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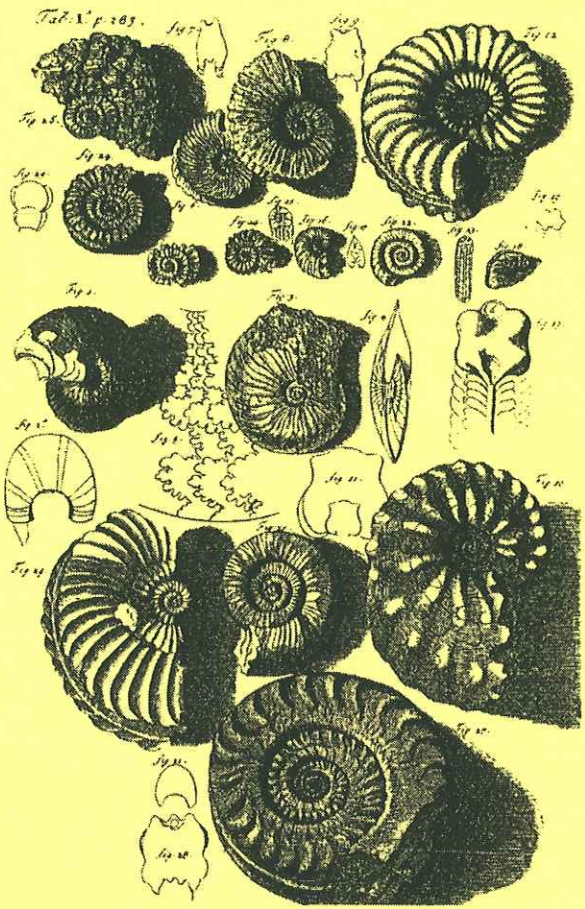


LEICESTER LITERARY & PHILOSOPHICAL SOCIETY : THE NEWSLETTER OF SECTION C (GEOLOGY)

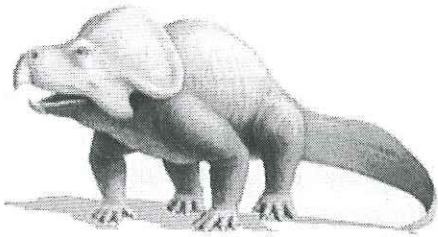
WINTER 2003/4 EDITION

New Year Editorial – 2004

Having begun to read Christopher McGowan's ***'Dragon Seekers'***, sub-titled 'The Discovery of Dinosaurs During the Prelude to Darwin' (Little, Brown, ISBN 0 316 85783 1, 2001) my curiosity was aroused as to how humankind interpreted fossils way before the C18th and C19th. So, in an encyclopaedia I found a 'Timetable of Earth Science', that listed some very interesting facts. The earliest reference to what might be termed palaeontology is: 'c.575 BC Anaximander of Miletus in Ionia states that fossil fish are the remains of early life'. Although there are quite a few references to discoveries and ideas about the physical aspects of the Earth the next reference to past life in the encyclopaedia is Cuvier's discovery of giant fossil bones in the banks of the River Meuse. I knew I had seen references to Mediaeval 'formed stones' and that there just had to be a wealth of information somewhere out there about the missing two and a quarter millennia.

A comprehensive answer was eventually found in Adrienne Mayor's ***'The First Fossil Hunters'***, sub-titled 'Paleontology in Greek and Roman Times' (Princeton University Press, ISBN 0 691 05863 6, 2000). Mayor's approach to this fascinating aspect of palaeontology is from the perspective of a classical folklorist and she convincingly demonstrates that griffins, centaurs and Cyclops had their origins not in the fictitious fancies of imagination but from the evidence in the rocks.

Griffin



Proceratops

For example, the legend of the gold-guarding griffin originates from tales told by Scythian gold miners who encountered *Protoceratops* remains at the edge

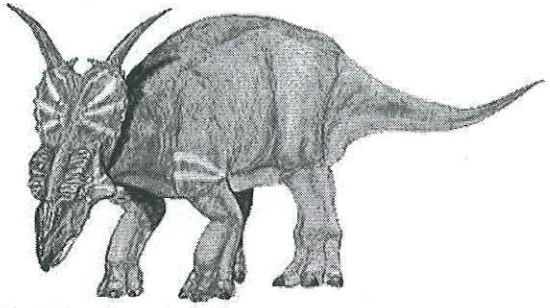
of the Altai mountains in the Gobi Desert ('altai' means 'gold' in the original local language). This does not exclude comparatively recent myth-making; for example, texts on historical geology frequently perpetuate the idea that Empedocles studied fossil elephants in Southern Italy in the fifth century BC, relating the remains to the Cyclops killed in a cave by Odysseus in Homer's Odyssey. Modern texts also cite with authority that Giovanni Bocaccio in the C14th. was the first to publicise Empedocles' finds. There is a valuable object lesson here in always referring to primary source material. While it is true that Bocaccio was present when peasants found a giant skeleton in a cave, circa 1371, neither he nor anyone else identified the bones as elephant. Bocaccio did write that the giant bones were of the Cyclops though never mentioned Empedocles. Empedocles himself is not known to have referred in his writings to skulls, giants, caves or Cyclops, and in any case elephants were unknown to him. In her book Mayor has traced the origin of this modern myth to an Austrian palaeontologist, Othenio Abel. Quoting from Mayor's account:

'Writing about fossil folklore in 1914, Abel hit on the idea that ancient sailors mistook the large nasal opening in unfamiliar fossil elephant skulls for the eye socket of a one-eyed giant. To support his own ingenious speculation, Abel attributed the idea back in time to Empedocles, an ancient philosopher who pondered the origins of life. With no basis in the surviving record, Abel declared that "Empedocles reported such finds in Sicilian caves and believed these to be unassailable proof of the existence of an extinct race of giants." In the 1940s, Willy Ley, one of the first historians of paleontology to repeat Abel's Empedocles myth, added the false claim that Bocaccio had cited Empedocles as his authority when he announced the discovery of the Cyclops. In the manner of folk legends, Abel's and Ley's plausible-sounding assertions were taken up and elaborated by successive writers who never bothered to check what Empedocles and Bocaccio had really said.'

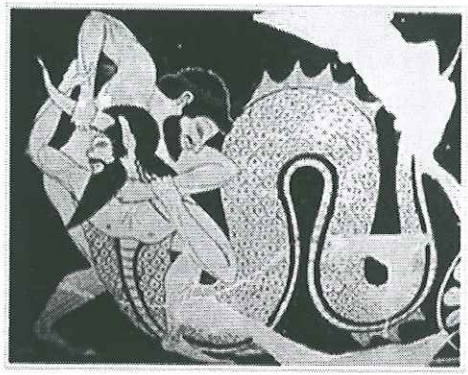
The Chinese concept of dragons appears to have a basis in palaeontology. The I-Ching, compiled shortly after the time of Homer, relates in one of the 'peasant omens' that 'dragons encountered in the fields' is a good omen, if only for the fact that dragon teeth and dragon bones fetch good money! Just how many excellent fossils have been ground-up for sale in Chinese apothecaries down the centuries does not bear thinking about. In the second century BC a canal was excavated in north-central China; a chronicle of that time records 'dragon bones were found and therefore the canal was named Dragon-Head Waterway'.

Mayor's book is packed with examples of palaeontology, largely from the Classical times. It would be tempting to describe many of the examples here but space simply does not permit. Many cases involved assemblages of fossil skeletal material which mimicked the skeleton of man. Since many of the skeletons attracting attention were huge there was no other explanation two thousand years or so ago that they could be anything but giants. Even as recently as 1613 a skeleton of *Dinotherium* was found in Southern France assembled in the form of a man. This was interpreted at the time as the skeleton of King Teutobochus, a giant king of the Germanic tribe defeated in battle by the Romans in 105 BC.

Naming fossils after giants or mythical creatures is not wholly out of fashion. For example, Othniel C. Marsh (see 'Charnia' Editorial for Summer, 2003.) named *Brontotherium*, which means 'Thunder Beast', after the Sioux myth of the beast of that name. Other like examples are *Indricotherium* (= *Baluchitherium*) the largest ever land mammal, named after the Russian earth-shaking Indrik beast. The pterosaur *Quetzalcoatlus* was named after the Aztec serpent-god and one example with a really nice twist was the naming of *Achelousaurus horneri*. Achelous was a mythical river monster whose horn was broken off by Heracles – the horn was put back in honour of Jack Horner, the Curator of the Paleontology Museum of The Rockies.



Achelousaurus



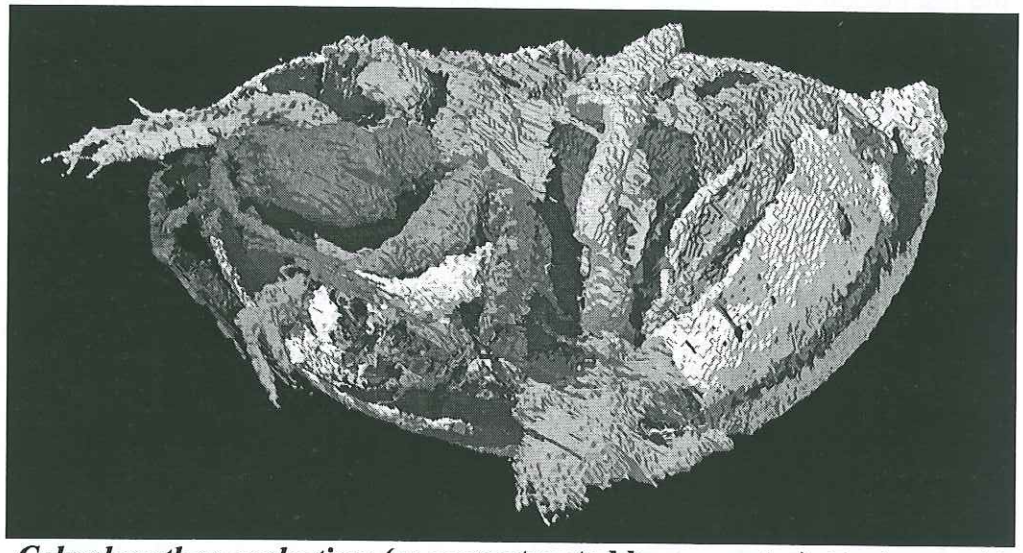
Achelous

You'd think descendants of dinosaurs were making trouble in the Black Hills of Dakota. OK, there aren't any descendants except possibly the birds twittering in the Black Hills, though the FBI were called in to raid the Black Hills Institute of Geological Research in Hills City, South Dakota, in 1992. The FBI were acting on behalf of the US Bureau of Indian Affairs, which claimed that a *T. rex* had been illegally removed from land belonging to the Cheyenne River Sioux. You might be more familiar with this actual specimen of *T. rex* if I said it had been named 'Sue', named in honour of its finder, Sue Hendrickson. (See Elaine Smith's article 'Desperately seeking *Suchomimus*',

'Charnia', Summer, 2001.). Up until 1995 Sue's bones remained in a secure government warehouse, with the issues of collecting rights and ownership unresolved. Happily, Sue now resides in the Field Museum, Chicago, the purchase being enabled by a large fast-food company (whose logo is interpreted as 'M' for Mummy by my four year-old son) and a cartoon enterprise that doesn't encourage messing about with their mouse.

This case has parallels with Kennewick Man. In July 1996, a human skull was discovered in a bank of the Columbia River in Washington State. It appeared at first to be the skull of a European who died between forty and fifty years of age. However, closer examination found a stone projectile point in the hip bone when the remainder of the skeleton was recovered. This evidence, plus carbon dating, placed the skeleton at between 9.2 and 9.6 thousand years BP. A facial reconstruction of the skull bore a remarkable resemble to the actor Patrick Stewart, aka Captain Jean-Luc Picard of Star Trek fame. The European features of the skull came about as a result of the confusion made by comparing the features of living populations with those of the past – overlaps are bound to occur. The age of the skeleton brought political implications in that the 1990 Native American Graves Protection and Repatriation Act demanded that the remains should be handed over to the appropriate Native American Tribe. The Umatilla tribe subsequently claimed Kennewick Man as one of their own, as did the Asatru Folk Assembly. A legal battle ensued and goes on to this day. Fortunately, Kennewick Man's remains are secure in the custody of the US Army Corps of Engineers. If, for the sake of political correctness, these remains are eventually interred as part of a traditional native custom, what knowledge of the history of mankind will be forever lost? Do we clean out anthropological specimens relating to the past few thousand years of mankind's history from the world's museums? How far do you go down the line of acceptance that remains are culturally affiliated with present human groups and their claims that they have occupied lands since time immemorial? Surely it is far better to enlighten the people who make these claims? Who knows what new scientific techniques will emerge in the future to reveal more of our native and aboriginal ancestry? Here lies the irony with Kennewick Man; studies of the genetic material recovered from this skeleton show that his genotype is closely linked to populations from the region of Lake Baikal in Southern Siberia, who appear to be the ancestors of Native Americans.

Something caught my eye recently in 'The Guardian', a newspaper not normally noted for what might be called 'tabloid tendencies'. Under the heading 'Well hung Scientists' Big Find' (there was no other punctuation in +this heading) was a picture of a 425 million year old Ostracod with exceptional fossil preservation of internal structure. The organism has been named *Colymbosathon ecplecticos*, which apparently is Greek for 'amazing swimmer with large penis'. The 5mm long specimen (i.e. the complete Ostracod) came from 'an undisclosed location in Herefordshire' and Professor David Siveter of Leicester University (one of those who discovered the organism) is quoted by 'The Guardian' as saying "We have won the lottery. Its basic body plan is very similar to living representatives. It has the same number of limbs, it has compound eyes, it has gills, it has a penis."



***Colymbosathon ecplecticos* (as reconstructed by computer).** Thanks to David Siveter for the image

Another tit-bit that came to my attention concerned the 509 million year old trilobite *Elrathia kingii*, found in the Middle Cambrian of Utah. It appears to have lived at the anoxic/dysoxic boundary, yet occurs in fossil densities of up to five hundred individuals per square metre. There seems a strong likelihood that *Elrathia* depended on chemoautotrophic sulphur bacteria that oxidised the plentiful sulphides occurring in such environments. Thus, these arthropods seem not to have been dependent on photosynthesis as their primary input of energy. Examples of such food chains today are the specialised extremophile communities living on submarine hydrothermal vents. It is not known if the trilobites existed symbiotically with the sulphur bacteria or whether they simply ingested them.

Finally, an apology to the structural geologists, geophysicists, geochemists and mineralogists; I focus on palaeontological matters in these editorials because this area of geology tells us most about our origins – perhaps *the* greatest and most popular area of fascination in geology. In an attempt to restore some balance I will mention that I have just finished reading 'Uncle Tungsten' by Oliver Sacks (Picador, ISBN 0 330 390287, 2002.). It is a fascinating autobiography of Sacks' formative years. 'Uncle Tungsten' was Oliver's Uncle Dave who owned a lightbulb manufacturing business. Sacks' whole family background revolved around science and medicine and it was the fascination with minerals and chemistry that drew the author into an early scientific career. Chapter Six of Sacks' book is called 'The Land of Stibnite' and is full of resonances surely familiar to many geologists, amateur and professional alike. It concerns young Oliver's frequent visits to the Geological Museum in South Kensington and his fascination with not just the appearance and chemistry of minerals but their naming too – which is more or less where this editorial began – the naming of things.

NB: Most, if not all of the titles cited in 'Charnia' Editorials, can be obtained from local libraries. If the title and other relevant details are passed on to your librarian the books can either be new acquisitions or they can be obtained via the inter-library loans network. If you have internet access a very interesting account of the legal battle to rescue Sue can be found at http://www.panix.com/~gmcgath/sue.html and a description of the extraction and preparation of this and other *T. rex* specimens (e.g. 'Stan') can be found at the website of the Black Hills Institute of Geological Research, http://www.bhigr.com/

GS

Programme of indoor meetings 2004

All held at 7.30pm in Lecture Theatre 10 (LT10) in the Geology Department, Leicester University, except where stated

Monday January 12th
Parent Body Lecture, to be held at **New Walk Museum, Leicester**. Dr Jane A Evans (NERC Isotope Geosciences Lab., British Geological Survey, Keyworth) - 'You are what you eat: isotope studies and migration'

Wednesday January 14th
Dr Graham Weedon (Department of Environment, Geography and Geology, University of Luton) - 'From climate change to time scales: examples from the Jurassic in England'

Wednesday January 28th
Dr Diana Sutherland (Mears Ashby, Northampton) - 'Geology above ground: the building stones of Northamptonshire'

Wednesday February 11th
Members evening, to be held at the **New Walk Museum, Leicester**

Saturday February 21st (whole day)
Saturday School, **Vaughan College, Leicester**. 9.30 am - 5.00 pm. 'Not walking with dinosaurs: marine and flying reptiles of the Mesozoic'. Six speakers, convened by Mark Evans.

Wednesday February 25th
Dr Jane Francis (Department of Earth Sciences, University of Leeds) - 'From greenhouse to icehouse, from forests to frost. Using fossil plants to track climate change in Antarctica'

Wednesday March 10th
Professor Simon Conway-Morris (Department of Earth Sciences, University of Cambridge) - 'Meeting the extra-terrestrials: clues from evolution on Planet Earth'

Wednesday March 24th
AGM and Chairman's address - Andrew Swift (Department of Geology, Leicester University) – 'Geological highlights of the Midlands, II – Southam (Long Itchington) Quarry, Warwickshire'

Annual General Meeting March 24th 2004

A reminder about the AGM on March 24th. If you have any nominations for officers or committee, there is a form enclosed with this Charnia. This is your opportunity to suggest or propose changes you might like to see, remember that all officers and committee are subject to re-election and can be replaced

by nominees put up and voted for by you. If you fancy a go yourself, all you need is a proposer and seconder. We are looking to fill specific vacant posts and there may be just the job for you (subject of course to you getting elected at the AGM).

Abstracts of Winter Programme talks 2004

Abstract of Parent Body talk scheduled for Monday January 12th

You are what you eat: isotope studies and migration

Dr Jane A. Evans
NERC Isotope Geosciences Laboratory,
British Geological Survey,
Keyworth

This talk presents the current understanding of how we can use oxygen, strontium and lead isotope composition to trace the climatic, cultural and geographic/geological origins of migrating populations, either human or animal. It describes the techniques and then presents examples of how these techniques have been applied to bird migration and to archaeology - taking examples from a project undertaken for a TV programme

Abstract of talk scheduled for Wednesday January 14th

From climate change to time scales: examples from the Jurassic in England

Dr Graham P. Weedon
Department of Environment, Geography and Geology
University of Luton

Ancient open-marine mudrocks are characteristically cyclic. In many cases the cyclicity relates to orbital forcing of climate and the Milankovitch Theory. The calculated history of orbital changes cannot be extended to before 35 million years ago (i.e. earlier than the late Eocene). Nevertheless, orbital tuning can be applied to ancient mudrock sequences provided appropriate procedures are used in the collection and treatment of the records (time series) obtained:

a) Data (time series) collection must involve a meaningful variable and a sampling rate that avoids aliasing.

b) Time-series analysis is needed to identify regular cyclicity as a function of depth. In particular it is critical to test the possibility that the data merely represent smoothed random numbers.

c) Independent time control must be available to identify the likely period of any regular cycles identified.

d) The ever-present possibility of undetected stratigraphic gaps means that the time control can only provide the maximum possible cycle period.

e) Provided orbital cycles can be identified fairly confidently, a floating chronology can be obtained by tuning the regular cycles isolated via band-pass filtering to a sine wave.

Examples of orbital tuning will be illustrated for British Jurassic mudrocks.

Further reading:

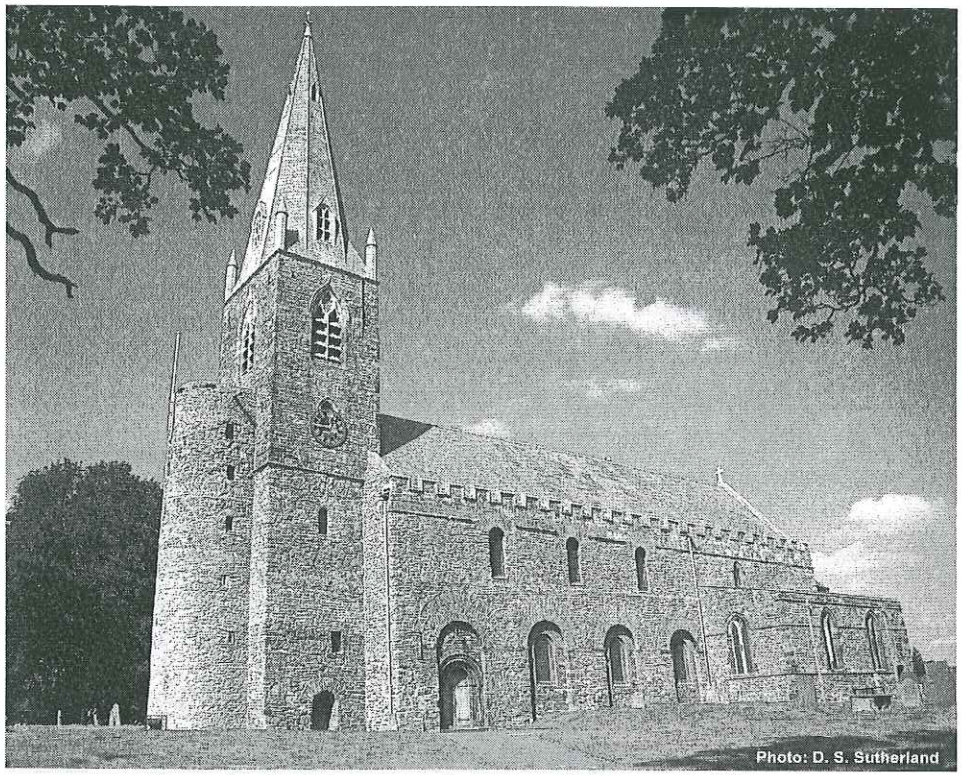
Weedon, G.P., 2003. *Time-Series Analysis and Cyclostratigraphy. Examining Stratigraphic Records of Environmental Cycles*. Cambridge University Press. ISBN 0-521-62001-5

Lower Jurassic strata near Lyme Regis. Result of orbital forcing?

Abstract of talk scheduled for Wednesday January 28th

Geology above ground: the building stones of Northamptonshire

Dr Diana S. Sutherland
Mears Ashby, Northampton



A geological treasure house – Brixworth Church

Stone villages across Northamptonshire display a surprising variety of Jurassic building stones, from rusty ironstones to pale limestones. Village stone is found to be very local, and can be read like a geological map. Geological exposures may be rare, but the widely available building stones facilitate an appreciation of the changing palaeogeography of the region.

Ironstone occurs at more than one geological horizon, but Liassic Marlstone Rock often contains fossils which distinguish it from ironstone of the Northampton Sand Formation. The NSF also includes ferruginous sandstones, widely used as building stone. Several different limestones occur in the Middle Jurassic, recognisable by their textures and regional distribution. And among the various rocks were some that provided freestones, transported further afield for elegant houses. Lincolnshire Limestone from Weldon and King's Cliffe went to build Cambridge colleges. The well-known Collyweston Stone Slate comes from the base of the Lincolnshire Limestone in northern Northamptonshire.

Wellingborough Limestone from the Rutland Formation is continuous with the Taynton Limestone Formation yielding the historic Helmdon Stone. The Blisworth Limestone Formation was a common building stone along its outcrop, and a source of freestone at Cosgrove, Raunds and Oundle.

Abstract of talk scheduled for Wednesday February 25th

From greenhouse to icehouse, from forests to frost - using fossil plants to track climate change in Antarctica

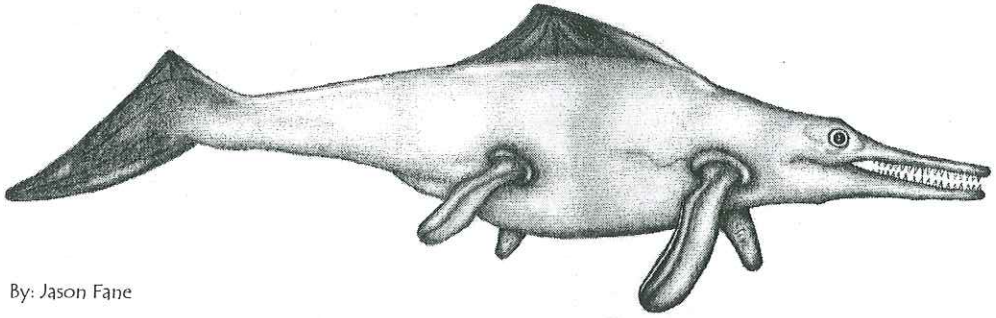
Dr Jane Francis
Centre for Polar Sciences, School of Earth Sciences
University of Leeds

Although Antarctica is now a frozen land of ice caps and glaciers, for much of its past it was a place of lush green forests, even though it was situated in high palaeolatitudes. Fossil leaves, wood and marine creatures preserved within Cretaceous and early Tertiary sediments show that environments at high latitudes were warm and favourable for forest growth and that marine waters were also warm, with no signs of significant ice caps. The onset of the Cenozoic ice age about 40 million years ago had a profound effect on Antarctic life and wiped out the last major forests during the Oligocene, although tundra plants of dwarf bushes, mosses and cushion plants held on during warmer interglacial phases a couple of million years ago.

Saturday School, Saturday February 21st 2004

We have had several enquiries about this year's Saturday School at Vaughan College, so this is to let you all know that it is ON, and should be another excellent day. We have had some problems with continuity this year, since our main contact Diane May left, but have now established a dialogue with the College and it's all systems go for Saturday February 21st from 9.30 - 5.00. Vice-Chairman Mark Evans is convening the day and has all the details if you

want some advance information, but the title will be '**Not walking with dinosaurs: marine and flying reptiles of the Mesozoic**'. There will be six speakers including Dr David Martill, TV personality and a long-standing friend of the Section. We understand that the fee will be £22, with concessions at £18, all ticket enquiries to Vaughan College please (0116 2527368).



By: Jason Fane

Programmes of other societies

LLPS Natural History Section. Wednesday evenings at 7.30 in New Walk Museum, except where stated

January 21st – How pondweeds get themselves about (Dr Richard Gornall, Leicester University Botanic Gardens)
February 4th – Inter-relationships between insects and the lower plants (Dr Tony Fletcher, Leicestershire Museums Service)
February 18th – Landscape and wildlife: the changing scene (Tony Squires)
March 3rd – Life in the darkness (John Jones, with Joan Plummer)
March 17th – Bats: what's new? (Jenny Harris, Leics & Rutland Bat Group)
Monday March 22nd, Joint Meeting with the Parent Body. Farming and wildlife (Nicholas Watts)
March 31st – AGM, Natural History forum and social evening

East Midlands Geological Society. 6.30 pm in lecture theatre B3 of the Life Sciences (Biology) building, University of Nottingham, except where stated. Contact: John Wolff (EMGS Secretary) sec@emgs.org.uk or 01623 794458

Saturday February 7th – President's Evening celebrating 40 years of the EMGS.
Saturday March 13th – Earthquakes in the English Midlands (Dr Brian Baptie)
Saturday March 20th – Environmental Geology (prov. title). Joint meeting with the YGS at BGS, Keyworth, 2 pm.
Saturday April 3rd – The life and work of Alfred Wegener (Dr Clare Dudman)

Yorkshire Geological Society. Contact: Dr Paul Wignall (Programme Secretary) wignall@earth.leeds.ac.uk or 0113 2335247

Saturday 24th January. Univ of Leeds Rupert Beckett Lecture Theatre.
Evolution of Early Vertebrates Speakers:
Ivan Sansom, University of Birmingham, "Fishin' in the Ordovician"
Paul Smith, University of Birmingham, "The biology and macroecology of early vertebrates - evolution meets plate tectonics"
Moya Smith, Kings College, London, "At the cutting edge: a bite deep into fish and the origin of vertebrate teeth"
Mark Purnell, University of Leicester, "Conodont dentition"

Saturday 21st February, University of Durham, "New developments in postgraduate research"
Saturday 20th March, BGS Keyworth, "Geological Hazards and Disasters"
Speakers: Nick Riley and Phil Allen

Stamford and District Geological Society. Contact: Pauline Dawn, 01780 764714. Meetings are held at Tinwell Village Hall at 7.30 (visitors £1.50)

Wednesday January 14th – Sumatra, and the break-up of Gondwanaland (Dr Michael Crow, ex-BGS)
Wednesday February 11th – Aralsk to Huanglong: geological treats across central Asia (Dr Tony Waltham)
Wednesday March 10th – AGM and Member's Evening

Central Branch of the Russell Society. Meetings are usually held in the Manzoni Building, Loughborough University at 8.00 pm. Section member John Dickinson can give details (01530 834104)

Saturday 21st February. Visit to the Department of Geology, Leicester University.
Friday 12th March. Branch AGM. followed by "The Manganese Mines of the Harlech Dome, an update" (John Jones)

Warwickshire Geological Conservation Group. Contact: Martyn Bradley, 01926 428835 0r Jon Radley 01926 412481. Meetings are held in St John's Museum, Warwick at 7.30.

Wednesday January 21st – The Permo-Triassic extinction (prov title) (Dr Roz White)
Wednesday February 18th – Soft-bodied sensations from the Silurian of the Welsh Borderland (Dr David Siveter)
Wednesday March 17th – Member's Evening. Conserving the geology of Warwickshire quarries: why and how? (Jane Worrall)

Summer Programme 2004

Dennis Gamble has a good idea of the venues and dates for the summer programme, but some trips await final confirmation, so a full programme will appear in the May edition of Charnia. However, please note that the first field trip of the season will be somewhat earlier than usual, on **Sunday April 25th**, and will be a trip to very productive fossil localities in the **Cotswold Water Park** with **Dr Neville Hollingworth**. We would also like you to note that the **Weekend Fieldtrip** will take place over the weekend of **Friday May 21st – Sunday May 23rd**, and the venue will be the **Welsh Borderlands** to visit **Lower Palaeozoic** localities. Leaders will be Dr Gary Mullins from the Leicester Geology Dept, and the Chairman. It is important that we book hotel accommodation for this one ASAP, so please can we ask prospective participants to let us know now. Either phone Dennis on 0794 7725361 or e-mail the Chairman at as48@le.ac.uk

Other confirmed trips include a visit to Northamptonshire with Dr Diana Sutherland to visit a quarry and a stone-built village where we will take lunch in the village pub. We are also investigating two further trips, one to Quaternary sites in eastern England and another to a local igneous locality. A visit to a local British Gypsum mine may also take place, depending on permissions being granted.

Christmas Meeting, New Walk Museum, December 17th 2003

Once again the festive season was ushered in with Section C's traditional Christmas Meeting at the Museum. And, as usual, a good time was had by all. Especially commendable was the excellent spread of food and drink so generously donated by members. In recent years, we've tried to introduce a few more attractions to enhance the evening, and this time we ran a looped projection of photographs from the 2003 field season, which was popular. There was also a 25 question quiz which taxed some more than others. Strangely, it was the teams that were making the most noise who did the worst - the strong, silent team lead by Mark Evans quietly demolished the rest! Mark also provided a 'mystery object' quiz – I'm not quite sure who won that! We missed Roger Newman's quiz this year due to Roger's continuing health problems, but he assures us he's on the road to recovery and is anxious to rejoin the throng. He keeps me in touch with his progress, and we wish him all the best.

Some members brought along objects of geological interest and Dennis Gamble brought some well curated trays of fossils, which also attracted favourable attention. Thanks must go to Joanne Norris and Margaret East for turning everyone's shopping bags of food donations into a nicely laid-out feast, and to Mark Evans for providing facilities at the Museum.

A last word – despite a (fairly) intensive publicity campaign, the attendance was not large. Those who came clearly had a good time – how about the rest of you coming along in 2004 to make things even more enjoyable!?

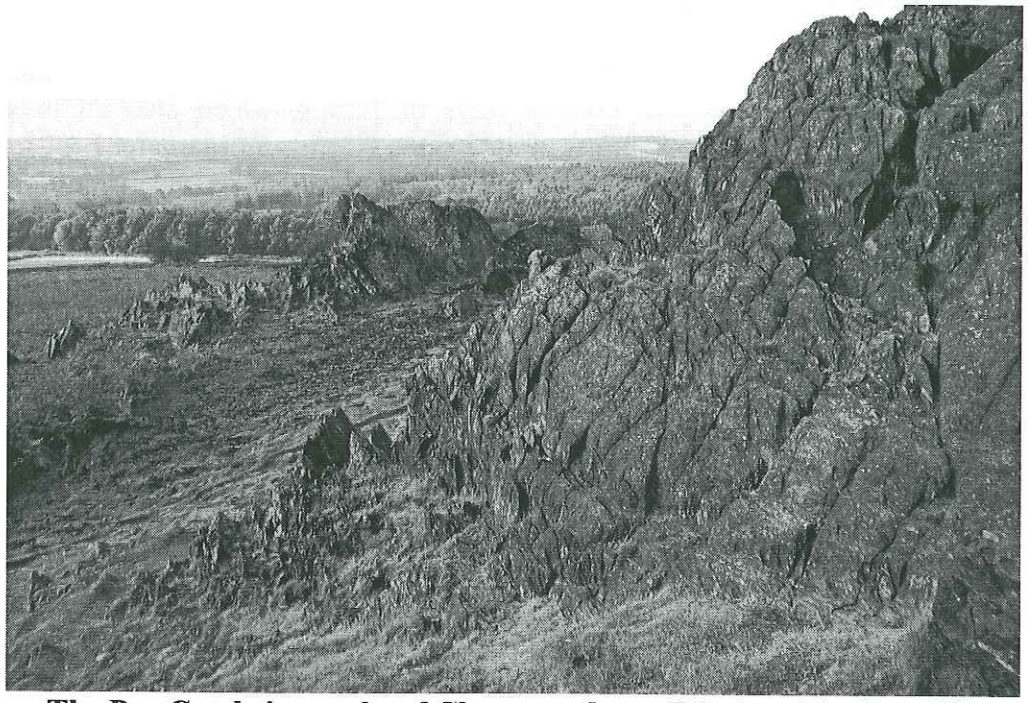
Andrew Swift

Book review

The Geology of the East Midlands. Geologists' Association Guide No. 63. Compiled by Albert Horton & Peter Gutteridge. £11.00. Available from the Association or the East Midlands Geological Society.

This field guide has been a long time gestating. I can remember sitting on the Council of the EMGS in 1997 when we were told, 'publication was anticipated soon'. But I must say that the wait has been worthwhile, and this most useful publication is a fine achievement, and congratulations are in order for the authors and compilers. It is possible that some of the topography and access details, particularly regarding the quarries, have changed in the interim since the authors made their surveys prior to writing their chapters, but a little checking prior to undertaking these field excursions should solve that problem. The format is a soft covered A5 book of some 129pp, with a pleasing coloured front cover showing a stone-hewn tunnel in Nottingham,

and photos on the rear of scenes in Derbyshire and Bradgate Park. The book is split into three parts, each prefaced by a most useful chapter setting the geological scene for a particular section of the column, compiled in stratigraphical order from the Pre-Cambrian to the Middle Jurassic. Thus, the order of the book is natural and organic. Within each of the three parts is a selection of excursions selected to show the best of the geology that can be seen in the field. The itineraries are clear and easy to follow and well-supported by concise and uncluttered diagrams and illustrations. No-one should get lost!



The Pre-Cambrian rocks of Charnwood – well featured in the guide

One can have few gripes with this excursion guide, and errors are minimal. However, beware of the run-on from page 82 to 83, as there is clearly missing or displaced text. Coverage of East Midlands geology is admirable, but on a personal note, I regretted the omission of a chapter or at least one excursion dedicated to the Quaternary, particularly the glacial and fluviatile deposits, and perhaps the otherwise excellent Pre-Cambrian section would have been enhanced by the inclusion of an itinerary which took in the granite of Mountsorrel. As a Late Triassic/Early Jurassic enthusiast, I looked in vain for much on my favourite Penarth Group (Rhaetian) sediments. However, I am only too well aware of how little of that fascinating short sequence of rocks appears at the surface!

All in all, a very welcome addition to the geological literature on East Midlands geology, and a credit to all concerned. Buy it!

Andrew Swift

Remember the March 2003 hominid Saturday School?

Thanks to Mick Kidd/Chris Garratt

On global warming and snow

On a chilly winter day I thought again about global warming.

Although the greenhouse effect is a simple enough concept, it is much more difficult to understand its current application to our planetary situation. I am not a scientist, and I would be grateful to be corrected if I am wrong at any stage of this article. As I understand it, on our neighbouring planet Venus, dense carbon dioxide clouds produce a surface temperature high enough to melt lead (not ideal – if you are made of lead!). Our own atmosphere with carbon dioxide, methane and water vapour, produces an average surface temperature that is reasonable for our existence – if there were no carbon dioxide, methane and water vapour, our surface temperature would be below zero centigrade.

Variable amounts of carbon dioxide in the atmosphere will change our temperature, and increasing concerns about the enhanced levels have resulted in (pathetically unsuccessful) attempts to reduce the levels.

I have seen with my own eyes possible results of global warming. I can recall when the Lake District mountains were covered with snow for three or four months each winter. The last really cold snap that I can personally testify

to here is February 1983. The lakes were covered in ice, broken only around the edges, the ducks – unused to such conditions – were all skidding around on the ice chasing thrown scraps of bread, The ascent of Skiddaw, by a straightforward route, was an icy experience. I can recall winters in Scotland when winter snowfall could be relied upon – as lads we checked our sledges in excited anticipation each November, and we speculated just how large a snowball we would be able to roll when a few inches of snow fell.

It does still snow occasionally. Leicester, December 2000

Skiing in Scotland was possible each winter, but that is no longer the case. In 2003 all the snow in Scotland had melted by the end of August, the earliest that this had happened in over one hundred years. The Glencoe ski centre will not open at all this winter. I understand that the Alps present a similar scenario, with a very lean time forecast for the lower lying ski areas. Making artificial snow will not solve the problem there. Of course, this might just be a normal fluctuation with nothing at all to do with global warming, but we do not know.

Just in case, could you all recycle bottles, and solve the planet, so that I can make a snowman again?

Roger Newman

Pygidium

There's an Old Chinese Proverb which runs, 'A fool can ask more questions than a wise man can answer.' So, I thought I'd better have a crack at the little problem I left you with in the Autumn copy of 'Charnia', which was to calculate the amount of energy released by Asteroid QQ47, had its orbit intersected that of the Earth's. The conversion factor for converting joules of energy into megatons of TNT equivalent should have been 4.186 and not 4.184. Not a terribly important typing error – let's call it 4.2 megajoules per ton of TNT for simplicity. In the best of traditions I did my calculation on the back of an envelope, admittedly it was an A4 envelope, the figure arrived at being around 5.7x10^21joules, if you use the US billion. Am I correct though? This is the problem with large numbers – they have no meaning at first sight.

This is not easily visualised unless we have some comparisons to mentally grapple with. Let's start with the Chicxulub object that arrived at a velocity of 25 km per second some 65 million years ago. This mass had a diameter of some 10 000 metres (ca. six miles) and its rapid deceleration liberated 10^23J, or 10^8 MT TNT equivalent. This is roughly equivalent to detonating the world's total nuclear arsenal ten thousand times over all at once. Let's try this to help us picture the scene: if you detonated just one ton of TNT then 2 977 789 639J of energy would be liberated. Most of the energy released is heat, plus a little (in terms of energy) sound and some light, plus the kinetic energy of the outward movement of gases. The biggest man-made 'conventional' or chemical explosion was the blasting of the Heligoland fortifications in 1947, which was a puny 4.5 kiloton event. Striking a match liberates just one thousand joules …

The Chicxulub crater is between 170 and 180 km in diameter, whereas QQ47 would make a hole in the order of 50 to 55km wide. By comparison, the Barringer, or Great Meteor Crater, in Arizona is a mere 1.22 km across. The nickel-iron object responsible for the hole was in the order of 60 metres in diameter and the impact liberated some 15MT equivalent energy. Another well-known collision was the Tunguska explosion of 1908 which liberated 60x10^9J, or 15MT equivalent, though as an air-burst. The Sudbury impact released 10^23J, which is about 100 000 times the energy release of a Richter 9.0 earthquake, making it a Richter 14.0 event! The Mount St. Helens eruption released 6x10^16J and the largest earthquakes release around 10^18J.

Of course, the energy released depends on velocity as well as mass. Cometary impacts are in the order of 70km per second, while asteroid material

impacts at a more leisurely 25km/s, although this is still 90 000 mph. If motorists who ignore speed limits thought about 'half m v squared' and the effect the bigger numbers have on flesh and bone they might drive more carefully! A 6 metre diameter meteorite travelling at 20km/s would have the effect of a 20kT explosion on arrival at the Earth's surface – not to be sniffed at. The effects of QQ47 making its presence felt would have been utterly catastrophic to all higher forms of life on Earth. The total energy released by volcanoes, heat flow and earthquakes is equivalent to 310 000MT; a large colliding object would liberate this amount of energy in just a few tens of seconds!

...and finally: Creationists accept the evidence of impacts, though they choose to believe that they all happened in the single year of the biblical flood. Could our planet have withstood such a hammering? Had this been the case the Martians would have been sandwiched between two asteroid belts!

GS

Coming soon ..... the Saturday School

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