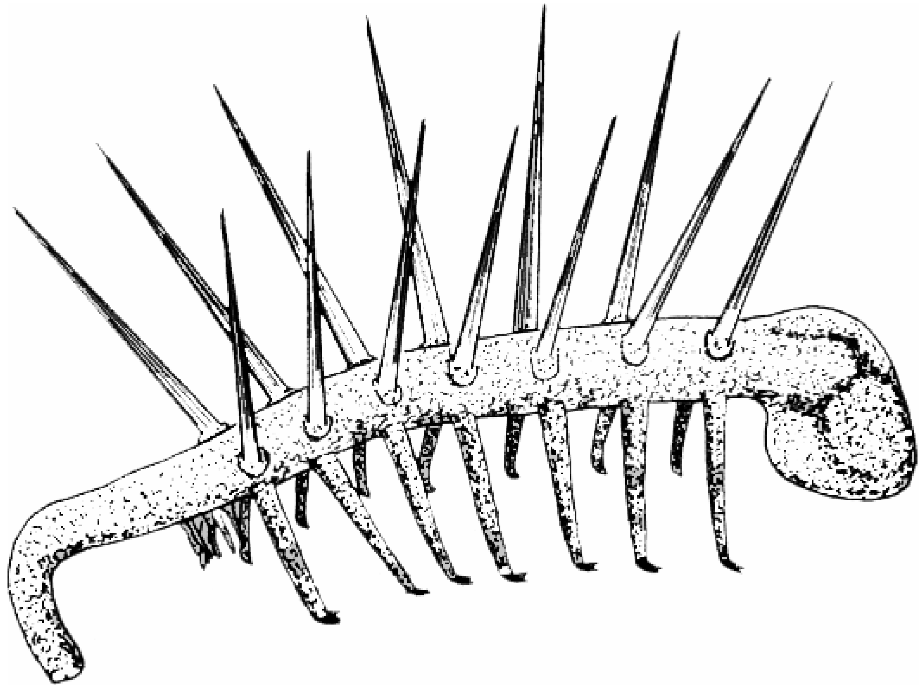
Progressive Palaeontology 2006

Cambridge

22 - 23 June 2006

University of Cambridge
Department of Earth Sciences

ABSTRACT BOOK



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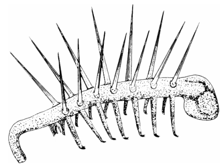

Contents

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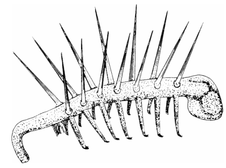

Attendees

Matt Allinson	University Museum of Zoology, University of Cambridge
Jonathan Antcliffe	Department of Earth Sciences, University of Oxford
Behnaz Balmaki	Association of Earth Scientists, Iran
Karl Bates	Palaeontology Research Group, University of Mancester
Mark Bell	Department of Palaeontology, Natural History Museum
Carys Bennett	Department of Geology, University of Leicester
Roger Benson	Department of Earth Sciences, University of Cambridge
Richard Butler	Department of Palaeontology, Natural History Museum
Richard Callow	Department of Earth Sciences, University of Oxford
Andrea Cobbett	Department of Biology and Biochemistry, University of Bath
Allison Daley	Department of Earth Sciences, Uppsala University
Peter Falkingham	87 Market Street, Pocklington
Jo Hellawell	Department of Geology, Trinity College Dublin
Jen Hoyal Cuthill	Department of Earth Sciences, University of Bristol
Phil Jardine	Department of Earth Sciences, University of Bristol
James Jepson	School of Earth, Atmospheric and Environmental Sciences, University of Mancester
Sarah Joomun	Department of Geology, Royal Holloway
Hilary Ketchum	Department of Earth Sciences, University of Cambridge
Benjamin Kotrc	Department of Earth Sciences, University of Bristol
Susannah Maidment	Department of Earth Sciences, University of Cambridge
Jason Moore	Department of Earth Sciences, University of Cambridge
Jennifer Morris	School of Earth, Ocean and Planetary Sciences, Cardiff University
Emma-Louise Nicholls	Department of Earth Sciences, University of Bristol
John Orcutt	Department of Earth Sciences, University of Bristol
Alex Page	Department of Geology, University of Leicester
Mark Phipps	University of Durham
Laura Porro	Department of Earth Sciences, University of Cambridge
Sean Pyman	University of Durham
Imran Rahman	Department of Earth Science and Engineering, Imperial College
Andre Sartori	Department of Earth Sciences, University of Cambridge
Esther Sharp	University Museum of Zoology, University of Cambridge
Lara Shychoski	Department of Earth Sciences, University of Bristol
Claire Slater	Department of Earth Sciences, University of Cambridge
Adam Smith	School of Biology and Environmental Science, University College Dublin
Michael Taylor	School of Earth and Environmental Sciences, University of Portsmouth
Ceri-Wyn Thomas	Department of Earth Sciences, University of Bristol
Lucy Wilson	British Antarctic Survey

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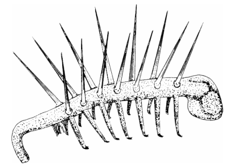

Timetable of Events

Wednesday 21st June

7.30 pm	Informal gathering at the Eagle Pub. Look out for Stephen the inflatable stegosaur to identify us!

Thursday 22nd June

8.30 – 9.00	Registration: in the coffee lounge, Department of Earth Sciences
9.15 – 9.25	Introduction, Nick Butterfield
9.25 – 9.45	The earliest small shelly fossils preserved in a lower Cambrian pyrite lagerstatte – Richard Callow
9.45 – 10.05	An interpretation of *Hurdia* as a dinocaridid from the Burgess Shale, British Colombia, Canada – Allison Daley
10.05 – 10.25	Ostracods from the Midland Valley of Scotland: Colonisation of the non-marine realm in the Lower Carboniferous – Carys Bennett
10.25 – 10.45	A re-evaluation of carpoid systematic position using three-dimensional reconstruction techniques – Imran Rahman

10.45 – 11.15 Tea and coffee break: in the coffee lounge

11.15 – 11.35	The significance of fossils in phylogenetic inference – Andrea Cobbett
11.35 – 11.55	New insights into the British Carboniferous lungfishes – Esther Sharp
11.55 – 12.15	Revising the systematic of Lower Jurassic pliosaurs – Adam Stuart Smith
12.15 – 12.35	Testing the phylogeny of extant and fossil Crocodylia – Emma Nicholls

12.45 – 1.45 Lunch: at the Cow

2.00 – 2.10	Introduction – Liz Harper
2.10 – 2.30	Collecting biases and the completeness of the dinosaur fossil record – John Orcutt
2.30 – 2.50	High resolution Light Detection and Range (LIDAR) imaging and digital photographic survey of the Fumanya dinosaur tracksites (SE Pyrenees, Catalonia): Implications for the cons.. – Karl Bates
2.50 – 3.10	Systematics and phylogeny of Stegosauria (Dinosauria: Ornithischia) – Susie Maidment
3.10 – 3.30	An unusual new neosauropod dinosaur from the Lower Cretaceous Hastings Beds Group of East Sussex, England – Mike Taylor

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3.30 – 4.00 Tea and Coffee break: in the coffee lounge

4.00 – 4.20 A geometric, morphometric and Finite Element Analysis of cranial variation in tyrannosaurid dinosaurs – Lara Shychoski

4.20 – 4.40 Mammalian supertrees – Claire Slater

4.40 – 5.00 Mammalian diets as indicators of palaeoenvironmental change: Eocene-Oligocene Ungulates of Europe – Sarah Joomun

6.00 – 7.00 **Reception: in the Sedgwick Museum, welcome by David Norman**

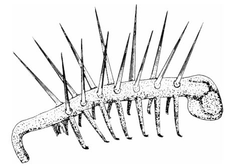
7:30 **Dinner: at Selwyn College**

Friday 23rd June

9.30 – 5.00 Field trip to Whittlesey

Minibuses depart from the Downing Street entrance to the Department of Earth Sciences at 9.30 am.

We will visit two brick pits, Bradley Fen and King's Dyke, one in the morning and one in the afternoon, and lunch will be at the Falcon Inn, Whittlesea. We will aim to be back in Cambridge by 5pm.



Talk Abstract

The earliest small shelly fossils preserved in a lower Cambrian pyrite lagerstätte

Richard Callow[1] and Martin Brasier[1]
[1]Department of Earth Sciences, University of Oxford, UK.

We will show in this talk that early diagenetic pyritization of biominerals is giving exciting new insights into the palaeobiology and potential affinities of organisms involved in the Cambrian radiation event. The Lower Cambrian Chapel Island Formation of Newfoundland arguably contains the world's oldest skeletal fossils - *Ladatheca*, *Aldanella* and *Watsonella* - preserved as locally abundant pyrite moulds and casts within a thick siliciclastic succession of Nemakit-Daldynian (i.e. basal Cambrian) age. *Watsonella* has been considered an early rostroconch, *Ladatheca* may be related to hyoliths and *Aldanella* is most commonly interpreted as a paragastropod or a primitive annelid but since their initial description and illustration these organisms have been largely neglected. Although pyrite lagerstätte are well documented (e.g. Chenjiang, Hunsrück), the secondary replacement of primary carbonate or phosphatic shells by pyrite has been little explored. High-resolution SEM study of specimens at Oxford reveals high-fidelity pyritization of primary biomineral structures, similar to those seen by replacement by authigenic minerals such as phosphate and potentially shows evidence for some soft tissue preservation. This lower Cambrian taphonomic window allows us to examine not only the process of pyritization but also the earliest known biomineralization in multicellular animals.

Talk Abstract

An interpretation of *Hurdia* as a dinocaridid from the Burgess Shale, British Columbia, Canada

Allison Daley[1], Graham Budd[2] and Jean-Bernard Caron[3]
[1,2] Department of Earth Sciences (Palaeobiology), Uppsala University, 22 Norbyvägen, Uppsala, Sweden and [3] Department of Natural History, Paleobiology Division, Royal Ontario Museum, 100 Queen's Park, Toronto, Ontario, Canada

The Burgess Shale in Canada provides an exceptional record of a normal marine community, soon after the appearance and diversification of animals in the early part of the Cambrian. This study is primarily based on specimens housed at the Royal Ontario Museum (ROM) in Toronto, the largest depository of Burgess Shale fossil in the world. Two separate "genera", *Hurdia* and *Proboscicaris*, which were originally interpreted as carapaces of unidentified arthropods, have been shown to belong to the same animal (Collins, 1999). Thanks to the finding of specimens with these two types of carapaces, plus claws (previously called "Appendage F") and a mouth apparatus ("*Peytoia*"), it can be shown that this animal, referred to here as *Hurdia*, belongs to the dinocaridids. In addition to morphology, the evolution and ecology of the *Hurdia* animal can be described, due to the abundance of specimens and the stratigraphic data associated with them. The description of the *Hurdia* animal is the first step towards a taxonomic revision of the dinocaridids, and may help elucidate the relationships within members of this group, and between this group and crown and stem group arthropods.

Talk Abstract

Ostracods from the Midland Valley of Scotland: colonisation of the non-marine realm in the Lower Carboniferous.

Carys E. Bennett[1]
[1]University of Leicester, University Road, Leicester, LE1 7RH <ceb28@le.ac.uk>

Ostracods are abundant in the fossil record from the Ordovician onwards, with a high diversity of species, and now thrive in all aquatic environments, but there is still uncertainty regarding the nature of their transition into the non-marine realm, during the Lower Carboniferous. Analysis of field sections and boreholes from the Viséan Pathhead Formation, East Fife, examines the nature of this transition.

Marine limestones and mudstones, deposited in a shallow marine seaway, are common and pass upward into restricted-marine deltaic, estuarine and lagoonal sediments that are overlain by non-marine deposits (including coal) from lakes and swamps. This study shows that marine sediments contain a high diversity of bairdiacean, cavellinid and palaeocope ostracods, and a diverse macrofauna including corals, crinoids, gastropods, and bivalves. In contrast non-marine and restricted marine sediments are characterised by a low diversity, high abundance of ostracods, dominated by paraparchitaceans, such as *Shemonaella scotoburdigalensis*. Low diversity non-marine macrofossils are dominated by *Naiadites, Curvirimula, Spirorbis,* fish fragments and plants. Preliminary test results of $\delta^{13}C$ and $\delta^{18}O$ from macrofossil and ostracod calcified shells, will give evidence for the type of environment, and salinity range in part of the Pathhead Formation.

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Talk Abstract

A re-evaluation of carpoid systematic position using three-dimensional reconstruction techniques

Imran A. Rahman
Department of Earth Science and Engineering, Imperial College London, South Kensington Campus, London SW7 2AZ, UK <i.rahman@imperial.ac.uk>

Carpoids are an extinct group of Palaeozoic marine deuterostomes. Modern deuterostomes are classified into three phyla (chordates, echinoderms and hemichordates), but placing the carpoids within one of these sub-groups has proved highly controversial. This is primarily because they possess a mixture of characters not seen in any extant organisms, and consequently several competing theories exist for the systematic position of carpoids within the deuterostomes.

Three-dimensional virtual models of the taxon *Lagynocystis pyramidalis* have been produced in an attempt to evaluate alternative hypotheses of carpoid affinity. These were constructed using computed tomography (CT) and a custom computer software suite (*SPIERS*). Study of *Lagynocystis* in this manner allowed the visualisation of features that were previously poorly understood, with an external opening identified adjacent to an internal series of rod-like structures. These features have important implications for interpretations of *Lagynocystis* palaeobiology, and consequently may help in testing models of carpoid systematic position.

Talk Abstract

The Significance of Fossils in Phylogenetic Inference

Andrea Cobbett[1], Jessica Pollitt[2], Angus Buckling[3] and Matthew A Wills[4]
Department of Biology and Biochemistry, University of Bath, Claverton Down, Bath.

Fossils record extinct morphologies and unique combinations of character states, but their significance for phylogenetic studies has been controversial. Here, we investigate empirically the impact of fossil taxa compared with living taxa when used to reconstruct most parsimonious cladograms. Two classes of metric are used to quantify their behaviour. The first class assesses the effects of omitting individual taxa prior to analysis, measuring the impact on tree topology and length. The second class uses a bootstrapping approach to quantify the effect of data perturbation on the mobility of individual taxa (leaf stability). In a data set of 50 matrices collected from the literature, there was no significant difference in the behaviour of fossil or extant taxa. We conclude that the fossils included in our sample of published studies are as influential as the living forms.

Talk Abstract

New insights into the British Carboniferous lungfishes

Esther Sharp
University Museum of Zoology, Downing Street, Cambridge, CB2 1RL
<els33@cam.ac.uk>

Lungfish (Dipnoi) are one of the most long lived groups of osteichthyans, with their origins in the Early Devonian. The Devonian record of this group is exceptionally well known and the extant genera have been studied extensively. Those groups which fall in between are less thoroughly known. The British species of *Sagenodus*, *Ctenodus*, *Uronemus* (*Ganopristodus*) and *Straitonia*, despite being some of the earliest lungfish groups to be described, are some of the genera that are still unsatisfactorily understood. The current study addresses this problem and aspects are presented here.

Classically defined on the morphology of their tooth plates, these genera are poorly defined, and while their skull roofs are well known, associations of dental and skull material are rare. The question of the validity of the numerous described species is raised, and new ways sought to use tooth plates in species designation. The study also investigates the distribution of *Sagenodus* and *Ctenodus* throughout the Carboniferous and questions whether morphological variation is a result of taxonomic difference, or is correlated with stratigraphy and palaeoecology. An overview and systematic descriptions are presented of the currently valid species of *Sagenodus* and *Ctenodus*, based on old and also some new material. The phylogenetic position of the British genera within the post-Carboniferous lungfishes is considered and a review of localities and their possible significance discussed.

Talk Abstract

Revising the systematics of Lower Jurassic pliosaurs

Adam Stuart Smith
School of Biology and Environmental Science, Department of Zoology, University College Dublin, Belfield, Dublin 4 <adam.smith@ucd.ie>

A newly prepared plesiosaur skull from the Hettangian of Street, Somerset, has been identified as *Rhomaleosaurus megacephalus* and provides new information on the cranial anatomy of this species. Notable features of the newly exposed palate include clear lateral palatine fenestrae, a large ectopterygoid contacting the medial border of the elongate suborbital fenestra, and an elongate exposure of the jugal contacting the posterior border of the suborbital fenestra. Comparison of this species with other rhomaleosaurid plesiosaurs indicates that it does not belong within the genus *Rhomaleosaurus*, a taxon comprising a maximum of only four species, all from the Toarcian of Yorkshire (*cramptoni, zetlandicus, propinquus)* and Northhamptonshire (*thorntoni)*. Thus, '*R.' megacephalus*, plus other species previously pertaining to *Rhomaleosaurus* (e.g. '*R.' victor, 'R.' longirostris)* require revised generic names. In the case of the latter, the name '*Thaumatosaurus'* could be resurrected. Next, it must be determined whether the species *megacephalus* belongs to an existing genus ('*Thaumatosaurus', Eurycleidus*) or a novel one?

All four species of *Rhomaleosaurus sensu stricto* share very similar skull construction and proportions, and possess the following synapomorphy - a large dorso-median foramen between the external nares. The validity of these four species (or their synonymy) shall be tested after the holotype of the genus *Rhomaleosaurus cramptoni* is transported from the National Museum of Ireland, Dublin and prepared by the Palaeontological Conservation Unit in the Natural History Museum, London. A second rhomaleosaurid plesiosaur skull, from Barrow, Leicester, is also undergoing preparation (in Dublin), and will shed further light onto the systematics of Lower Jurassic pliosaurs.

Talk Abstract

Testing the phylogeny of extant and fossil Crocodylia

Emma-Louise Nicholls[1], Michael Benton[2], Graeme Lloyd[3], Davide Pisani[4]
[1,2,3]Department of Earth Sciences, University of Bristol, Wills Memorial Building, Queen's Road, Bristol, BS8 1RJ, UK. [4] Bioinformatics Laboratory, The National University of Ireland, Maynooth, Maynooth, Co. Kildare, Ireland.

Although the phylogeny of the Eusuchia has been widely studied, those of the Protosuchia and the Mesosuchia remain relatively poorly known. As such no supertree currently exists for the entire Order Crocodylia. A supertree of the whole order will be created utilising both morphological and molecular data. Due to the vast number of taxa within the Crocodylia, the study will also produce several smaller species level trees which can be mapped on where required to the supertree by future authors. Literature on crocodilian phylogeny is dominated by Brochu, which will inevitably have a skewing effect on the topology of the supertree. Thus two separate supertrees, one including solely data from Brochu, and one eliminating all Brochu work, will be created in order to produce a comparison. Other comparative trees will include morphological data vs. molecular data, extant data vs. fossil data and pre 1990 literature vs. post 1990 literature.

Talk Abstract

Collecting biases and the completeness of the dinosaur fossil record

John D. Orcutt[1] & Emma-Louise Nicholls[2]
[1] Univeristy of Bristol, Department of Earth Sciences, Wills Memorial Building, Queen's Road, Bristol BS8 1RJ <jo5573@bristol.ac.uk>
[2] University of Bristol, Department of Earth Sciences, Wills Memorial Building, Queen's Road, Bristol BS8 1RJ. <en5144@bristol.ac.uk>

Collector curves, a plot of named taxa against year named, are a useful tool for estimating the completeness of the fossil record for a given group of organisms. We have constructed a collector curve based on dinosaur genera. The data were sorted by continent, age, and taxonomic group in order to determine if any significant collecting biases have skewed our understanding of dinosaur diversity. The topology of the overall curve suggests that the dinosaur fossil record is still largely incomplete. The major bias in the record of dinosaurs appears to be geographic, with genera from North America and Europe better understood than those from other continents.

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Talk Abstract

High resolution Light Detection And Range (LIDAR) imaging and digital photographic survey of the Fumanya dinosaur tracksites (SE Pyrenees, Catalonia): Implications for the conservation and interpretation of palaeontological heritage sites

Karl T. Bates[1], Phillip L. Manning[1,2], David Hodgetts[1], Robert L. Gawthorpe[1], Bernat Villa[3], Oriol Oms[4] and Frank Rarity[1]
[1]School of Earth, Atmospheric and Environmental Science, University of Manchester, Williamson Building, Oxford Road, Manchester, M13 9PL, UK.
[2] Manchester Museum, University of Manchester, Oxford Road, Manchester, M13 9PL, UK.
[3]Consorci Ruta Minera, Carretera de Ribes, 20, 08698, Cercs, Barcelona, Spain
[4]Department de Geologia, Facultitat de Ciencies, Universitat Autonoma de Barcelona, 08193, Bellaterra, Spain.
Corresponding author email: <karl.bates@postgrad.manchester.ac.uk>,

Palaeontological heritage sites have the potential to offer exceptional information about palaeobiodiversity and the evolution of life. Increasing political and social awareness of the need to protect palaeontological heritages sites is compelling scientists to consider new methods of reconciling conservation and exploration of their research sites. Terrestrial LIDAR (LIght Detection And Range) imaging is a highly accurate and efficient method of collecting quantitative spatial data that is being under-utilised in palaeontology as both an analytical and geoconservation tool.

In order to assess the value of integrated LIDAR imaging and digital photography as a geoconservation tool, a survey of a Maastrichtian dinosaur tracksite at Fumanya (SE Pyrenees, Catalonia) was undertaken using established ground-based procedures. The unique tracks and trackways at Fumanya constitute one of the most important Cretaceous tracksites in the world. However, the site has suffered significant erosion since the early 1980's when it was first exposed by open-air lignite mining. The preliminary LIDAR survey of the Fumanya South site has provided sufficient data to construct a number of high-resolution 3D Digital Outcrop Model's (DOM) of the locality. The 3D geometry of individual tracks within the DOM can be viewed and quantitatively analysed, providing the first comprehensive record of the tracksite. By enabling workers to build high-resolution photo-realistic DOM's, integrated LIDAR and digital photography may provide the means to produce a global inventory of palaeontological heritage sites, providing a unique level of access.

Talk Abstract

Systematics and phylogeny of Stegosauria (Dinosauria, Ornithischia)

Susie Maidment
University of Cambridge, Department of Earth Sciences, Downing Street, Cambridge CB2 3EQ <smai03@esc.cam.ac.uk>

Stegosauria is a clade of ornithischian dinosaurs characterised by a bizarre array of dorsally projecting dermal plates or spines extending from the cervical region to the distal end of the tail. Although the first stegosaur was discovered in Swindon, U.K., in 1875, and numerous remains have since been recovered from North America, Tanzania and China, as well as locations throughout Europe, taxonomy and relationships within the group are largely unstudied. The first cladistic analysis of Stegosauria based upon direct observation of specimens is presented. In contrast to previous analyses, the resulting cladogram is well resolved, and although relationships are not strongly supported by statistical tests, groupings accord well with the current understanding of palaeogeography during the Upper Jurassic and Lower Cretaceous: North American and British genera are closely related, and the African genus *Kentrosaurus* is more distantly related. Chinese genera are basal and imply a relict primitive fauna in China during the Middle and Upper Jurassic.

Talk Abstract

An unusual new neosauropod dinosaur from the Lower Cretaceous Hastings Beds Group of East Sussex, England

Michael P. Taylor[1] and Darren Naish[2]
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<dino@miketaylor.org.uk>
[2]School of Earth & Environmental Sciences, University of Portsmouth UK, PO1 3QL
<darren.naish@port.ac.uk>

BMNH R2095 is a well-preserved partial mid-to-posterior dorsal vertebra from the Berriasian-Valanginian Hastings Beds Group of Ecclesbourne Glen, East Sussex, England. It was briefly described by Lydekker in 1893, but its importance was not then realised and it has subsequently been ignored.

This specimen's concave cotyle, large lateral pneumatic fossae, complex system of bony laminae and camerate internal structure show that it represents a neosauropod dinosaur. However, it differs from all other sauropods in the form of its neural arch, which is taller than the centrum, covers the entire dorsal surface of the centrum, slopes forward at approximately 22º relative to the vertical, and has its posterior border coincident with that of the cotyle. Also unique is the featureless lateral side of the arch, devoid of laminae; and the asymmetric neural canal, small and round posteriorly but large and teardrop-shaped anteriorly, containing arched supporting laminae.

The specimen cannot be referred to any existing sauropod genus, and represents a new genus and possibly a new “family”. Other sauropod remains from the Hastings Beds Group represent Titanosauria and Diplodocidae; R2095 brings to three the number of sauropod “families” represented in this group.

The specimen is 200mm long and 165mm in cotyle diameter, compared with 276mm and 292mm for corresponding vertebrae in *Diplodocus carnegii* CM 84. This suggests a rather small sauropod, perhaps 72% as long and 23% as heavy as *Diplodocus* (19m, 2800 kg).

Supported by The Palaeontological Association, Oxford University Press, Blackwell’s and the Sedgwick Museum

Talk Abstract

A Geometric Morphometric and Finite Element Analysis of Cranial Variation in Tyrannosaurid Dinosaurs

Lara Shychoski[1], Emily J. Rayfield[2] and Manabu Sakamoto[3]
Department of Earth Sciences, University of Bristol, Will's Memorial Building, Queen's Road, Bristol, BS8 1RJ, United Kingdom [1]<ls5940@bristol.ac.uk>, [2]<e.rayfield@bristol.ac.uk>, and [3]<m.sakamoto@bristol.ac.uk>

Significant research has been undertaken to discover the anatomy, form and evolution of various theropod crania, and while numerous studies have been developed to understand bite force and/or related biomechanical implications, few have been focused to address the issue of scaling and its associated effects on functional efficiency. Similarly, research addressing morphological variation throughout ontogeny to understand functional adaptations in response to size change, also deserves consideration; specifically in regards to tyrannosaurids for which there is a fairly complete ontogenetic series available. In this study, data collected from geometric morphometrics and finite element analyses are presented regarding interspecific and ontogenetic tyrannosaurid cranial variation. Geometric morphometric analyses were conducted on various tyrannosaurid crania employing type I, II and III homologous landmarks to observe principal components of variation which are illustrated utilizing thin-plate splines. Finite element analyses identify principal areas of stress/strain within each morphologically unique cranium to elucidate tyrannosaurid evolution in response to mechanical function. Conducting these analyses on various morphologies within theropod crania will allow insight into the biomechanical aspects of scaling to develop a better understanding of efficient cranial design in small-scale and large-scale tyrannosaurids.

Supported by The Palaeontological Association, Oxford University Press, Blackwell's and the Sedgwick Museum

Talk Abstract

Mammalian supertrees

Claire S. C. Slater[1,3], James A. Cotton[2], Mark Wilkinson[1], Paul Upchurch[4], David B. Norman[3] & the PanTHERIA Project[5]
[1] Department of Zoology, The Natural History Museum, Cromwell Road, London SW7 5BD, U.K.
[2] Bioinformatics Laboratory, Department of Biology, National University of Ireland Maynooth, Maynooth, Kildare, Ireland
[3] Department of Earth Sciences, University of Cambridge, Downing Street, Cambridge CB2 3EQ, U.K.
[4] Department of Earth Sciences, University College London, Gower Street, London WC1E 6BT, U.K.
[5] Institute of Zoology, Zoological Society of London, Regents Park, London, NW1 4RY, U.K.
Corresponding author email: c.slater@nhm.ac.uk

Hypotheses of relationships of large numbers of taxa are useful for a variety of reasons, especially as they allow for comparisons from an evolutionary basis. Of particular interest for this project is the information they will be able to impart when the palaeogeographic distributions of the included taxa are considered both temporally and spatially.

The aim of this part of the research project was to create mammalian supertrees, which included both extinct and extant taxa from the Mesozoic and Cenozoic. The data and construction method used, and some of the resultant supertrees will be presented and discussed here.

Supertree construction, as a method, is still in its initial stages of development and there are many issues relating to its use. The results of two investigations relating to supertree methods will also be discussed here. Firstly, the importance of using a taxonomy as an input tree has been considered, and a practical method for its inclusion is offered. Secondly, a number of the current supertree methods have been evaluated to compare their effectiveness for summarising the source trees.

Supported by The Palaeontological Association, Oxford University Press, Blackwell's and the Sedgwick Museum

Talk Abstract

Mammalian diets as indicators of palaeoenvironmental change: Eocene–Oligocene ungulates of Europe

Sarah C. Joomun[1, 2], J. J. Hooker[2] and M. E. Collinson[1]
[1]Department of Geology, Royal Holloway, University of London, Egham, TW20 0EX, UK (S.Joomun@rhul.ac.uk) [2]Department of Palaeontology, Natural History Museum, London, SW7 5BD, UK

The Late Eocene and Early Oligocene was a time of climatic change from greenhouse to icehouse conditions. A major mammalian faunal turnover (the 'Grande Coupure') took place in Europe coincident with the first major glaciation in Antarctica (Oi-1). Much of the endemic European fauna became extinct with a significant effect on the ungulates (hoofed mammals). Possible causes of the Grande Coupure are climatic deterioration at the start of the Oligocene or competition following the dispersal into Europe of Asian taxa.

The feeding preferences of the herbivorous ungulates depend on availability of plant material, which is controlled by climate. In this project ungulate diet will be investigated using tooth microwear and wear facet development. Initial work aims to determine the best method for documenting microwear to allow quantitative analysis of multiple specimens. Results from the Infinite Focus light microscope and SEM (back-scattered and secondary) will be presented and their relative suitability discussed.

In addition, the dental wear of two closely related pairs of ungulates, one which survived across the Grande Coupure and one which became extinct, is being investigated. Preliminary results for the first pair, *Palaeotherium* and *Plagiolophus*, will be presented and the implications of these results will be discussed.

Supported by The Palaeontological Association, Oxford University Press, Blackwell's and the Sedgwick Museum

Poster Abstract

Cainozoic radiolarian size changes and the global silica cycle

Benjamin Kotrc[1], Daniela N. Schmidt[2] and David B. Lazarus[3]
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Radiolarians have played a key role in the silica cycle, balancing influx of dissolved silica in the oceans from continental weathering. Changes in their body size thus affect silica export to the deep ocean. Cainozoic size change trends in planktonic foraminifers (Schmidt *et al.,* 2004), benthic foraminifers (Kaiho, 1998) and diatoms (Finkel *et al.,* 2005) correlate closely with climatic change, suggesting extrinsic control on evolution. But while dramatic reductions in radiolarian test weight throughout the Cainozoic have been described (Moore, 1969, *GSA Bull.* 80, 2103-2107), the evolutionary trajectory of radiolarian size is unknown. Harper and Knoll (1975) suggested that test weight decreased due to competition for silica by diatoms, implicating a biotic control on evolution. Whether shell weight reduced due to a decreasing body size or silica use (shell robustness) is unclear.

A high- and low-latitude time series are examined at ~5- and ~2-m.y. resolutions respectively. Radiolarian size and silica usage are estimated by measuring test width, length, pore vs. bar area and shell thickness. Each specimen is classified to the family level to investigate the significance of taxonomic changes. Comparisons are made to existing size change data for other plankton groups and the oceanographic proxy record. With this data, climate change can potentially be linked to this important plankton group, and the radiolarian-diatom silica competition hypothesis tested. Comparison with the closely related planktonic foraminifers will reveal whether similar mechanisms drove size change in calcifying and silicifying plankton.

Finkel *et al.,* 2005. *PNAS* **102**, 8927-8932.

Harper and Knoll, 1975.*Geology* **3**, 175-177.

Kaiho, 1998. *Geology,* **26**, 491-494.

Moore, 1969. *GSA Bull.* **80**, 2103-2107.

Schmidt *et al.,* 2004. *Science* **303**, 207-210.

Supported by The Palaeontological Association, Oxford University Press, Blackwell's and the Sedgwick Museum

Poster Abstract

Boring Biostratigraphy? Dating and reconstruction of early vegetation and environments from the Old Red Sandstone, Wales.

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Over the past 40 years, the study of early land plant megafossils and their insitu spores, integrated with the dispersed spore record from Wales and the Welsh Borderlands, has contributed much to the understanding of the evolution and diversity of vegetation from Old Red Sandstone environments. The late Silurian – early Devonian is a key time interval for the evolution of vascular plants, but ecological and evolutionary studies are hampered by the lack of well-preserved megafossils from terrestrial red bed deposits. A better understanding of the Old Red Sandstone environments and taphonomy will help distinguish between patterns of ecological variation and taphonomic effects. Therefore an integrated approach is required, linking palaeobotany with sedimentological studies.

One site suitable for such a study is Tredomen Quarry, Brecon. It is an increasingly important site for the understanding of early Devonian ecosystems and depositional environments. Initial studies have cited diversity in palaeontology and palaeobotany and the presence of palaeosols, which are particularly useful environmental indicators.

Important to evolutionary studies is accurate dating. The Old Red Sandstone is dated using fish and miospore assemblage biozones. Borehole drilling of the quarry for palynological samples also provides material for detailed studies of the sedimentology and palaeobotany.

Poster Abstract

Microvertebrate Faunas of the Chipping Norton Limestone Formation, North Cotswolds

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In the early 1990s, near complete remains of a cetiosaur were discovered within a mid-Jurassic clay lens, at Hornsleasow Quarry in the northern Cotswolds. The dinosaur was discovered alongside remains of other terrestrial reptiles, plus terrestrial mammals and plants but also hybodont sharks and various marine invertebrates. The palaeoenvironment for the area is thus of great interest; is this a case of terrestrial animals and plants being washed out to sea, or is the explanation more complicated? A previous study concentrated on the macro remains and concluded that Hornsleasow must represent a mid-Jurassic marine environment but the conclusions were made upon limited evidence. Therefore, in an attempt to gain a 'total evidence' result, bulk sampling of the clay lens plus other horizons within the Chipping Norton Formation was carried out in order to study the microvertebrates and microinvertebrates. The fauna collected revealed not only that the species of hybodont were fresh water, but also that there was such an abundance of terrestrial material that a marine environment was not feasible. Correlations with palaeoenvironmental sea level studies by Underwood led to the conclusion that Hornsleasow was a lagoon in the mid-Jurassic.

Poster Abstract

Determining sea-level change and climate variation for the NE of England using Foraminiferal assemblages taken from Cowpen Marsh, Tees Estuary.

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The Tees Estuary (located in the NE of England) is a prime site for investigation of change in sea level via Foraminiferal assemblages. Up to now there has been little to no study of cores in the area for this reason. A core from the Cowpen Marsh area was compared to a transect from the same area in an effort to determine relative sea level change. Unfortunately, the core showed nothing conclusive due to the core being taken from the wrong side of the boundary that would most clearly have shown the change in sea level. This was due to an underestimation of the effect of sedimentation in the area. While sea level has been shown to have risen, sedimentation is occurring at a higher rate.

Although the data may not conclusively show a relative fall in sea level, it does show a lot of promise. The ratio of Elphidium:Protelphidium is something that hasn't been used before extensively, yet it shows a clear sensitivity to environmental factors. Our data has definite zones where the ratio is disrupted due to changes in rainfall. Our work also indicates that the method we used is valid in determining changes in sea level. We found clear distinctions within the transect that, if seen in the core, would be obvious indicators of rise or fall. We didn't see them, which, for our core location, would indicate a fall. More research must be done to confirm this.

Notes

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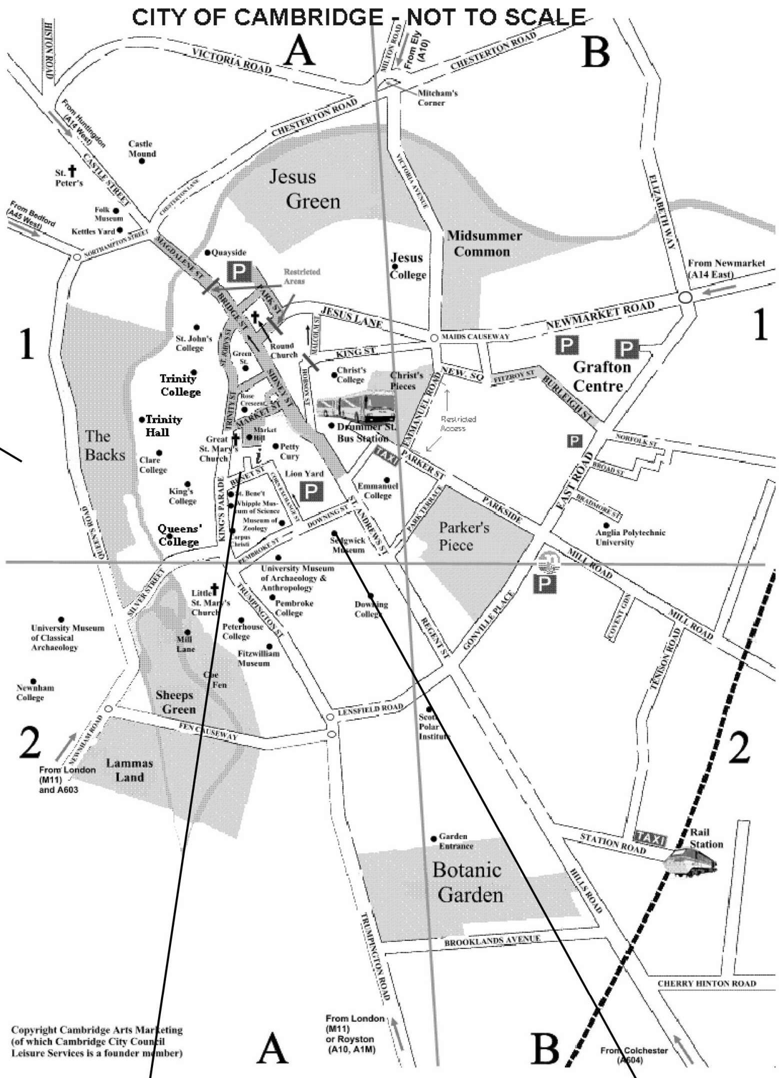
Notes

Tonight, Thursday 24th June

Follow on to reception in the Sedgwick Museum (6-7pm) with welcome by David Norman followed by dinner at Selwyn College (7:30pm)



Selwyn College

The Eagle Pub

Department of Earth Sciences and Sedgwick Museum

To Selwyn: At the eastern end of Silver Street, cross straight over Queens Road onto Sidgwick Avenue (not shown here). Continue to the end and turn right. Selwyn is immediately on the right hand side.

Tomorrow, Friday 23rd June

Field trip to Whittlesea

Minibuses depart from the Downing Street entrance to the Department of Earth Sciences at 9.30 am back by 5pm.

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