr M.J. Simms.

Dr Pearson was co-opted as Newsletter Reporter during the year.

Council is indebted to the Department of Palaeontology, Natural History Museum and the University of Wales Cardiff for providing Council Meeting venues through the year.

Council Activities

A noteworthy development in the fortunes of the Association, and perhaps in palaeontology as a whole, is a surge in the number of people attending the Association's meetings. The Annual Meetings in Birmingham and Cardiff both attracted attendances in excess of 200 and a Review Seminar on early vertebrate evolution was attended by 86 people. It is particularly welcome to see a significant number of overseas participants at the Annual Meeting.

During the year, Council made a decision to increase the frequency of publication for *Palaeontology* from the traditional four parts per year to six. This will take effect in Volume 41, and it is hoped that the increased frequency will serve not only to decrease the interval between acceptance and publication, but also to increase the impact of the journal, in both a formal and informal way. The Association celebrated its fortieth anniversary by changing the traditional blue cover of *Palaeontology* to an anniversary ruby red, although the precise hue and chroma may be the subject of some debate; Volume 41 will revert to 'Association Blue'. The year also saw the publication of the latest index to *Palaeontology*, which includes an index for *Special Papers in Palaeontology* Numbers 1-55. The Association is grateful to Valerie Deisler and Prof. Bassett for compiling the indices.

The Association held an Extraordinary General Meeting during the course of the Annual Meeting in order to put to the membership a proposal to appoint a paid Executive Officer to take over some of the administrative burden (see the report in this Newsletter). Following the acceptance of this proposal in principle, the necessary amendments to the Constitution will be put to the AGM in March and, if successful, the post will advertised in the Spring. Following some concern over the printing arrangements for the Association's journals, a sub-committee of Council will investigate the range of alternatives for printing Association publications and will report back in the Spring. It is hoped that any decisions will have been implemented by the end of 1998.

M. P. Smith Secretary

Lapworth Museum, School of Earth Sciences, University of Birmingham, Birmingham B15 2TT UK

REPORT OF THE EGM

University Hall, University of Wales Cardiff

15th December 1997

At the Extraordinary General Meeting of the Association held during the Annual Meeting in Cardiff, Prof. Edwards introduced the proposal to appoint a paid executive officer, explaining the need for such a change and the role of the proposed officer. Dr Palmer outlined the current financial status and Prof. Hancock, who had been asked for an independent review of the financial standing of the Association, reported that the reserves were strong and that the Association could afford the costs of the proposed appointment. After questions from the floor, Prof. Sevastopulo proposed that the Association accept in principle the appointment of a paid Executive Officer; Dr Skelton seconded the motion. The proposal was carried and the necessary amendments to the constitution will be put before the AGM in March (see below).

ANNUAL GENERAL MEETING

Linnean Society, Piccadilly, London

18th March 1998

PROPOSED AMENDMENTS TO THE CONSTITUTION

Following the vote at the December EGM in favour of the proposal to appoint a paid executive officer, a number of small changes to the Constitution need to be made to enable this decision. This also provides the opportunity for several minor amendments which have become necessary since the Constitution was last amended fifteen years ago (see Palaeontological Association Circulars 110 and 113). These latter amendments are mainly in connection with changes to the requirements laid down by charity laws. Deletions from the current constitution are indicated by a ~~strikeout font~~, and insertions by underlining.

It is proposed that:

1) Item 5 be amended so that it reads 'The business of the Association shall be undertaken by a Council and by committees of the Council. The Council shall consist of a maximum of twenty members. The Officers shall consist of a President and, at least, two Vice-Presidents, a Treasurer, a Secretary and an Editor, and such other Officers as the Council may from time to time determine. At any meetings of the Council ~~ten~~ eight members shall form a quorum which shall always include the President, or a Vice-President or the Secretary. The committees of the Council may co-opt members of the Association as non-voting committee members. Committees of Council shall be open to all members of Council. The President shall serve for two years. Periods of service for other Officers shall be flexible but should normally not exceed two years for Vice-Presidents, and five years for Secretary, Editors, and Treasurers ~~and Membership Treasurer~~. Total consecutive service as an Officer (excluding service as President) shall not exceed ten years. Other members of the Council shall be elected for a period of three years. All members of Council are Trustees of the Association in accordance with charity law.'.

2) Item 6 be amended so that it reads 'The Annual General Meeting shall be held on a date in the first ~~four~~ six months in every year. Other meetings shall be held as determined by Council.'.

3) Item 7 be amended so that it reads 'The accounts of the Association shall be made up to 31st December in each year and shall be examined ~~by auditors who shall be appointed by the Council annually~~ in accordance with the requirements of the relevant Charity Acts. ~~Audited~~ Examined accounts shall be submitted to the Annual General Meeting.'.

4) A new Item 10 should be inserted to read 'Council may, as resources allow, employ the services of one or more paid officers, to be known as Executive Officers, to carry out a proportion of the tasks involved in the running of the Association. Paid officers will normally attend meetings of Council but shall not be entitled to vote and will not be Trustees. The appointments of all paid officers will be reviewed on an annual basis.'.

Acceptance of these changes is now proposed by Council and will be voted upon by members at the Annual General Meeting in London on 18th March 1998.

CHANGES TO SUBSCRIPTIONS AND COVER PRICES

It is proposed that:

1) The rate for institutional subscribers is raised from £90 to £95.

2) The rate for institutional subscribers to *Special Papers in Palaeontology* is raised from £55 to £60.

3) The cover price for *Palaeontology* is decreased from £46 to £38.

The rates for ordinary and retired members remain at the level set in 1990 and those for student members at £10.00, the level reduced from £11.50 in 1997. Student membership has remained at £11.50 or the new reduced rate since 1983.

NEWS

THE DEPRAT AFFAIR: EXPLANATIONS AND QUESTIONS

Accused, at the beginning of the century, of having introduced trilobites of doubtful authenticity into the material collected from Vietnam and China (Yunnan), J. Deprat was found culpable by a 'jury d'honneur'. Relying upon the work of M. Durand-Delga (1990), a rehabilitation attempt was made in 1991 at a meeting of the Geological Society of France. Nonetheless, and contrary to the opinion of M. Durand-Delga (1990, p 202), I continue to think that the trilobites in question actually came from European localities (Henry, 1994), a point of view recently confirmed by the researches of R.A. Fortey (1997) in Thailand. The controversy regarding the "Deprat affair" is not therefore extinct, and since no verification has been made since 1991, it seems to me useful to draw attention to certain important points.

1. J. Deprat (1913, p.4) writes: "the probable oldest horizon of which we know at present in Indochina is that which I discovered at Nui-nga-ma in Annam… They are very hard quartzites of a clear yellowish colour… These quartzites with *Tr. Ornatus* of Nui-nga-ma, unfortunately, occur in poor conditions for allowing a stratigraphic series to be established, for they are overlain unconformably by Lower Triassic conglomerates and in any case vanish under paddy-fields of some 2km broad and set on alluvium. I have not yet discovered this horizon at Tonkin, even though it might he expected, given that it is found again in Yunnan, as can be observed between this latter region and Annam". According to M. Durand-Delga (1990, p.194), "the quartzites really do exist in the region of Nui-Nga-Ma"; however, certain questions should be asked. Are these quartzites fossiliferous? Is there, as M. Durand-Delga writes, a genuine horizon in place between the granite forming the hill and the Mesozoic conglomerate? Are there any recent or comparatively recent publications (books or maps) devoted, amongst other things to Nui-Nga-Ma and adjacent regions? If so, do they mention the fossiliferous horizons discovered by M. Deprat?

2. In the same volume (*Memoire du Service géologique de l'lndochine*), J. Deprat (1913, p.7), described a geological section near Lang-chiet, in the basin of the Black River. In the succession J. Deprat cites "the stage with marls of Ban-Hom", showing at its base a fine greenish sandstone with *Acidaspis quadrimucronta* MURCH., *Cyphaspis* cf. *convexa* MANSUY, *Dalmanites Iongicaudatus* MURCH. var. *orientalis* C. REED. J. Deprat adds: "the interest of this series resides in the presence of a thin band of fine friable sandstone, of a green colour, in which I collected species of Trilobites, interesting because of their affinities with the Trilobites of Dudley and Bohemia". In a footnote, the author specifies that *Acidapsis quadrimucronatus* is a trilobite from Dudley. His Figure 7, entitled "detail of the Gothlandian at Lang-chiet" shows at no. 3 the fossiliferous sandstone bed. Here again, it would be interesting to know if the geological map mentions the existence of Silurian at Lang-chiet or its immediate environs; does the sandy bed from which J. Deprat states that he collected trilobites actually exist? If so, what fossils does it yield?

It is surprising that these elementary verifications, certainly possible with the aid of Vietnamese colleagues, have not been made. The attempt to rehabilitate the geologist J. Deprat, at the very least hasty, is all the more regrettable since it is accompanied by an unjustified condemnation of the palaeontologist H. Mansuy, as presented in the work of M. Durand-Delga (1990 p.184) as well as in other publications (for example "Le Monde" dated 7 August 1991) as an unreliable person, who had wrongly accused one of his colleagues of fraud.

Finally, as regards the Silurian trilobites of Lang-chiet, it must be said that the introduction of European species into the material collected, by a third person (unknown to J. Deprat), when account is taken of the text and figure published by J. Deprat (1913), remains highly improbable.

References.

Deprat. J. (1913). Note sur les terrains primaires dans le Nord-Annam at dans le bassin de la Rivière-Noire (Tonkin) et sur la classification des terrains primaires en Indochine. *Mémoires du Service géologique de l'Indochine* **2**, 1-22.

Durand-Delga, M. 1990. L'Affaire Deprat. *Travaux du Comité français de l'Histoire de Géologie (Cofrhigeo)* **4**, 117-212.

Fortey, R.A. 1997. Late Ordovician trilobites from southern Thailand. *Palaeontology* **40**, 397-449.

Henry J-L. 1994. The trilobites of the "affaire Deprat". *Alcheringa* **18**, 359-362.

Rebeyrol, Y. 1991. Jacques Deprat, l'homme démoli. *Le Monde*, 7 August 1991, 9-10.

Jean-Louis Henry,
Micropaléontologie et Paléontologie Marines,
Université de Rennes 1, Campus de Beaulieu, 35042 Rennes cedex, France

GEOLOGICAL SURVEY OF IRELAND

The new type/figure catalogue of the Geological Survey of Ireland is just published:

Parkes, M.A., and Sleeman, A.G. 1997. *Catalogue of the Type, Figured and Cited Fossils in the Geological Survey of Ireland.* x + 124 pp. Geological Survey of Ireland, Dublin.

It is available to members at a 50% discount price of £5 plus £1 postage and packing, from Geological Survey of Ireland, Beggars Bush, Haddington Road, Dublin 4, Ireland.

CATALOGUE OF PALAEONTOLOGICAL TYPES IN AUSTRIAN COLLECTIONS

This database project (financed by the Austrian Academy of Science, the Austrian National Bank and the Natural History Museum Vienna) has been an ongoing endeavour for several years. Currently more than 26,000 palaeontological types (plants and animals, figured and unfigured specimens) from ten Austrian institutions have already been included.

The information for every specimen includes the:

1 generic (sub-) name
2 species (sub-) name
3 author(s) of the species (sub-)
4 information on the geographic and stratigraphic position
5 reference and illustration
6 status of the type
7 collection file number
8 institute (where the material is kept)

A restricted version of this database is now accessible on the World Wide Web, via the address:

`http://www.oeaw.ac.at/~oetyp/palhome.htm`

It contains the data on items 1 to 3 and 5 to 8 above, and provides the opportunity to combine up to four criteria in one search run. Four different sorting possibilities are available for the output of the results. More detailed information on the objects is available from the collection curators at the respective institutes. An address list enables the user to contact the responsible persons there.

All the references for which types have already been included in the database are listed alphabetically (now more than 800).

As the data input is an ongoing process, regular updates will be provided.

Contributing Institutions:

- Geologische Bundesanstalt Wien
- Karl-Franzens Universitaet Graz:
  Institut fuer Botanik
  Institut fuer Geologie und Palaeontologie
- Krahuletzmuseum Eggenburg
- Landesmuseum Joanneum Graz
- Naturhistorisches Museum Wien
- Universitaet Innsbruck:
  Institut fuer Geologie und Palaeontologie
- Universitaet Wien:
  Institut fuer Geologie
  Institut fuer Palaeontologie
- Vorarlberger Naturschau Dornbirn
- Johanna Kovar-Eder,
  Natural History Museum Vienna,
  Geological-Palaeontological Department, Burgring 7, A-1014 Vienna, Austria

NEW PUBLICATION: PALAEONTOGRAPHICA CANADIANA NO. 14

Palaeontographica Canadiana is a monograph series of major contributions to Canadian palaeontology that is dominantly, but not exclusively, systematic in content. The series is sponsored jointly by the Canadian Society of Petroleum Geologists (CSPG) and the Geological Association of Canada (GAC).

Palaeontographica Canadiana No. 14 – Silurian encrinurine trilobites from the central Canadian Arctic by Jonathan M. Adrain and Gregory D. Edgecombe. 1997, 109 pp. (incl. 35 pls). ISSN 0821-7556, ISBN 0-920230-63-7. Published December 5, 1997.

Summary

Carbonate debris flow deposits in the Cape Phillips Formation of the central Canadian Arctic Archipelago contain rich silicified shelly faunas, and preserve the most diverse and complete record of Wenlock trilobites known from anywhere in the world.

This work systematically describes the encrinurine trilobites of these faunas (28 species in total, including 11 new species), along with six stratigraphically successive trilobite faunas. A comprehensive phylogenetic analysis of the Struszia genus group also provides an explicit hypothesis of cladistic structure.

Due to different methods of calculating postage and handling costs, prices from the two distributors vary depending on destination. For Canadian orders: from GAC $44.50 CAN (incl. taxes, postage); from CSPG $36.00 CAN + $3.75 CAN postage + appropriate CAN taxes. For US orders: from GAC $44.50 US (incl. postage); from CSPG $36.00 CAN + $7.50 CAN postage. For International orders: from GAC $44.50 US (incl. postage); from CSPG – contact CSPG through the Internet home page `http://www.cspg.org` for exact costs for international post.

Coming soon…

Palaeontographica Canadiana No. 15 — S. Pinard et B. Mamet. *Taxonomie des petits foraminifères du Carbonifère Supérieur-Permien inférieur du bassin de Sverdrup, Arctique canadien.* 43 pls. (early 1998).

Palaeontographica Canadiana No. 16 — *Valanginian Foraminifera and biostratigraphy of the McGuire Formation, Northwest Territories.* S.P. Fowler and J. Dixon. 7 pls. (ms with senior author for final revision).

Palaeontographica Canadiana No. 17 — *Late Ordovician to Early Silurian strophomenid brachiopods from Anticosti Island, Quebec*. K. Dewing. 31 pls. (ms with author for final revision).

Publication Distribution Offices

Geological Association of Canada Publications, Department G222 Department of Earth Sciences Memorial University of Newfoundland St. John's, Newfoundland A1B 3X5 (tel (709) 737-7660, fax (709) 737-2532, e-mail `gac@sparky2.esd.mun.ca`, Web Home Page `http://www.esd.mun.ca/~gac`).

Canadian Society of Petroleum Geologists #160 - 540 -5th Avenue SW Calgary, Alberta T2P 0M2 (tel (403) 264-5610, fax (403) 264-5898, Web Home Page `http://www.cspg.org`).

Sandy McCracken
Geological Survey of Canada

NEW INTERNATIONAL GROUP: MARINE PALAEOBIOGEOGRAPHIC CLASSIFICATION

Our group was founded in 1996 with the immediate aims:

(1) To find a consensus of the principles of palaeobiogeographic classification and nomenclature of palaeobiogeographic units (biochores) that are congruent with neobiogeography, by open discussion among a few representatives of the major "fossil" taxa throughout the Phanerozoic, and

(2) To apply these principles to the published (palaeo-) biochores by compiling all named units on a single set of maps and to analyze synonymies and homonymies.

Other aims are to extend this classification to the terrestrial biomes, and to enhance palaeobiogeography in general by a simplified and standardized terminology.

I have requested our incorporation in the *International Paleontological Association* as "Friends of Palaeobiogeography", functioning as a working group. As a formal group, we may request small rooms for Friends' meetings at national and international conferences. I will do so for the 1998 Intl. Jurassic Conference in Vancouver and the 1998 GSA meeting in Toronto.

Organization:

Project leader:	Gerd E.G. Westermann, Hamilton, Canada
Palaeozoic:	
coordinators:	Luis Benedetto, Cordoba, Argentina (Cam.-Ord.); Arthur Boucot, Oregon (Sil.-Dev.); [representative for Carb.-Perm. to be designated]
Porifera:	Keith Rigby, U.S.A.
Stromatoporoidea:	Carl W. Stock, U.S.A.
Cnidaria:	William A. Oliver, Jr., U.S.A.
Trilobita:	Brian D. E. Chatterton, Canada
Bryozoa:	Nils Spjeldnaes, Norway
Brachiopoda:	Arthur J. Boucot, U.S.A. [Dave Harper, quantification]
Cephalopoda:	Rex E. Crick, U.S.A.
Bivalvia:	T.M. Sanchez, Argentina
Graptolithida:	E. Brussa, Argentina
Mesozoic:	
coordinators:	Kevin Page, Okehampton, Essex, U.K.; Fabricio Cecca, Urbino, Italy (Mediterranean/Tethys)
Nannoplankton:	Alan R. Lord, U.K. Paul Bown, U.K.
Dinoflagellata:	James B. Riding, U.K.

Ostracoda:	Robin Whatley, U.K.
Brachiopoda:	Miguel Mancenido, Argentina.
Bivalvia:	Susanna Damborenea, Argentina. J. A. Crame, U.K. [Jack Grant-Mackie, regional rep.] [A. Hallam, member-at-large]
Ammonoidea:	Kevin Page, U.K. Fabricio Cecca Raimond Enay [Gerd Westermann, Project leader]
Belemnitida:	Walter K. Christensen, Denmark. Peter Doyle, U.K.

Cenozoic/Recent:

coordinator:	Edward J. Petuch, U.S.A.
Nannofossils:	Paul R. Bown, U.K.
Cnidaria:	Brian Rosen, U.K.
Gastropoda:	Eduard J. Petuch, U.S.A.
Bivalvia, etc:	Karl W. Flessa, U.S.A.

Quantification of biochores: David Harper, Ireland

Regional representatives:

Mediterranean/Tethys:	Fabricio Cecca
E. Europe/Russia:	Irena I. Sey
Australasia:	Jack Grant-Mackie

Terrestrial palaeo- and neobiogeographers:

Vertebrates (Mes. Rept.)	Ralph Molnar, Australia
Plants (fossil-Rec.):	Mary Dettman, Australia

Neobiogeographers-at-large:

John C. Briggs, U.S.A.
Gustave Paulay, Guam – U.S.A.

Members-at-large:

Co-editor J. Biogeog., Palaeo-3, etc.:	Anthony Hallam, U.K.
Co-editor Oxford U.P. Biogeog. Series:	Brian Rosen, U.K.
Intl. Subcomm. Strat. Class.:	Alberto C. Riccardi, Argentina
Palaeogeographer:	Chris Scotese

Preliminary opinions:

The 22 questionnaires returned (total circulated ca 30) indicate the following preliminary concerns:

1. Hierarchy of biochores (biogeog. units): Realm, (Subrealm), Province, (Subprovince), (Endemic Centre); Region informal or instead of Subrealm. However, this terminology differs from that of neobiogeographers, who use Belt/Zone for climate-based units, e.g. North Temperate Realm; Realm to distinguish pelagic from benthic oceanic biota; and Region as the highest true biochore.
2. Biochore definition should be based on a biota – not on a single higher taxon when a diverse fauna is present (as has been common use!), nor on biased death-assemblages, e.g. mixed pelagic/benthic.
3. Biochores were highly dynamic through time, in their biotas as well as geographic extent, and they may disappear entirely at extinction events. This should be reflected in the changing hierarchy of a specific biochore. There are lots of problem here: quantitative methods as well as agreement on scaling of the hierarchy are required.
4. Nomenclature of biochores: Names should be based on geographic/geologic names (not climate or taxa; but Boreal and Austral are considered geographic names). Priority should be the guide (not rule) to achieve stability of nomenclature, conditional on proper definition and utility of the units.

Future actions:

1. Survey of marine biochores. The Coordinators (see above) have now been given the latest palaeogeologic world maps (C. Scotese: PALEOMAP PROJECT 1997) and have begun the large task of compilation of all published marine biogeographic units.
2. Informal discussion meetings of our group will be arranged at international meetings of the major geological and palaeontological societies/associations. I have requested a room for the August 1998 Jurassic conference in Vancouver and will do so for the October 1998 Toronto meeting of the Geol. Soc. America. The Coordinators are requested to arrange other discussion meetings. Everybody is most welcome to participate at these informal get-togethers.

Gerd E.G. Westermann,
School of Geography and Geology,
McMaster University, Hamilton, Canada L8S 4M1

LIFE AND DR HUTTON

1997 was a year of celebrations for geology, with the bicentenaries of the death of James Hutton (1726-1797) and the birth of Charles Lyell (1797-1875). The two great Scotsmen were remembered in style by the scientific world (if not the media) with lavish international conferences held in Edinburgh and London. Hutton and Lyell stand out from many other figures from the early history of geology in that their science concerned cycles and processes, not just maps and strata. As speaker after speaker at the twin conferences emphasised, this kind of dynamic thinking is still very much key to the earth sciences.

But what, specifically, do palaeontologists owe to these revered figures? In the case of Lyell, the answer is that we owe a great deal. The whole second volume of the *Principles of Geology* is devoted to the history of life, and was hugely influential in its day. Perhaps one reason why palaeontology is now so firmly embedded in the geological sciences, rather than with the life sciences where arguably it belongs, has much to do with the work of Lyell. It can even be held that Lyell's statistical treatment of species originations and extinctions was a distant herald of modern analytical palaeobiology.

Hutton, on the other hand, belonged to an earlier age when scientific knowledge of fossils was much more rudimentary. He admitted that his main interest in "figured stones" as he called them was not so much their biological affinity, but their mineralogical nature. True, he did specifically argue that fossils could be used to infer the original nature of particular environments, for example by distinguishing land and sea objects. However, he was also a strong advocate for the then standard view that each species was a divine creation, and fossils represent essentially the same species as are found today: "There are, indeed, varieties in those species, compared with the present animals which we examine, but no greater varieties than may perhaps be found among the same species in different quarters of the globe". This is from possibly the first geologist to chip fossils from the Coniston limestone!

Given this, it is a curious fact that Hutton anticipated Charles Darwin by more than half a century by outlining the principles of evolution by "natural selection" (although he did not use Darwin's phrase). I was amazed when I first learned of this from an article written 50 years ago by E.B. Bailey to mark the 150th anniversary of Hutton's death. Bailey had uncovered a lengthy unpublished manuscript of Hutton's entitled *Elements of Agriculture*, in which the idea of adaptation through random variation and selective survival is briefly articulated. Perhaps because the work is unpublished, it has scarcely received the attention it deserves. Whole books have been written on the history of evolutionary thought that make no mention of Hutton, except in relation to his geology.

In his review of Hutton's writings, Bailey admitted understandable fatigue in reading the great man's circumlocutory prose, and so he skipped the voluminous metaphysical works on the grounds that little of interest was likely to be found there. Unknown to Bailey, there is a whole chapter devoted to "natural selection" languishing in the middle of the second volume of Hutton's recondite thousand-page *Investigation of the Principles of Knowledge* (1794). I am not, I hasten to add, the first to notice this, but curiously it has never been discussed in any detail. The account is longer and more logically structured than that in the *Elements of Agriculture*. Surely this published account cannot be ignored by historians, even if few people have ever read it.

Hutton was a farmer and had a first-hand knowledge of animal husbandry, so perhaps, like Darwin, artificial selection was a key insight for him. For example, he was outspoken in his praise for Robert Bakewell's selective breeding of Longhorn cattle. In re-reading the *Elements of Agriculture*, I was delighted to discover that Hutton had conducted experiments in plant growth and nutrition, finding

that the variation in luxuriance caused by differences in nourishment was not inherited. He also noted that in sexual reproduction, although not in grafting, individuals tend to differ from their parents, and that such differences are heritable. This was the basis for his formulation of "natural selection". However, as we have seen, Hutton held that species were independent creations. The power of self-adaptation in species was cited by him as an example of divine wisdom, whereby species had been supplied with a means of responding to change without continuous intervention from the Creator, and yet remain perfectly adapted.

For those interested in this subject, I hope to write a fuller account of Hutton's biology for publication elsewhere. Meanwhile, I have posted the text of the relevant chapter from the *Investigation* on the World Wide Web at

`http://palaeo.gly.bris.ac.uk/personnel/hutton1794`

and I can also supply it on request. Below are a few choice quotations from this work.

"The essential property of a species, among living bodies, consists of this, that each individual have [sic] the capacity of breeding with the rest, in such a manner as the offspring may continue to augment the race. Great variety may be admitted among the individuals of a species, provided that they have this property; and, without this property, different individuals may resemble much, without being both of the same species."

"…if an organised body is not in the situation and circumstances best adapted to its sustenance and propagation, then, in conceiving an indefinite variety among the individuals of that species, we must be assured, that, on the one hand, those which depart most from the best adapted constitution, will be the most liable to perish, while, on the other hand, those organised bodies, which most approach to the best constitution for the present circumstances, will be best adapted to continue, in preserving themselves and multiplying the individuals of their race.

"Let us, for example, suppose that a race of dogs are so situated, that nothing but swiftness of foot and quickness of sight could be useful, in procuring to them the necessities of life; it must be evident, that the most defective in respect of those necessary qualities, would be the most subject to perish, and that those who employed them in greatest perfection would be best preserved, consequently, would be those who would remain, to preserve themselves, and to continue the race; and, this race would continue, in those circumstances, to preserve itself in all its perfection. But, let us change the circumstances of this race, and let us suppose, that the acuteness of his smell were more necessary to the sustenance of the animal, than the sharpness of his sight, or the swiftness of his feet, in that case, the natural tendency of the race, acting upon the same principle of seminal variation, would be to change the qualities of the animal, and to produce a race of well scented hounds, instead of those who catch their prey by swiftness.

"The same principle of variation must influence every species of plant, whether growing in a forest or a meadow; The plant which is the best adapted to the climate, and the soil, will continue to prosper in the place. But, the most prosperous plant must be that which will furnish, with its maturated seed, a vigorous race of fertile plants; and, these will be more and more accommodated, in the varying power of vegetation, to the soil and circumstances in which they grow."

Paul Pearson
University of Bristol

MUSEUM CORNER

Dudley – a National Heritage

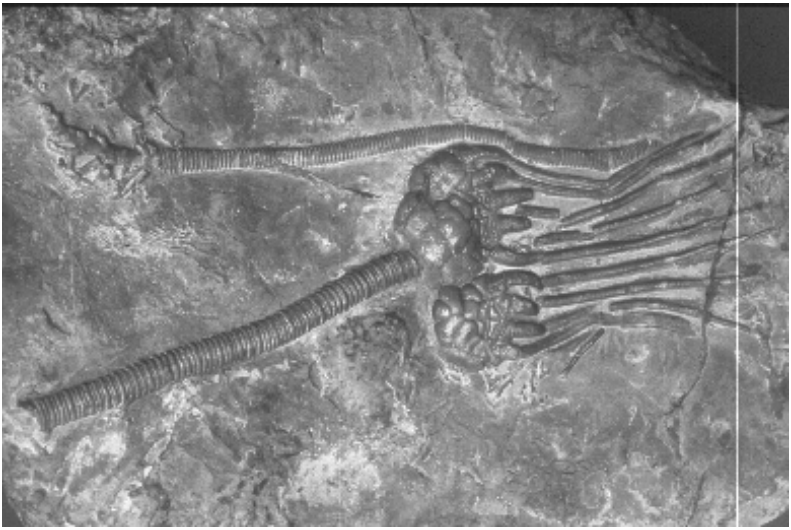
Le petit calcare de Dudley qui a enrich le monde entier. (Gignoux)

Pick up any general book on palaeontology and you are almost certain to come across fossils from Dudley. Situated at the heart of the English Midlands, Dudley has long been famous for the superb quality of its Wenlock Limestone fauna – notably crinoids, corals and trilobites, of which the most celebrated – *Calymene blumenbachii*, better known as the 'Dudley Locust' or 'Dudley Bug' – has pride of place in the town's coat of arms.

Much of the finest material was found in the last century, when the mines under the town's twin hills, Wren's Nest and Castle Hill, were turning out thousands of tons of limestone each week for the Black Country iron industry. Specimens sold through local fossil shops at the time are now to be found in museum collections throughout the world and figured in countless publications.

In 1956, long after the last mine had ceased operation, Wren's Nest was designated Britain's first National Nature Reserve for geology. It remains one of the most popular destinations for students of geology and fossil collectors (although a strict code of collecting is enforced). It has remained an under-utilised resource, however, and one whose scientific significance is not fully appreciated.

To view Dudley simply as a source of pretty fossils is to misunderstand its importance completely. The Much Wenlock Limestone Formation of Dudley contains the most diverse and abundant fossil fauna in the British Isles. To date over 600 species of marine invertebrate have been described, representing some 29 major fossil groups. 186 taxa have Dudley as their type locality; 63 taxa are unique to the locality.*



1. Marsupiocrinus from the Dudley Museum collection

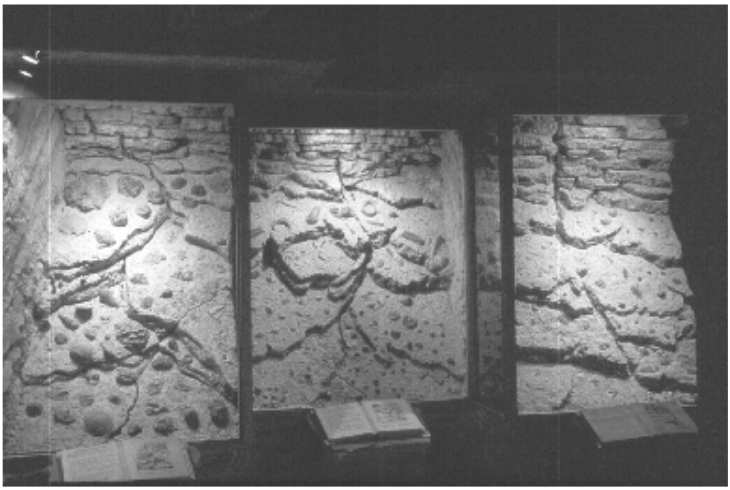
Dudley boasts a faunal assemblage markedly different to that of the Wenlock type section in the Welsh Borders. Its palaeoecology is that of a carbonate shelf ecosystem, comparable today to the crinoidal banks off the coast of Jamaica. The majority of its echinoderm fauna are unique to the area. British Wenlock cystoids and carpoids are recorded only at this locality. Rare and important life fossil lagerstätten are represented by beds of articulated crinoids. These perfectly preserved remains were discovered mostly by miners in the 19th century. They owe their existence to rapid burial by influxes of terrigenous mud during brief tropical storms or waterlain volcanic ash deposits. Recently, rare plant and annelid remains have also been discovered at Wren's Nest, the latter containing what is believed to be soft tissue.

For all its importance, the palaeontology of Dudley's Wenlock Limestone has been greatly under-researched. Some fossil groups have scarcely been examined since Murchison's Silurian System (in which incidentally, more Wenlock taxa were described and figured from Dudley than all the other localities put together). Clearly there is a need to improve this situation.

A current bid by the local authority to have the Wren's Nest / Castle Hill area nominated as a World Heritage Site – a bid founded largely on palaeontology – may re-focus minds. Whether this is the case or not, we at Dudley are keen to enlist the support of the palaeontological community in our efforts, and the Palaeontological Association in particular.

For those members wishing to visit Dudley, a joint trip to Wren's Nest and Dudley Museum is recommended. Wren's Nest has a new interpretive classroom part-funded by English Nature and the Geologists' Association. More ambitious plans for facilities commensurate with the site's importance are on the drawing board, but have yet to be realised.

Dudley Museum boasts a small but memorable geological gallery, *The Time Trail*, which features the cream of Dudley's superb fossil collection, displayed in artificial rock faces that replicate faithfully the local limestone strata. Celebrated for its innovation, the gallery was commended in the 1993 Museum of the Year awards. An article on the gallery is featured in *Geology Today Vol.10, No.2, p.68-69* (1994).



2. Wenlock fossils embedded into artificial rock faces in Dudley's Time Trail gallery.

'Over and Under Dudley' excursions taking in Wren's Nest, the Museum and a narrowboat trip into Dudley's limestone caverns make for a unique day out, and the opportunity to explore Dudley's geological treasures from all angles. Enquiries are welcomed.

*The accompanying list, prepared by the author, summarises the results of several years' work with the help of many experts in the field. It is as exhaustive as possible at the present time, but owing to a lack of recent research, only several groups (trilobites, crinoids, brachiopods and the microfossils) can be said to be reasonably accurate.

Faunal List Statistics

Faunal Group	Type Locality Dudley	Found Only At Dudley	Total Number Of Species
Acritarchs	n.a.	n.a.	65
Annelids	n.a.	n.a.	1
Asterozoans	3	3	4
Bivalves	?10	?	39
Brachiopods	15	0	48
Bryozoans	28	0	66
Cephalopods	6	4	42
Chitinozoans	n.a.	n.a.	9
Conodonts	?0	0	8
Conularids	4	2	5
Cricoconarids	0	0	3
Crinoids	?39	?39	74
Cystoids	5	3	7
Carpoids	1	?0	1
Eurypterids	0	0	2
Gastropods	?9	?	45
Graptolites	0	0	5
Machaeridians	2	1	2
Miospores	n.a.	n.a.	1
Miscellanea	n.a.	n.a.	3
Ostracods	11	4	39
Poriferans	?0	?0	1
Plants	n.a.	n.a.	1
Rugose corals	7	0	36
Stromatoporoids	1	0	6
Tabulate corals	11	0	40
Trilobites	34	7	50
Total:	186	63	603

('n.a.': data not available at present)

Colin Reid,
Keeper of Geology
Dudley Museum

Palaeo-Comment

As I approach retirement I welcome the opportunity offered me by Sue Rigby to cast my mind back over my career, especially because I have had the good fortune to experience times of dramatic scientific changes which have significantly altered the perception of how we view the world. The most notable event, of course, was the plate tectonics revolution in the late 1960s. Having had a long-standing sympathy towards continental drift I responded with alacrity to pursue the palaeobiogeographic implications, an interest which persists still, although the major excitement is now over. It is more appropriate, however, in this essay, to review some of the most important changes, as I see them, that have taken place strictly within palaeontology.

My undergraduate experience at Cambridge was of an intellectually dull subject taught in a drearily unimaginative way. It was epitomised by the so-called Students' Series, a collection of some 400 British fossils that we were required to learn, like so many French irregular verbs. The joke among us was that we could distinguish *Lingula* from *Lingulella* by the matrix, the latter being a piece of dark grey slate. One felt that we were being trained to be geologists of the type employed by the Geological Survey in the 19th century, who could presumably map geologically virgin territory and be able to distinguish Silurian from Jurassic. No wonder that one of my supervisors, a petrologist, contemptuously dismissed palaeontology as "counting the hairs on graptolites". As this remark suggests, the subject had a low status among other subdisciplines in the Earth sciences, and no wonder. While this may not have changed much in certain quarters, it is now more likely to be a matter of ignorance and narrow-mindedness than it used to be, because of the advances that have been made since the 1950s.

Initially, and throughout the 1960s and beyond, the most important advances were in the field of palaeoecology, and the clear demonstration of how valuable fossils could be as palaeoenvironmental indicators. Thus palaeontology could be something more than a mere "handmaiden of stratigraphy". There is an interesting parallel with the emergence of sedimentology as an independent subdiscipline, which took place at about the same time. In both fields, what were exciting original advances in the 1960s and early 1970s are now standard material for undergraduate textbooks, and interest has moved on to more comprehensive facies interpretation involving both sequence stratigraphy and geochemistry, for which palaeoecology and sedimentology are essentially little more than relevant tools. I sense that in recent years sedimentology has rather lost its way as an independent discipline, and am thankful that my primary interest is in the fossil record, where there is so much variety still to explore.

Palaeoecology is, however, like the extremely valuable albeit rather pedestrian subject of biostratigraphy, essentially a geological discipline, and what most excited me early in my career was the emergence of a more biological approach to fossils, epitomised by the rapid adoption of the term palaeobiology, coined by the late Tom Schopf for the eponymous journal that he founded. My initial interest in evolution was stimulated during my research student days at Cambridge by a study of *Gryphaea*, which had been the subject of a classic piece of research in the 1920s by A.E. Trueman. His claim that in the basal Lias of Glamorgan and elsewhere there was a gradual transition from flat *Liostrea* to highly incurved *Gryphaea arcuata* quickly became adopted in the textbooks as a prime example of orthogenesis. Although my research on the Blue Lias was primarily palaeoecological, I couldn't avoid both noticing and collecting numerous oysters, and it soon became apparent, even from casual inspection, that there was no evidence whatever of the sort of transition between *Liostrea* and *Gryphaea* that

Trueman had claimed. Moreover, the increased coiling of the left valve of *G. arcuata* up the Sinemurian succession was evidently a consequence of a combination of size increase and allometric growth.

Trueman was widely acknowledged as a pioneer in the statistical treatment of whole assemblages of fossils, and he emphasised in his classic paper that it was necessary to collect at least 50 specimens from each horizon. So where were all the specimens he claimed to have collected? I enquired at the Geology Department at Swansea, where he was the first Professor of Geology, and at Glasgow, where he went subsequently, at the National Museum in Cardiff and the British Museum (Natural History), as it was then known. The enquiries were in vain – there was no Trueman collection. When I put this to L.R. Cox, the distinguished bivalve and gastropod expert at the last named institution, he replied that he wasn't at all surprised because he believed that Trueman had concocted the whole story (and I swear these were his exact words). I had begun to suspect as much but would never have dared to say so in print. Instead I endeavoured to beat Trueman at his own game by using the newly fashionable bivariate statistics. The first published reaction to my paper in the *Geol. Mag.*, which provoked some murmuring in high places, was an intemperate attack by the aged Professor Swinnerton, who evidently still regarded Trueman as his star pupil. More significantly, a couple of people, who knew more about biostatistics than I did, entered the fray to argue both with me and each other, so that the wider public was left somewhat confused. In retrospect I regret that I did not put any pictures of the relevant fossils in my paper, because I could have made my point so much more effectively in that way. The whole exercise made me rather cynical about the use of statistics, about which it can be said with some truth that if a pattern of change is obvious on visual inspection you don't need statistics, but if it is not, no number of probability statistics will persuade the sceptic. Within a few years the controversy ceased, when specimens resembling a diminutive *Gryphaea arcuata* were reported from the Upper Triassic of the Arctic. The species had evidently migrated into the British area in the late Hettangian, as I had maintained.

Returning to the emergence of palaeobiology, it was an entirely American phenomenon, and I was privileged to be well acquainted with most of the leading protagonists. I still recall with great pleasure the considerable intellectual stimulus provided by the new debates involving such varied subjects as modes of speciation, heterochrony and the origin of phyla, followed somewhat later by analysis of variations of diversity and organic turnover with time and their relationship with radiation and extinction events. In the last few years the very interesting issue of disparity, as opposed to diversity, has emerged as a worthy subject of investigation, most notably for its bearing on the significance of the Cambrian radiation. Evolutionary biologists could no longer ignore the fossil record, as they had for most of this century. In John Maynard Smith's celebrated words, palaeontology had at last been admitted to the high table of evolutionary research. In my view the modern advances in palaeobiology have been dominated by the Americans and the British, but they have tended to be along somewhat different lines.

The prime American contribution, epitomised by many of the papers in *Paleobiology*, has laid emphasis on broad patterns and theoretical issues, whereas the British have followed a more empirical tradition stressing the importance of thorough, insightful morphological analysis of fossil specimens and well argued functional interpretations. This is well exemplified by the justly acknowledged breakthroughs in study of the Burgess Shale fauna and the nature of the conodont animal and earliest tetrapods. I consider that the two approaches are equally valuable, so long as there is a healthy interaction between the participants, and an emphasis laid on testing models, something that palaeontologists had

tended to ignore in the past. I had this in mind during my spell as President of the Palaeontological Association by proposing that the annual meeting at Swansea be devoted to the subject of evolutionary case histories from the fossil record (published as *Special Papers* no. 33), in which British palaeontologists could test models on such subjects as phyletic gradualism versus punctuated equilibria, and species selection.

The other striking change during my career, in which I have merely been an intrigued bystander, has been in the field of taxonomy and systematics. The advent of high speed computers in the 1970s provoked a burgeoning interest in numerical taxonomy and phenetics, with the attempt to eliminate subjectivity by measuring as many characters as possible and declining to weight them. At about the same time the completely different approach of cladistics, where the emphasis is on derived as opposed to primitive characters, began to be adopted in some institutions, most notably the American Museum of Natural History in New York and the Natural History Museum in London. There followed lively and often acrimonious debates between pheneticists and cladists, and of both with the more traditionally minded systematists who preferred still to think in terms of evolutionary grades. Richard Fortey has written an engaging account of these conflicts in his recent book *Life: an unauthorised biography*, and I will only add here the astonished dismay I felt in the early 1980s at the emergence of an exceptionally zealous group calling themselves "transformed" or pattern cladists, who both denied the value of fossils and maintained provocatively that one could use cladistic methods without even believing in evolution. Since Hennig's method is based fundamentally on the Darwinian assumption of descent from a common ancestor, and makes no sense otherwise, I was provoked to write that the pattern cladists' stance was tantamount to climbing out on a branch of the tree of life and proceeding to cut it off!

More recently, thank goodness, common sense has prevailed, and the value of fossils in providing key information on both stratigraphic order and morphologies not present in the biosphere today is generally accepted. The less extreme version of cladistics has won the battle quite decisively, as possessing a logic and coherence lacking in any alternative taxonomic system. In the future we are likely to be concerned increasingly with molecular tests of phylogenetic schemes. The University of California at Berkeley is the first university where the palaeontologists have their own molecular biology laboratory, PCR and all. Younger members of the Palaeontological Association should take due note of this development and draw the appropriate conclusions.

Tony Hallam,
University of Birmingham

Palaeo-Reply XCVI

I wish to add my comments to the growing body of correspondence concerning "Specimens in private collections". I fully sympathise and support the views of Steve Etches (*Palaeo*-**Reply** II, *Newsletter* **33**:16). As an amateur with an interest in the Jurassic of Dorset I have, for thirty years, monitored, recorded sections and collected bed by bed from most of the famous, and almost all of the temporary exposures that have become available in the Inferior Oolite of the region; always with the full cooperation of the land owner and other bodies who may have introduced restrictions (English Nature in the case of SSSIs). Does any museum or other institution have the time and resources available, or indeed the interest, for the undertaking of such a task? In reality, it is only the individual who is prepared and able to invest the time and effort – often at considerable personal and financial cost – to make a detailed and comprehensive collection and in the course of it acquire a specialised expertise second to none.

Visitors to my collection include an international selection of ammonite workers, often as interested in my views on the Dorset geology as in the specimens themselves. The collection therefore represents more scientific information than the sum of its parts, while it remains in my hands. It could easily be argued that collectors such as I are best disposed to care for the material. The point has been made "They are, in truth private collections which can be dumped or sold the day after the palaeontologist retires" (*Palaeo*-**Reply** IV, *Newsletter* **33**:21). This statement was in reference to university departmental 'research' collections, but clearly applies to a much broader range of collections. In private hands, under a binding agreement, such a sell off should never happen.

My collection, which includes a number of types and specimens of which figures have been published in reputable scientific journals, probably represents one of the best biostratigraphic collections of lower Middle Jurassic ammonites in Britain. I fully realise the importance of my material and have made a will ensuring that the collection in its entirety will be donated to the Sedgwick Museum, Cambridge. David Norman of that museum is in possession of a copy of that document. I think it is important to point out that I spent some time considering which institution to donate my collection to. In some museums the level of neglect is inexcusable. For example, a few years ago I visited the Whitby museum only to see some of Martin Simpson's specimens, some of which may be members of type series (Type Ammonites – S.S. Buckman, 1909-1930), rotting into piles of dust for all to see in public display cabinets. Who would claim that such an example of neglect is unique to Whitby?

It seems to me that each case must be judged individually. Would it not be possible to have a standardised form of legally binding contract which gives an institution unquestioned ownership in the event of a collector's death? I agree with Steve Tunnicliffe that some of the problems he describes are highly undesirable, but these could surely be eliminated by the introduction of a fair (to amateur and academic alike) procedure that all researchers interested in publication must follow regarding the eventual deposition of published material.

The apparent dismay experienced by Steve Tunnicliffe that "a knowledgeable private collector will clutch a unique specimen to his bosom knowing its scientific value" is hardly surprising. If for example I found a unique antiquity, my first thought would be to pass it into safe expert care. It may be scientifically valuable, but not important to *me*. Alternatively, if I find an ammonite far outside its normal range, of course I have no wish to part with it. Retaining it will enable me to compare it with

other material including perhaps, some I have yet to discover. I may then eventually publish the results as part of a long term research project. In practical terms, I do not have the time or money to go miles to a museum (there are *very* few that I would be content to allow my collection to pass to) to view, by appointment, one or more of my own specimens.

The ownership of a possibly valuable private collection can do a lot to help one to understand the depth of feeling some amateurs can have for their material. The time, effort and expense of gathering such collections is enormous; cleaning, curation, storage and not least the cost of photography and publication – publication, in my case, urged, encouraged and aided by prominent academics in the discipline of ammonite biostratigraphy. I suggest that the person most knowledgeable regarding material in his or her own collection, is the collector. Once in a museum, a primary source of evidence is removed and the specimens inevitably have a reduced value.

Finally I wish to address the argument that material should be stockpiled in a *recognised* museum to await description and publication at some future time. What this advocates is that valuable but undescribed material should be stored and very often forgotten until one day, long in the future – if ever – someone will find and describe it, long after the main provider of information, the collector, is dead. Such material is unique but remains unimportant while undescribed. It is the responsibility of any respectable scientific agency to ensure the broad dissemination of information about new material at the earliest time. Restriction on publication dependent on source should never enter into any serious discussion on the future of Palaeontology, and what of the ever increasing mass of undescribed finds? Would they later be sold off when the museum was short of storage space or short of funds, and needing to avoid an academic redundancy? A similar situation to the aforementioned private collector who ends up strapped for cash or in a wheelchair?

The pages of our *Newsletter* and many other publications abound with testimony to the success private individuals have had, and their positive impact on our science. I am sure Angela Milner would agree that involvement in the exhumation and description of Bill Walker's *Baryonix* was something of a highlight. In this case Mr Walker's generous attitude resulted in a great attribute to science and the display gallery of the Natural History Museum. The actual specimen is no less valuable in scientific terms whoever owns it or describes it. What is important is that all parties, scientific and private, agree where it will end up and that it will be permanently secure and accessible. It should be possible by contract to secure its long term future. Why not work towards a compromise along those lines as a fall back position where a collector refuses to allow material to go to an 'acceptable' institution during his/her lifetime?

To disregard privately held material amounts to burying ones head in the sand. The loss to science resulting from such an attitude should be weighed against the loss that *might* occur in the case of original described material which does not find its way to an acceptable institution. Fine quality duplication and photography can go a long way to neutralising the impact of the loss of important material from private collections. In the absence of the original, it would be reasonable to insist on duplicates and photographs to be deposited together with a formal written agreement to deposit the originals in certain circumstances, e.g. death of collector. This is the sort of route to pursue if our science is not to be artificially held back.

Robert Chandler,
Riddlesdown High School,
Purley, Surrey, CR8 IEX.

MEETING REPORTS

Palaeontological Association Annual Meeting

Cardiff

15-18 December 1997

The Christmas meeting this year returned to a Celtic theme that has run strongly through the last few years (meetings in Glasgow, Galway and now Cardiff in the last four years). Now that talk of a Celtic Province has been scotched though, we may perhaps rest assured that the annual meeting is immune from any prospect of permanent residence in these distant parts. To add to the romantic image of remote wildness, the weather duly put on a display of seasonal snow, for the first time (if memory serves me correctly) since Liverpool at the end of the '80s. This was exactly the sort of thing I was coming from Sweden to escape, of course. The meeting was splendidly organised by Chris Berry and Dianne Edwards, with Mike Bassett also willingly offering help, especially with the events in the National Museum: everything seemed to run absolutely smoothly. Unlike many previous occasions where accommodation and talks were often far apart, this year both were on the same location, which was very welcome. Cautiously to make a very small moan though, the lecture theatre's design meant that projection of slides and overheads was onto a white brick wall. Whilst not overly-intrusive (although I once caught myself contemplating limestone outcrops for an instant) the effect was slightly bizarre.

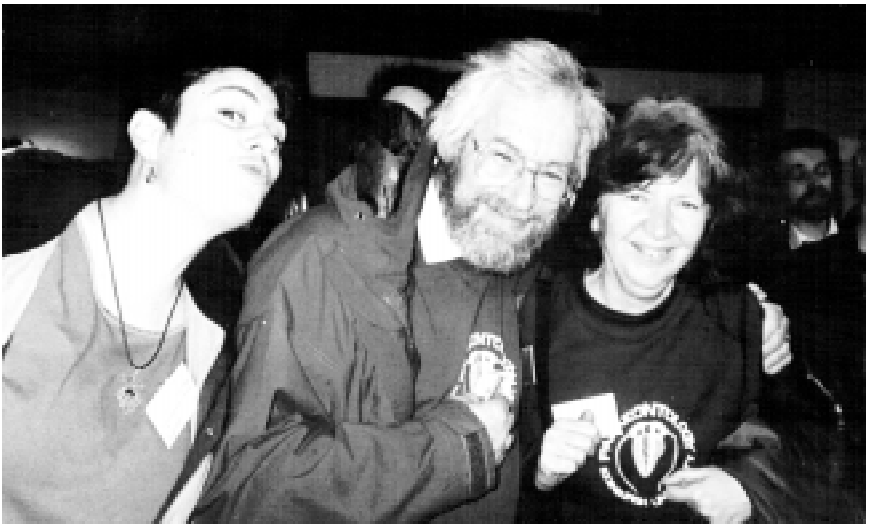


Figure 1: Euan Clarkson, next President of Pal. Ass., with Cecilia Taylor (right) and Liz Hide, curator of invertebrate fossils, National Museum of Scotland.

After the Byzantine complexities of last year's enormous meeting in Birmingham, where the innovation of dual sessions was tried, this year saw a return to the more usual Full Monty approach: if you turned up, you saw everything. In order to cram in the still large numbers of talks into the time, an ageist device was employed (no doubt there is a European Directive against this sort of thing), whereby those deemed to be Established were given 15 minutes, as opposed to the whippersnappers who got the usual 20 minutes. The boundary between the two categories was of course a blurred one, and, as we shall see, some unfortunates fell on what they considered the wrong side, although it must be said that I didn't hear anyone complaining that their dignity demanded the shorter time period. This system worked much better than splitting the sessions, although given that I was one of those who benefited from being the right side of the cut-off, I am somewhat biased, perhaps.

After opening remarks by the Head of the Cardiff department, the sessions kicked off with the now traditional visit to the conodonts, punctuated by the even more traditional misbehaviour of the slide projector. Caroline Smith started with an analysis of deep sea palaeobiology as witnessed by conodont assemblages in transgressive sequences. As deepening continues, the deep-water fauna is effectively brought up onto the shelf, allowing a glimpse of these mysterious forms. Phil Donoghue then followed his President's Award performance last year with another fine effort, this time on the enigma of conodont growth. Given that conodonts seem to grow by external accretion, how do they at the same time function as teeth? This problem was tackled, although perhaps not solved, by the recognition that individual elements are ontogenetic composites, representing the fusing together of different units. We switched to further up the vertebrates with Ivan Sansom's discussion and reconstruction of the rare Ordovician fish *Astraspis*. Despite new material from the Harding Sandstone, the authors drew back from presenting a full cladistic analysis, pending further work, but clearly the possibility that these early fish diversified lower in the Ordovician or even Cambrian must now be entertained. Striding (or, in this case, flapping) up to higher vertebrates, the next two talks were a sort of double act between Dave Unwin and Natasha Bakhurina on pterosaurs. Dave gave an entertaining if slightly unnerving personal demonstration of the sorts of locomotory habits grounded pterosaurs might have had (hint: whatever it was, they were pretty bad at it). I was for some reason strangely reminded of this talk whilst in the bar after the Annual Dinner. Natasha, in more sober vein, talked about exceptionally preserved tissue from the Kazakhstanian pterosaur *Sordes*.

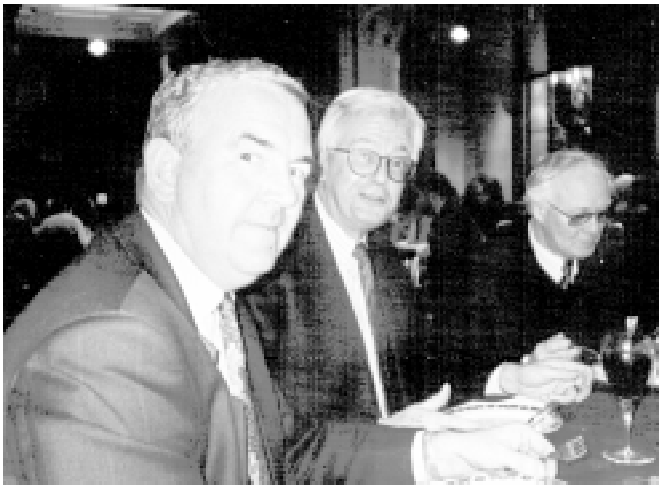


Figure 2: Mike Bassett and David Siveter, the evening before the morning after…

To press on, Ian Jenkins talked about form and function, using finite element analysis, of a Permian sabre tooth, satisfyingly demonstrating how the ecology of the animal links with its constructional morphology; Mags Duncan showed how much palaeoenvironmental information can be squeezed out of apparently insignificant fragments of fish teeth, bones and scales, whilst Clive Trueman presented a taphonomic application of rare earth element analysis, long the preserve of hard rock geochemists. Switching to evolutionary patterns in microfossils, Taniel Danelian talked about radiolarians from the Jurassic, whilst in an engaging and enthusiastic talk, Helen Coxall talked of her hunt for hantkeninid ancestry in the Deep South.

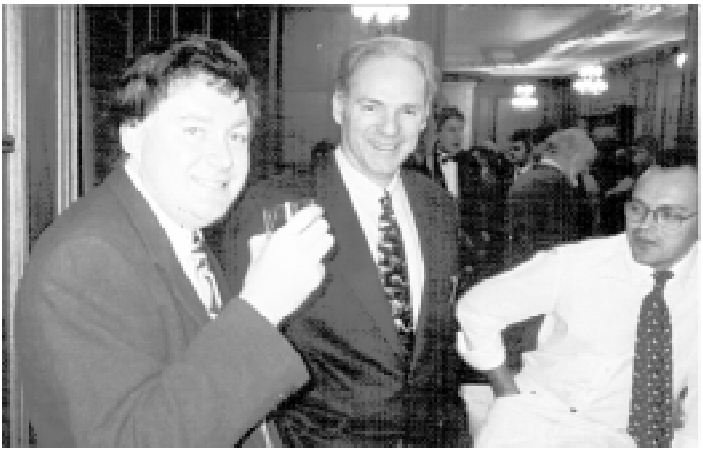


Figure 3: Paul Smith and Mike Barker caught discussing Council business.

After lunch, a reefy session ensued with a talk on the diversification of calcified algae by Julio Aguirre, another elegant presentation by Ken Johnson on Miocene reef corals (talking about the problems of undersampling and patchiness in species distribution), and an intimate dissection of a Waulsortian mud mound by Jeff Lord, using careful taphonomic analysis to reveal initial mound conditions, essential if theories on the origins of these structures are to be tested. Graham Young then manfully tackled the daunting task of disentangling genetic and environmental factors in tabulate corals. This is certainly a task I would have assumed is impossible, but Graham showed quite nicely I think that with care a certain amount of distinction may be made. He was then a coauthor on the next presentation by Stephen Kershaw, which had a pleasingly iconoclastic feel about it. Remember those tales about how counting coral growth bands tells you how long the year was (or, how far the moon was away, who would win the next Grand National, and so on)? By actually looking at what growth bands are, they revealed complex stories in both stromatoporoids and tabulates, which – given what we know about coral and sponge growth rates today – leaves disturbingly large question marks over the actual significance of these phenomena. This was, perhaps, the one talk that suffered slightly from the brick wall effect of the projection surface…

In the final talks of the day, Richard Bettley gave a charming and considered discourse on the Ordovician of Wales – part of Richard Fortey's much to be applauded, if somewhat Quixotic "Save the British Ordovician" campaign. The myriad of historical, aesthetic and scientific reasons why one might wish

to retain terms like Llanvirn sadly seem to be lost on certain of our colleagues across the Atlantic. As well as the stratigraphy, Bettley also pointed out some evolutionary patterns seen in Welsh trilobites. Kay Mannifield followed with a discussion of crinoid ossicles, somewhat similar to the previous presentation on ichthyoliths, with both talks attempting to show what information can be gleaned from disarticulated fragments of animals. The day ended with a very nice pair of talks on palaeotaxodont bivalves by Vivian Alexander Ratter and on *Dunbarella* by Chris Peel. The first of these was centred on the systematics and phylogeny of the group, and the second was an entertaining examination of the mode of life of paper pectens: the grave question of "where are all the baby *Dunbarella*?" remains unanswered though.

After a reception hosted by the Vice Chancellor, the Annual Dinner was this year held in the National Museum of Wales, and perhaps it is fair to say that the elegant surrounds made it a somewhat less riotous affair than usual. To celebrate forty years of the Association (although, confusingly, this was the forty-first meeting, and I am afraid I still haven't worked out how to reconcile the two), some of the founding fathers of the Association were invited to the meeting, and it was a considerable pleasure to see several of them present, including Harry Whittington and Stuart McKerrow. Whether or not the notorious Friends of the Irish held their annual meeting after the dinner I am unable to say, but the next morning there seemed to be rather fewer sore heads than last year!

Figure 4: Tim Palmer thinks hard

The opening collection was of the senior talks, with each given 15 minutes. Andrew Scott, then, filled the unluckiest slot in the programme with a study of how plant ecology in the fossil record may be skewed by site-based taphonomic bias. Henry Williams, following again the theme of small might be beautiful, showed how the tiny graptolite *prosicula* might be useful for taxonomy and biostratigraphy, followed by an amusing talk by David Loydell on Palaeozoic sea-level curves. It might be nice to report a steady refinement of the curves through time, but in fact his analysis was shockingly at odds with previous investigations. After Paul Wignall (does he really belong in the seniors? I suppose so) and Richard Twitchett on the Permo-Triassic extinction, and Malcolm Hart on Cretaceous forams, came a brace of bryozoan talks. In the first, Paul Taylor showed how patterns of competition have shifted through time, whilst in the second Mike Weedon (another surprise senior, especially to himself) demonstrated the disparity in skeletal architecture between cheilostomes and cyclostomes. Simon Kelly then talked (somewhat sheepishly) about a rather different interpretation of Greenland ammonite successions than

what he had originally intended, based on the intervention of someone else's results (always inconvenient, of course). Following her splendid talk of two years ago when she discussed invertebrate traces found in conjunction with dinosaur traces, Joanna Wright now got onto the dinosaurs themselves, showing how their tracks had important and unsuspected implications for their gait. Simon Braddy then gave a splendid talk on how LocBug, his computer simulation of track-making arthropods, can be used for assessing the morphology of track-making arthropods, which looked really promising. John Marshall described a bizarre (and faintly suggestive) new Devonian plant reproductive structure, whilst (perhaps appropriately enough) just before lunch Kate Hapgood discussed the implications for food webs of early terrestrial coprolite content.

The usual arthropod afternoon followed, with a cladistic and phenetic analysis of crustacean evolution by Matthew Wills, who showed how their horrifying diversity and disparity can be battered into some kind of order. Then followed an unusual and innovative examination of the fundamental components of skeletal organization in the Burgess Shale by Roger Thomas and Rebecca Shearman. Graham Budd nervously ventured out into the minefields of arthropod head segmentation, whilst Sarah Gabbott described a terrifyingly odd new fossil from the Ashgill Soom Shale of South Africa (I simply do not have a clue). Finally, an interloper in the form of Juliette Dean gave an excellent talk on ophiuroid diversity and disparity that was rightly rewarded with the President's Award. In the final session, David Siveter talked about the various Cambrian bivalved arthropods that always used to be shovelled into the ostracods (but now we're not so sure), and Leonid Popov and his student Tatiana Tolmacheva talked respectively on the earliest calcareous brachiopods the *obellatids*, and Kazakhstanian conodont clusters. Last of all, David Evans finished with a Celtic (or even Pictish, perhaps) flourish on the cephalopod fauna of the Durness Limestone.

Your intrepid reporter is sadly not in a position to comment on the field trips, having had to rush off at this point, but some reflections on the talks themselves might be in order. First, it was somewhat noticeable how much the focus of palaeontological research seems to have shifted in the last ten years. At the end of the 1980s, there seemed to be a great emphasis on cladistic methodology and results, allied with an interest in the large sweep of phylogenetic and evolutionary patterns. With some key exceptions (the winner of the President's Award being one of them) this whole topic seems to be rather out of favour, especially amongst graduate students, and hardly a cladogram was seen in the whole of the meeting – although reports of last year's Progressive Palaeontology, are, to be fair, completely at odds with this impression! However, there does seem to be something of a concentration of efforts on palaeoecological and environmental studies; whether this is for good or bad is hard to say.

Finally, it would be completely amiss not to mention the posters this year, which seem to be increasing in importance. In recognition of this trend, the first President's Poster award was given to Aaron O'Dea for his poster on ecophenotypic variation in bryozoan colonies as an indicator of palaeoseasonality.

For next year? Keeping the single session must be a priority, and also perhaps the few extra days before Christmas we had this year were very welcome: for visitors from abroad especially, travelling at this time can be very taxing. So, many thanks to Chris and Dianne, and I look forward to this year's meeting!

Graham Budd
University of Uppsala

Palaeontological Association Review Seminar – 'Fins, fangs and phylogeny': The origin and early evolution of vertebrates.

Birmingham University

5th November 1997

Early arrivals were welcomed with coffee and biscuits in the splendid setting of the Lapworth Museum and there were no problems in parking!! Professor Hallam welcomed a larger than average audience to the Seminar, the majority of whom were third year undergraduates. Four half-hour reviews were delivered in the morning, followed by four after lunch and two after tea. It was a packed programme involving colleagues from biology, genetics and palaeontology.

The aim of a Review Seminar is to present an overview of current research. A straw poll at lunch time, of around twenty-five students, revealed that Paul Smith's 'Cambrian origins' and Phil Donoghue's conodont palaeobiology talks were hitting their targets. During the afternoon, the star quality of Becky Hitchin's talk on ray finned fishes shone through, even though it was delivered towards the end of the day. Mark Purnell's eloquently succinct talk, concerning the functional morphology of conodonts and their role in understanding agnathan feeding strategies, was also noteworthy. Ivan Sansom's take-away message of Ordovician "Explosion" was also well received and, I'm sure, will now form part of the audience's understanding of early vertebrate evolution.

Other talks were cutting edge research lectures, which were well appreciated by the small number of senior researchers in the audience. From the neontologist's point of view, Helmut Wicht's tightly argued presentation, cautioning the over use of modern animals, 'in projecting recent animals into fossil reconstructions', was a particularly dazzling example of modern research.

Most undergraduates I questioned enjoyed the day as a whole and there is value for current and future research students to glimpse the complexities of emergent science. However I did feel that the majority of talks were aimed at a research audience. Review seminars should be about empowering students and not leaving them shell-shocked. This was borne out by the fact that there wasn't a single question from the undergraduates, who represented at least 80% of the audience. Surely an opportunity missed?

The multi-disciplinary approach however must be pursued in future, bearing in mind that most geology students take palaeontology as an eighth part of their degree. An overview handout could be provided to introduce unfamiliar areas of subject matter, which a student could digest at a later stage. Talks should last no more than twenty-five minutes, leaving students time to take part in short discussions led by the chairperson.

Lessons aside, the lasting impressions will be ones that recall the cautionary lessons of most talks, from the revisionist talks of Mark Purnell and Ivan Sansom who painted new scenes from the Silurian and Ordovician, to the iconoclastic one of Moya Smith who dispensed with gill arches as precursors for jaws.

I'm sure everyone who attended will want me to thank the organisers at Birmingham University for their hospitality, in addition to putting together a real multi-disciplinary approach to vertebrate evolution.

Alan Perkins,
University of Leicester

FUTURE MEETINGS OF OTHER BODIES

Fabulous Fossils: examples of exceptional preservation
Vaughan College, Leicester, England
7th March 1998

This one-day meeting, from 9.30am to 5pm, is promoted by the Leicester Literary and Philosophical Society and University of Leicester Department of Adult Education. Eight distinguished palaeontologists from academia will deliver talks on aspects of this fascinating topic. Everyone welcome. For further details, programme and booking form see the Web page at:

`http://parrot.le.ac.uk/geology/misc/gl_lap1.html`

or make bookings directly through the Secretary, Vaughan College, St Nicholas Circle, Leicester LE1 4LB. (tel 0116 251 7368, fax 0116 251 1128).

Convenor: Andrew Swift, Department of Geology, University of Leicester, Leicester LE1 7RH (tel 0116 252 3646, e-mail `as48@Leicester.ac.uk`).

International Symposium: Palaeodiversifications, land and sea compared
Lyon, France
6 – 8 July 1998

The Conference is held under the auspices of the UMR 5565 of the CNRS and is organised by Mireille Gayet, UFR des Sciences de la Terre, Université Claude Bernard, Lyon I, 27-43 bd du 11 novembre 1918, 69622 Villeurbanne cedex, France (tel +33 (0)4 72 44 83 98, fax +33 (0)4 72 44 84 36, e-mail `gayet@univ-lyon1.fr` or `lysiane.thevenod@univ-lyon1.fr`).

5th International Symposium on the Jurassic System
Vancouver, B.C., Canada
17 – 20 August 1998

Organised by the IUGS Jurassic Subcommission. There will be pre- and post-meeting field trips to the Canadian Rockies, the Coast Mountains, the Queen Charlotte Islands and Nevada. Contact Paul L. Smith, Earth and Ocean Sciences, University of British Columbia, 6339 Stores Rd., Vancouver, B.C. V6T 1Z4, Canada (tel (604) 822-6456, fax (604) 822-6088, e-mail `psmith@eos.ubc.ca`).

Symposium Website: `http://www.eos.ubc.ca/jurassic/announce.htm`

46th Symposium of Vertebrate Palaeontology and Comparative Anatomy
Bournemouth, UK
9 – 12 September 1998

The Symposium will be preceded by the **7th Symposium of Palaeontological Preparators and Conservators**, from *7th to 9th September 1998*, both meetings at the University of Bournemouth.

Contact: Jane Clarke, 65 Oakmount Road, Chandler's Ford, Hants SO53 2LJ UK (tel +44 (0)1703 252309, fax +44 (0)1703 904364, e-mail `jane@geoden.demon.co.uk`).

VII Congreso Argentino de Paleontología y Bioestratigrafía
Bahía Blanca
4 – 9 October 1998

Under the auspices of A.P.A., organized by the Departamento de Geologia, Universidad Nacional del Sur. Further information: Dra. Mirta E. Quattrocchio, Laboratorio de Palinología, Depto. Geología, U.N.S., Alem 1253 (8000) Bahía Blanca, Argentina (fax (54-91) 556756).

The biology and evolution of bivalves
University of Cambridge, UK
14 – 17 September 1999

Organised on behalf of The Malacological Society of London by E.M. Harper, J.D. Taylor and J.A. Crame.

An international meeting to focus solely on the Bivalvia. The organisers welcome papers and posters on all aspects of the biology and palaeontology of bivalves, in particular studies of the ecology, phylogeny and palaeobiology of the class. The Society hopes that the proceedings of the meeting will be published as series of refereed papers.

The meeting is to be held over three days in the historic and picturesque city of Cambridge (UK) within the ancient university. This is the first call for offers of papers and posters. It will be possible to organise workshops and themed sessions to accommodate those with similar interests.

Registration Fee: to be announced.

For offers of contributions and to request further details please contact: E.M. Harper, Dept. of Earth Sciences, Downing St, Cambridge, CB2 3EQ, UK (tel 01223 332846, fax 01223 333450, e-mail `emh21@cus.cam.ac.uk`), or J.D. Taylor, Dept. of Zoology, The Natural History Museum, Cromwell Rd, London, UK (e-mail `J.Taylor@nhm.ac.uk`), or J.A. Crame, The British Antarctic Survey, High Cross, Madingley Rd, Cambridge, UK (e-mail `JACR@pcmail.nerc-bas.ac.uk`).

VII International Symposium on Mesozoic Terrestrial Ecosystems
Buenos Aires, Argentina
26 September – 2 October 1999

A wide-ranging scientific programme and several field trips are planned; further information from the Secretary to the Symposium at Museo Argentino de Clencias Naturales “B. Rivadavia”, Avda. Angle Gallardo 470, 1405 Buenos Aires, Argentina (tel/fax 54-1 983 4151).

BOOK REVIEWS

Arthropods of the Lower Cambrian Chengjiang fauna, southwest China

Hou Xianguang & Jan Bergström (1997). Fossils and Strata no. 45. Scandinavian University Press 116 pp. ISBN 82-00-37693-1. US$ 33.00.

I objurgate the centipede, wrote Ogden Nash, a bug we do not really need. However one views the calamity of living in a world brazenly dominated by the arthropods though, it would be less than charitable to begrudge them their salad days in the Cambrian. And what a green youth it was! Nearly a century of Cambrian arthropod description has accumulated since Walcott's first essays at the Burgess Shale, and it is now clear just how rich and marvellous the faunas were. Indeed, although we are tempted to think of our own time as the Age of the Arthropods, our own terrestrial habits mislead us somewhat. In terms of dominance in the marine realm, a fair case can be made for the importance of arthropods having decreased through time, with their ecological roles being taken on by polychaetes and holothurians. Nowhere is this seen more clearly than in the great Lagerstätten of the Cambrian, the Burgess Shale, and the two Lower Cambrian faunas, the Sirius Passet fauna from Greenland and the Chengjiang fauna from China. It is the latter of these that Hou and Bergström concern themselves with, in an extended treatment of the arthropods of Chengjiang.

Hou and Bergström is the latest in that distinguished series *Fossils and Strata* which, especially with the volumes by Walossek and Müller on the Upper Cambrian Orsten fauna of Sweden, has done so much to increase our basic knowledge of these early arthropod faunas. Quite apart from its shocking pink cover (the editor claims that the aesthetics of the whole series on the shelf are more important than the appearance of individual volumes, but one wonders), this is indeed a striking work. Some eighteen Chengjiang arthropod species (five of them new) are described in detail and profusely illustrated with photographs, crisp camera lucida drawings, and splendid reconstructions by Javier Herbozo. Despite the high quality of the photographs, one is, though, perhaps inevitably left with a sense of some disappointment. Monochrome simply fails to capture the magic of these fossils, which are livid against an almost chrome yellow background. Despite being nearly (but not entirely) flattened, the fossils thus leap out at you as if still living. It is a pity that palaeontology, with its heavy reliance on visual data, has so far not been able to move over to colour where appropriate, in the same way that many developmental subjects have.

Nevertheless, much exquisite detail is illustrated in the material. In particular, the morphology of the limbs, so important in understanding arthropods, is in general more clearly expressed than in the Burgess Shale, together with information about their three-dimensional arrangement. It has proved possible in many cases to dissect the limbs back to their point of insertion into the body, so that the morphology of the junction between the two branches of the biramous limb is seen with great clarity.

This unprecedented detail leads on directly to novel conclusions about arthropod relationships. First, it is worth stressing that despite the new forms described, it would be wrong to be bamboozled by the diversity of Cambrian arthropods. The older view of Cambrian arthropods (especially as popularized by Gould's *Wonderful Life*) representing a storm of disparity, unmatched phylogenetically and morphologically since, is giving way to the pressure of patient and persistent inquiry. This is no Gordian knot to be slashed away by some arthropodan Alexander, but a complex scientific tangle that will eventually yield to the nimblest teasing out of its threads. The pioneers in

this field have been Briggs, Fortey and Wills, who have shown that despite the colourful splash of morphology, Cambrian arthropods do really show patterns of relationships.

The next stage, then, is to examine particular groups and particular morphologies closely for a deeper understanding of evolutionary relationships, to be tied into the extant fauna. After all, logically, the Cambrian arthropods are likely to fall into either the stem-group of the chelicerates or of the crustaceans, with perhaps some stem-group euarthropods scattered amongst them. This sense is reinforced by the iconoclastic attack launched on some taxonomic favourites of the Burgess Shale, *Canadaspis* and *Sanctacaris*. The authors have trenchant comments about both these animals, and I think quite correctly exclude them from the crustaceans and chelicerates respectively. This, along with recent assaults on so-called Cambrian ostracodes, leaves the Lower and Middle Cambrian pretty much bare of convincing members of crown-group arthropod classes, and we are thus entitled to look for their ancestry in these early forms. Rather than all types of arthropods instantaneously appearing at the base of the Cambrian, as in Gould's world view, there is now emerging a sense that these early forms really are more basal than the extant fauna, and indeed develop into them. As pointed out by Hou and Bergström, this is reflected in, among other factors, the general lack of complex tagmosis in Cambrian arthropods, as compared to, say, the rococo splendours of a lobster.

Hou and Bergström thus present a fairly complete analysis of Cambrian arthropod relationships that differs in many respects from previous, more rigorously cladistic attempts: which analysis one prefers will, I suppose, depend partly on how far one thinks the search for homology should be left to parsimony. Nevertheless, a common problem for both approaches is that of character rooting, which is critical in this case. With the anomalocaridids excluded from the stem-group of the arthropods by the authors, there are no taxa that could conceivably be used to determine character polarity. Actually, the grounds for their unceremonious dumping of the anomalocaridids, that they show some aschelminth features, may be less a problem than they appear. With recent molecular and some morphological work now suggesting several aschelminths and the arthropods are sister groups (Aguinaldo et al. 1997), one might expect to see features common to both being retained in the arthropod stem-group. No matter; the difficult task of tree rooting is attempted by more general considerations such as the assumption of proceeding from conditions such as low tagmosis, poor tergite/segment correlation and unspecialized limbs to the more complex arrangements of extant arthropods. This is a dangerous game to play, partly because it cloaks the challenge of the fossils to established dogma about how evolution is meant to proceed.

Hou and Bergström overall, then, present a beautiful and solid account of the Chengjiang arthropods, a considerable achievement that is not without its ironies: it has emerged from the often chaotic and perhaps even underhand maneouverings that have dogged so much Chengjiang research (a sorry tale indeed). As amply demonstrated by Hou and Bergström, the arthropods so easily lend themselves to furious argument precisely because of their complexity and detail, and the relative ease with which they are preserved in faunas such as the Chengjiang. As such they are the quintessential phylum for arguments about the nature of the Cambrian explosion. There are thus certain aspects to arthropod taphonomy that even the most delicate of arachnophobes should gratefully celebrate (you always wallop where he's not/ or, if he is, he makes a spot, as Nash ruefully put it).

Finally, a worrying end-note. *Fossils and Strata* itself, the vehicle of so much excellence in editorial quality and scholarship, is now threatened. With the Swedish Research Council bizarrely withdrawing support from the journal, on what appear to be the curious grounds that it is not a money-spinner, its numbers will be henceforth severely limited. In fifty years' time, with

mouldering heaps of *Nature* and *Science* so much waste paper, these monographs will surely remain as important and relevant as ever: what price then commercial success?

Graham Budd
University of Uppsala

Reference

Aguinaldo, A.M.A., Turbeville, J.M., Linford, L.S., Rivera, M.C., Garey, J.R., Raff, R.A. & Lake, J.A. 1997. *Evidence for a clade of nematodes, arthropods and other moulting animals*. Nature 387, 489-493.

Miniature Vertebrates: the implications of small body size

(1996). Zoological Society of London Symposia No. 69. Edited by P.J. Miller. Oxford Science Publications (Oxford University Press). ISBN: 019-857787-7. 328 pages. £75.

This book is the proceedings of a symposium held on 11th and 12th November 1994. The 328 page volume, the 69th symposium of the Zoological Society of London, takes a most unorthodox view of vertebrates. With the statement in the preface… "with *Homo sapiens* essentially a strolling omnivorous primate gathering small food items, perhaps it is not surprising that most of the vertebrates regarded as small for the present academic survey also fall into the category of having a girth less than the diameter of the average human mouth" …the volume gives the best ever definition of a small vertebrate. No linear parameters here, but a supremely intuitive understanding of what – to humans – constitutes a *small* vertebrate. It is the first book devoted specifically to the biology of small size across the entire vertebrate spectrum. The volume is split into two parts: function and ecology.

In chapter 1, McNeill Alexander reviews biophysical problems of small size in vertebrates. He provides an excellent synthesis, explaining that as cells are the same size, smaller vertebrates have room for fewer cells in their brains. This explains why shrews are so "thick". Muscles contain fewer fibres so cannot be so precisely controlled. Problems depending on the wavelength of light make small eyes less acute than large ones can be, because there are fewer cells in each whole retina. Intersurface areas in small fish are approached by Ian Harrison in the following chapter. He demonstrates how large body surface area:mass ratios and corresponding drag forces in small fish might account for 'transient' modes of swimming. Rieppel in chapter 3 demonstrates the effect of paedomorphosis in the skulls of miniature tetrapods. This chapter has some good clear diagrams of the skulls in question, but given its content, note should have been made – even a passing mention – of bauplane miniaturisation at the cynodont-mammal transition. Adequate brain and labyrinth size impose limits to the extent of skull miniaturisation.

The following three chapters discuss metabolic rates in small terrestrial mammals, biomechanical constraints in avian flight along with the effects of echolocation in bats. Call rate rather than frequency is suggested to limit bat body size.

The ecology section begins with a suitably academic offering from Purvis and Harvey who find variation in life-history to be independent of body size. The volume editor supplies the next chapter. This readable account covers the ecological opportunities and consequences of miniaturisation in teleost fish, with particular note made of the role of superfoetation. A summary concludes with the suggestion that very small fish are unlikely to go the way of the bluefin tuna and cod. Could it be that in 30 years' time the only dietary intake of 'wild' fish in the western world comes from

anchovies on pizza? Chapters on small amphibians, reptile-grade sauropsids and hummingbird territory dynamics follow. The amphibian study is of particular interest and importance as it includes ecological discussions in the scenario of lissamphibian evolutionary origins. Sara Churchfield provides an interesting account of very small mammal ecology, but does not extend the discussion into possibilities for expanding and refining the palaeobiological interpretation of the cynodont-mammal transition. Adrian Lister in the penultimate chapter does focus on fossil evidence, in this case size reduction in island mammals. The last chapter deviates greatly from the general theme of the book. An anthrozoologist looks at the psychology of human-small vertebrate interactions. It is a curious study and adds to the overall diversity of studies in the book.

By the very nature of its subject, this book may find a small readership. Its potential to vertebrate palaeontologists may remain unexplored. Too much of the book paid too little attention to an evolutionary aspect, notable exceptions being the chapters by Rieppel, Clarke and Lister. There is nevertheless much 'pure biology' here for the vertebrate palaeontologist to use in reconstructing evolutionary scenarios: origin of teleosts, mammals and lissamphibians. In this respect, the chapter by Clarke on small amphibians is probably the most useful. Peter Miller is to be congratulated on a tight editorial. The book is a lavish OUP production, but is typically expensive at £75. Zoology libraries should invest in a copy of this unusual and important book.

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Bibliography of European Palaeobotany and Palynology 1994-1995

Barry Thomas, Christopher Cleal, Heather Pardoe and Helen Fraser, 1996. Department of Botany, National Museums and Galleries of Wales, 161pp. ISBN 0-7200-0441-1.

This A5 book constitutes a highly useful 'way in' to palaeobotany or palynology for the new student or convert. For the cognoscenti, it must be a valuable directory resource. In it the authors list all published work in the field, in Europe, in 1994-5. Although it is noted that some eastern countries are not included or did not have correspondents, the coverage seems to be pretty comprehensive.

The information is separated into palaeobotany and palynology for each of the Palaeozoic, Mesozoic and Tertiary. A rather short Precambrian section, and a lengthy Quaternary chapter, are supplemented by two chapters on general references in palaeobotany and palynology. There are also listings of Ph.D. Theses, papers in press and current research, plus a round up of various research visits, grants and fieldwork of a good number of workers, presumably those most active, who contributed the information. Thirty five pages of addresses and phone/fax/e-mail details make it a useful tool to workers in the field.

I was previously unfamiliar with this, and although it may be standard issue to workers in either palaeobotany or palynology, there must be non-specialists who would find it a useful source of contact. To me it fills a similar role to 'Ordovician News' or 'Silurian Times', but has a longer period, and is more a book than a newsletter. It would sit comfortably on the shelf alongside other reference directories.

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Basic palaeontology

Michael J. Benton and David A.T. Harper, 1997, Longman, ISBN 0-582-22857-3.

Who amongst us would not benefit from an undergraduate textbook covering all applied aspects of palaeontology and the major fossil groups including vertebrates, microfossils and plant and trace fossils? This thoroughly modern textbook reflects the shifting association of palaeontology with taxonomy to evolutionary biology without neglecting the S*tigmarias* of the subject.

The book starts with a review of the growth of the science, emphasising the increasingly interdisciplinary nature of the subject, and an introduction to the process of fossilisation. The first of many quantitative case studies is given in this chapter and the importance and application of palaeobiostatistics is stressed throughout the text. The examples given are extremely versatile and could be used in conjunction with the book in practical classes and tutorials.

Biostratigraphy, palaeoecology and palaeobiogeography are included in the chapter 'fossils in time and space'. Reconstruction of palaeocommunities and analysis using statistical techniques is discussed and unusually the use of fossils in the determination of the origin and age of tectonic events is outlined. Phylogeny, cladistics and speciation are covered in the chapter 'macroevolution' and the reality of Jurassic Park is explored. An extremely clear classification of the prokaryotes is given in the chapter on the origin of life and the chapter on early metazoans is beautifully illustrated; the diagram showing the significance of worm-like animals at the Precambrian-Cambrian boundary is truly a work of art!

Chapters on the main fossil groups follow. A classification is given at a suitable level for each group, including a crinoid columnal classification. Functional interpretations of the morphology are proposed and controversies highlighted where appropriate. These chapters are extremely well illustrated with photographs, photomicrographs and line drawings. The final chapter deals with diversification and extinction. Progressiveness in evolutionary history and patterns, periodicity and selectivity of mass extinction are discussed. The chapter concludes with a summary of the major adaptations in the history of life in ten major steps.

For me the presentation and layout of the book really set it apart from other undergraduate texts. All diagrams and photographs are extremely clear and the use of boxed material and bullet points enables the maximum information to be included without apparent overload. Key points at the start of each chapter and the suggested further reading at the end are very useful. Even the size of the book seems right. It is has the feeling of a modern, efficient and concise text not lacking in detail and in-depth analysis.

My only concern is the title 'Basic Palaeontology' (remedial?); however if this is the portent of a further, advanced or applied palaeontological text then I am much in approval!

Clare Milsom
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S269 Earth and Life: Evolving Life and the Earth

Peter Skelton, Bob Spicer, Allister Rees, 1997, The Open University. Price: ? £23.00 *(sorry, Peter: you told me at the Pal. Ass. Christmas meeting, but I have forgotten… Ed.)*

I admit to having a slight dependency on Open University course materials and this new series on Earth and Life will definitely support my habit! *Evolving Earth and Life* is a much more transferable book than previous OU texts and could be used by any student studying Earth or Environmental Sciences.

The book focuses on the evolution of life and the Earth with an emphasis on the function and diversification of eukaryotes. Chapter 1 explores the origins of the eukaryotes and the evolutionary driving forces that operated in the early Earth which gave rise to the 'Carnival of Animals' led by the Ediacaran fauna. The trigger for the faunal 'Big Bang' is discussed in the second chapter. There then follows an exploration of life in the Phanerozoic. Radiations and extinctions are discussed in the context of environmental opportunity *versus* crisis. Three evolutionary faunas are identified: Cambrian, Palaeozoic and Modern; the Mesozoic Marine Revolution is given as the cause of the rise of plankton.

Chapter 4 investigates the development of terrestrial ecosystems and the environmental consequences of the dramatic evolutionary step. This leads into the closer look at the palaeogeographical relationship. Contrasting climates are discussed in chapters 6 and 7, the icehouse of the period from the late Carboniferous to the Permian and the Mesozoic greenhouse. The book concludes with an examination of the fundamental question raised at the start of the book: what is the relationship between evolving life and the Earth? The options are reviewed and the partnership is either considered as benign or a chaotic system.

As with all OU texts, questions are posed throughout the text and detailed analyses given in boxes. The diagrams and photographs have wonderful clarity and the use of colour makes it an extremely attractive book. The exploration of the relationship of Earth and life, the holistic approach to the Earth system, and the investigation of climatic change through Earth's history make it an excellent text for all students concerned with the history of life and environmental change.

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The Cretaceous-Tertiary event and other catastrophes in earth history

Eds G. Ryder, D. Fastovsky, and S. Gartner, Special Paper of the Geological Society of North America, 307, 1-569 (1996).

This is the third large multi-author volume on mass extinctions to have been published by the Geological Society of America. Previous volumes came in 1982 (Special Paper 190) and 1990 (Special Paper 247), based on the first and second Snowbird meetings (so-called because they were held at Snowbird, Utah). A third Snowbird meeting was held in 1994, and this book is a compilation of 39 papers given there.

The book is a curious amalgam, which contains the core of a useful contribution within it. As in the previous volumes, the subjects included are ostensibly anything to do with large impacts on the earth and mass extinctions, but the majority of papers focus on the KT event, as might be expected. About half the contributions concern new work on the Chicxulub crater and its ejecta, and it is good to have all these papers in a single volume. There is little that is new – most of the authors have published their initial announcements elsewhere already (*Nature*, *Science*, *Geology*) – but the *Special Paper* format allows a little more space and some more illustrations.

I cannot refer to all the Chicxulub chapters, but mention only some highlights. Virgil Sharpton and colleagues offer a detailed model of the crater, including some colour versions of geophysical images and petrological samples. Adriana Ocampo and colleagues describe a proximal ejecta deposit from Belize. Walter Alvarez muses on the trajectories of ballistic ejecta from the impact site. The disturbed shoreline beds at the KT boundary in Mexico are described in great detail by several authors. Jan Smit and colleagues, and Bruce Bohor, argue strongly that these units are

coarse breccias produced by the arrival of tsunamis after the impact, while Wolfgang Stinnesbeck and Gerta Keller, and Thierry Adatte, argue that the units accumulated by normal sedimentary processes over thousands of years. J. G. Lopez-Oliva and Gerta Keller elaborate the anti-tsunami case further, arguing that the so-called tsunamites accumulated in the last 170-200,000 years of the Maastrichtian, and the spherule layer, in Mexico at least, accumulated before the KT boundary. These assertions concerning dating are countered roundly by other authors.

Palaeontological contributions focus on the KT microfossil record. Norman MacLeod argues that apparently gradualistic patterns of planktonic foraminiferal extinctions may be real, and not the result of backward smearing (Signor-Lipps Effect) or forward smearing (reworking upwards). Steven D'Hondt and colleagues argue essentially the opposite case, that extinctions of planktonic foraminifera were sudden and probably caused by a single major impact event. Brian Huber takes a similar line, presenting evidence for extensive reworking upwards of many Late Cretaceous taxa into Palaeocene sediments. James Popsichal presents evidence for sudden extinction of calcareous nannoplankton, while Kenneth MacLeod and colleagues describe the mid-Maastrichtian extinction of inoceramids, and Alan Cutler and Anna Behrensmeyer, and Dale Russell, comment on aspects of the extinction of vertebrates.

The remaining chapters include single contributions on the Late Ordovician extinctions (Peter Sheehan and colleagues), the Late Devonian (P. Claeys and colleagues), and the Early Jurassic (Cris Little). Some general overview chapters are also informative. David Jablonski gives a useful summary of key palaeobiological questions about mass extinctions, concerning the quality of the data, correlations with actual killing mechanisms, selectivity, and recoveries. Michael Rampino and Bruce Haggerty offer an unapologetic case for impacts as the driving force of mass extinctions. They analyse a new compilation of data on 24 extinction events during the whole Phanerozoic, and find a periodic signal of extinction every 27.3 Myr. They argue that there is clear evidence of impacts (iridium anomalies) for 15 of the 24 extinction events. Much of their evidence would now be disputed head-on, and most of the strong proponents of periodicity and repeated impact-induced extinctions have quietly dropped their strongly-expressed views of the early 1980s. It is refreshing to read a powerful case for an unpopular theory. William Glen takes an historian's view of the KT debate, and presents an interesting summary of his recent book (*The mass extinction debates*, Stanford University Press, Stanford, California, 1994). Vincent Courtillot and colleagues provide a useful re-evaluation of their formerly-expressed view that mass extinctions were caused by environmental crises induced by flood basalt vulcanism. They make the case strongly for the end-Permian event (Siberian traps), and ally the Deccan traps eruptions with the Chicxulub crater in a double whammy at the end of the Cretaceous.

This book is a good representation of the views of a mixed community of scholars in 1994. There are probably more anti-impactors in the Snowbird 3 volume than in either of its predecessors, and the breadth of presentation is laudable. The weakness of the book is that it does not present a complete view of any particular aspect of mass extinctions. It is not a comprehensive view of current work on mass extinctions in general (this has now been done in Tony Hallam and Paul Wignall's excellent new book, *Mass extinctions and their aftermath*, Oxford University Press, 1997). Nor is it a full account of the latest on impact thinking, since there is very little on craters other than Chicxulub. A good book about Chicxulub, or about the KT boundary in general, could have been constructed with some firmer editorial direction, the rejection of one or two of the weaker chapters, and the addition of some more scene-setting material.

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Silurian encrinurine trilobites from the central Canadian Arctic

Adrain, Jonathan M. & Edgecombe, Gregory D. 1997. *Palaeontographica Canadiana* 14. 109pp (inl. 35 pls.) ISSN 0821-7556, ISBN 0-920230-63-7.

The fourteenth issue of *Palaeontographica Canadiana* is the sixth in the series on trilobites, and judging by the authors' comments that the Wenlock faunas of the Canadian Arctic are the most complete and diverse anywhere in the world, we can look forward to many more splendid publications such as this.

Encrinurines are not an easy group to deal with taxonomically; to the neophyte they all look remarkably similar, and species are not easily distinguished. This new major work, cladistically based, is a substantial contribution to their understanding. Following an introductory section with maps, stratigraphical sections, notes on occurrence etc, there is a short account of successive faunas and an interesting comment on biogeographical affinities. There is then an exhaustive and very clear section on phylogenetic analysis, with all the characters used illustrated, and several cladograms presented. Finally there is the main taxonomic part, a description of 28 species of encrinurines, preserved as isolated, silicified tagmata in carbonate debris flows; these are interleaved with graptolitic shales, allowing a singular biostratigraphical precision for all the species described. The genera represented are *Struszia*, *Frammia*, *Avalanchurus*, and *Mackenziurus*.

The illustrations are lavish, with excellent text-figures of particular species, and 35 faultless, and beautifully made up plates; the standard of presentation is wholly admirable. Altogether this is a very fine monograph, and a welcome contribution to Silurian trilobite taxonomy.

I have only two criticisms. The first is purely a mark of antiquity – being of the generation I am, I still believe that species should generally be named according to characters they display or after other scientists. The choice of *petebesti*, *garfunkeli*, *onoae* etc. as specific names, while reflecting the musical tastes of the authors, seems to me to be faintly trivial. But there is another point. Numerical taxonomy is out of fashion these days, sidelined by phylogenetic systematics. Yet some exceptionally fine numerical work on the encrinurines was undertaken by John Temple in the early 1980s and it showed how particular species of this very close-knit group come out in clusters. Such work seems to be ignored or forgotten these days, and yet it has its role. These points apart, my basic comment is clear. This is an exceptionally fine work. We look forward to more such on the magnificent faunas of the Canadian Arctic.

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The Carboniferous of the world. III. The former USSR, Mongolia, Middle Eastern Platform, Afghanistan, & Iran.

R.H. Wagner, C.F. Winkler Prins and L.F. Granados (eds). Institute Tecnològico GeoMinero de España, Madrid, and Nationaal Natuurhistorisch Museum, Leiden, 526 pp. (IUGS Publication No. 33). 10,000 Pesetas/Dfl. 135. ISBN 84-7840-256-X.

Much of the early interest in Carboniferous geology stemmed from its importance as a source of fossil fuels. However, there is now the added awareness that especially the later part of the period provides many analogies with conditions today, with extensive polar ice, large areas of tropical forest, and a marked climate-gradient between high and low latitudes. The Carboniferous is now seen as the best pre-Quaternary model for testing ideas such as the effect of deforestation on climate change. To fulfil this role, it is essential that the Carboniferous is viewed in a global context. For

many western geologists, this can be a problem as much of the crucial evidence is embedded in literature that is difficult to obtain and/or written in languages such as Chinese or Russian. Unless one has access to a vast library and an army of translators, trying to place local observations in a global perspective can be nigh-on impossible.

To overcome this problem, members of the IUGS Subcommission on Carboniferous Stratigraphy are producing a series of volumes entitled *Carboniferous of the World*, summarizing current knowledge of Carboniferous stratigraphy and palaeogeography in a global context. Written by local experts, their accounts have (where necessary) been translated into English, and then carefully edited by Bob Wagner, Cor Winkler Prins and Luis Granados. The first volume dealt with China and adjacent areas, the second with Gondwana. We now have published the third volume, covering the former USSR, Mongolia, Afghanistan and the Middle East. The areas included relate to modern political rather than natural, geological boundaries and thus cover high- and middle-northern (Angara and Kazakhstania), equatorial (European Russia) and middle-southern (Gondwana) Carboniferous palaeolatitudes. However, the bulk of the content deals with northern palaeolatitudes and is what makes the book of such interest to those in the West who are interested in the Carboniferous.

As in the previous volumes, there is a wealth of lithostratigraphical and biostratigraphical information, including summary sections, fossil range charts and numerous species lists. There are also illustrations of some of the key plant and animal fossils, which provide some indication of the type of material that can be found in these areas. Nowhere else can you find much of this information in such a readily accessible form and it is what makes the volume an unequivocal necessity for anyone interested in the Carboniferous. There is also some synthesis of the data into palaeogeographical models, allowing sedimentation and fossil distribution patterns to be seen in a wider context. The syntheses are on the whole brief, which may seem surprising in a volume such as this. On the other hand, such synthetic models often have only a relatively short shelf-life, whereas the raw data which form the bulk of the volume should have a much longer-lasting value.

The volume is clearly printed on glossy paper and has a robust hard cover. The paper is rather thin, presumably to keep down the price (which is very reasonable), and whether it will withstand the heavy use that my copy will be receiving will have to be seen. I have only one significant criticism: the absence of an index or detailed, paginated contents, which makes trying to navigate around the volume rather a nightmare. This is not helped by there being at least six levels of subheading, without any sort of hierarchical numbering system. This type of review volume must inevitably have an intricate structure but it is a pity that the authors and/or editors have not made it a little more user-friendly.

The book has taken ten years to appear, apparently due largely to problems in translating the Russian scripts, and a number of the contributors have died in the interim, including Olgerd Einor and Sergei Meyen. For the rest of us, however, the wait has been worthwhile and this important contribution to Carboniferous studies will be required reading for anyone interested in Upper Palaeozoic stratigraphy and palaeontology.

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Environmental stress, adaptation and evolution

Bijlsma, R. & Loeschcke, V. (1997) XVII + 344 S.; Basel (Birkhäuser), ISBN 3-7643-5695-2; SFR 148.-

According to its title, this volume should not be missing in any geosciences library as the blurb promises an "evolutionary perspective (of the) impact of stress on biological systems". The book is divided into five chapters, only the first of which (three articles) is based on studies of organisms experiencing extreme chemical and thermal stress in their natural environment. Four articles make up the second chapter concerned with genetic variation and its consequences for the resistance to various extreme expressions of ecofactors; the third part (three articles) deals with high temperatures exclusively. In the fourth chapter, four articles treat the population level of adaptation to stress; two of them with reference to sexuality, two others by the presentation of mathematical models. The final part probably appeals most to palaeontologists. This is not just because the single representative of our profession (Peter Sheldon) is explaining his thoughts, but also because the level of single-species and single-factor studies is left.

Most other articles, however, deal with a narrow spectrum of target organisms. Arthropods rank highest, due to *Drosophila* as the study object in six cases, and vascular plants and bacteria occur twice. Biological interactions are barely considered, let alone ecosystemary approaches. All in all, only three contributions discuss several ecofactors simultaneously; three others are pleasantly general in this respect.

At first sight, the book may appear disappointing for the palaeontologist, due to the poor representation of most animal groups and the seemingly irrelevant (for palaeontology!) choice of study species. The unnatural restriction to single ecofactors in most articles further contributes to this impression. Having left out "evolution" from the title of the book, its contents would be rendered more appropriately. The conclusions about evolutionary impulses from extreme biotopes drawn under various aspects, however, make this volume highly interesting. Up to now, palaeontology could only speculate about cause-and-effect relationships, but from this book existing "paradigms" may be verified and substantiated in a very concrete way. Most contributions are of the review type, and thus provide a lead-in to this special matter, further facilitated by extensive lists of references. Under these circumstances it is of little importance that only the last articles offer those perspectives one would have expected judging by the title.

The presentation of this book is characterized by best paper quality, as well as a solid and appealing hard cover. These features probably bear some responsibility for the high price of the volume; nonetheless it is to be recommended to every scientist engaged in evolutionary biology.

Markus Bertling,
Münster

Morphometric Tools for Landmark Data

Fred L. Bookstein, Cambridge University Press, ISBN: 0-521-58598-8, 1997. 435pp. £55 Hardback, £24.95 paperback.

Morphometrics is the statistical study of biological shape change. This change may be due to ontogenetic, phylogenetic or pathological causes. The most important data for morphometrics are landmarks: easily identified and consistent points such as "the bridge of the nose", labdoidal fissure, or external auditory meatus. As geometric locations which have biological names, landmarks lend themselves to many statistical analyses. This book, by the eminent – and combative – morphometrist Fred L. Bookstein, is an in-depth survey of such mathematical techniques which are currently available to biologists.

The book begins with an outline of morphometrics as the study of covariances of biological form. The four basic principles of landmark data-based morphometrics are discussed, and a short prospectus concludes the section. A short modern history of morphometrics finds its way in; and is a welcome and interesting addition. A critical survey of multivariate morphometrics – as the use of interlandmark distances as separate variables – is covered fully. Size-independent coordinates are introduced before a full exposition of their multivariate statistical applications are explored in depth.

The second half of the book is a detailed survey of the most general and powerful recent methods for describing the results gained from many different types of analysis. The book is thoroughly illustrated using examples from evolutionary biology, craniofacial growth, (in medicine and surgery), neuroanatomy, and micropalaeontology. The diagrams are closely integrated with the text; although some cases are misplaced from the textual content. Geometric features are interrelated with the text very well. This book is not so much a 'how-to' volume, but rather a "this-is-what's-available" book. As such it would be a useful addition to a zoological or palaeontological library, if there are enough 'go-ahead' palaeontologists ready to attempt the application of some of the techniques in the book.

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Palaeontology
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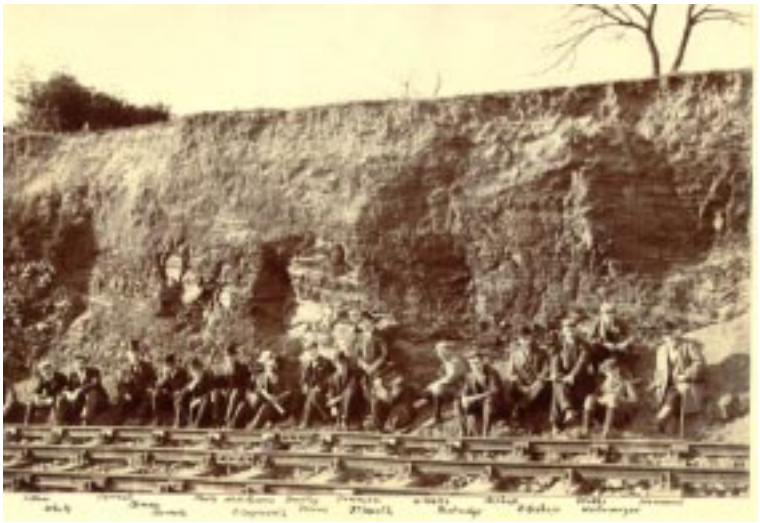
OUT OF THE ARCHIVES: SNAPS FROM THE PAST

The Pal. Ass. archive is held at the Lapworth Museum in Birmingham and offers a rare insight into the great and good of previous generations of palaeontologists.

Prof. W.W. Watts (centre) and Lapworth (right) in Comley Quarry, 1915.



A field party in Chapel End railway cutting, Nuneaton. Cutting is probably through the Upper Cambrian Outwoods Shales. The photograph is by the celebrated late Victorian landscape photographer W. Jerome Harrison.

Photographs from the Archive Collection of the Lapworth Museum, University of Birmingham.

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Notes for Authors

The journal Palaeontology is devoted to the publication of papers on *all aspects* of palaeontology. Review articles are particularly welcome, and short papers can often be published rapidly. A high standard of illustration is a feature of the journal. Six parts are published each year and are sent free to all members of the Association. *Typescripts* should conform in style to those already published in the journal, and should be sent to Dr R.M. Owens, Department of Geology, National Museum of Wales, Cardiff CF1 3NP, UK, who will supply detailed instructions for authors on request (these are published in *Palaeontology* 1990, **33**, pp. 993-1000).

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