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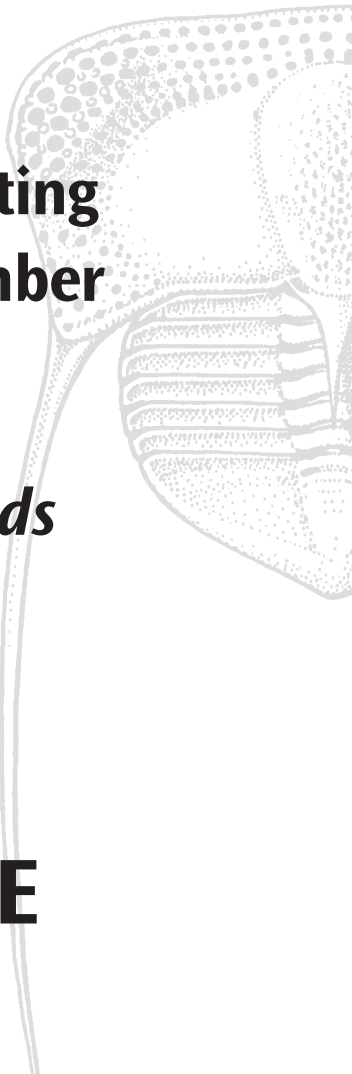

PROGRAMME
abstracts
and AGM papers

High-resolution of the Changhsingian succession in Iran and correlation with China

Dieter Korn[1], Abbas Ghaderi[2], Lucyna Leda[1] and Martin Schobben[1]

[1]*Museum für Naturkunde, Leibniz-Institut für Evolutions- und Biodiversitätsforschung, Berlin, Germany*

[2]*Department of Geology, Faculty of Sciences, Ferdowsi University of Mashhad, Mashhad-Iran*

We investigated the Changhsingian Stage in six sections in the area of Julfa (Aras Valley) for their lithology (petrography and carbonate facies), geochemistry (stable isotopes), conodonts and ammonoids. Revision of the biostratigraphy led to the separation of ten Changhsingian conodont zones and eight ammonoid zones. This refined scheme serves as a basis for studies on the proximate causes of the end-Permian mass extinction. The detailed subdivision of the Changhsingian by means of ammonoids has some potential for the correlation of sections within the Tethyan realm. However, ammonoids have only rarely been used for the correlation of the Transcaucasian/Iranian with the Chinese sections, but nevertheless they played a role in discussions about the completeness or incompleteness of the central Tethyan sections. This resulted in the statement that the Iranian assemblages represent only the lower part of the Changhsingian. Correlation of the Late Permian ammonoid successions in Iran and China reveals major problems, which are rooted in the significant differences of the assemblages on the family level. The morphological differences demonstrate that, in terms of sutural development (notching of individual lobes), the Tethyan forms are even more advanced than the Chinese forms.

Favourable impressions: ammonoid taxonomy and biostratigraphy in the Carboniferous Shannon Basin, Western Ireland

***Anthea Lacchia**

Trinity College Dublin

In the Carboniferous Shannon Basin, Western Ireland, ammonoids are largely preserved as 2D moulds. Taxonomy of 2D ammonoids relies on knowledge of shell ornament which varies with ontogeny. A detailed study of ontogenetic changes, based on the systematic description of 3D shells, is needed in order to provide robust taxonomic identifications but is not yet available for many ammonoids in the basin, whose fill spans part of the Alportian and Kinderscoutian substages.

Ammonoids are present throughout the succession, but are concentrated in thin dark shales, which are thought to represent intervals of sediment starvation and are referred to as condensed sections or 'ammonoid bands'.

The make-up of the ammonoid assemblages in these bands shows that, while some bands are distinctive and useful in both intrabasinal and extrabasinal correlation, the faunas of others are far more diverse than previously thought. This puts into question the idea of a series of discrete, widespread ammonoid bands in the regional Namurian Stage, each with a diagnostic assemblage.

We further exemplarily discuss difficulties of generic assignment in the Myophorellidae. Finally, we propose a revised classification for the Trigoniida that is put up for discussion.

The role of microbial anaerobic respiration in the end-Permian mass extinction

***Martin Schobben[1], Alan Stebbins[2], Abbas Ghaderi[3], Harald Strauss[4], Dieter Korn[1], Robyn Hannigan[2] and Christoph Korte[5]**

[1]*Museum für Naturkunde, Leibniz Institut für Evolutions- und Biodiversitätsforschung, Invalidenstr 43, D-10115 Berlin, Germany*

[2]*School for the Environment, University of Massachusetts Boston, 100 Morrissey Blvd, Boston, MA 02125, USA*

[3]*Department of Geology, Faculty of Sciences, Ferdowsi University of Mashhad, Azadi Square, 9177948974 Mashhad, Iran*

[4]*Institut für Geologie und Paläontologie, Westfälische Wilhelms Universität Münster, Corrensstraße 24, 48149 Münster, Germany*

[5]*Department of Geosciences and Natural Resource Management, University of Copenhagen, ØsterVoldgade 10, DK-1350, Copenhagen, Denmark*

Changes in plankton productivity have been connected with the end-Permian mass extinction. A box-model – proxy data comparison suggests that an increase of microbial sulfate reduction (MSR) can explain excursions in $\delta^{34}S_{CAS}$ and $\delta^{18}O_{CAS}$. These fluctuations are contemporaneous with the biodiversity crisis and are probably related to enhanced availability of organic substrates. This caused MSR to increase proportionally and induce the observed positive $\delta^{18}O_{CAS}$ excursion. The scenario would only require an increase in the oceans organic carbon inventory – a suggestion that can be linked to the climate warming and elevated continental weathering at that time. These physical processes are linked to the short-term carbon cycle, as ocean fertilization by nutrient input stimulated primary productivity.

Enhanced microbial activity can be regarded as the killing agent because of increased oxygen consumption (aerobic respiration) and H_2S (MSR) production. This caused a rapid global expansion of euxinic water and resulted in iron limitation in the ocean water. This, together with decreased iron supply due to a change in fluviatile regimes, reduced pyrite burial, explaining a negative $\delta^{34}S_{CAS}$ excursion. This suggests that the latest Permian ocean was not dead ('Strangelove Ocean') but rather alive, and that microbial life can create adverse conditions for eukaryotic organisms.

Rudist myophores: constructional constraints and phylogenetic informativeness

Peter W. Skelton

The Open University

Molluscan muscle/shell attachment is mediated by adhesive epithelium, which secretes a collagenous 'tendon sheath' bonded to the shell by embedded fibres. Serial detachment and re-attachment of muscle fibres allows growth migration of the muscles across the epithelium. But tendon sheath adhesion to the shell constrains normal growth of the latter. Hence, for the adductors to maintain their relative positions in the shell during growth, the insertion surfaces must remain coplanar with their growth trajectories. In most bivalves, muscle scars thus lie flush on the inner valve surfaces, tracking the radial growth of the valve margins.

The historic Ediacaran sites of Charnwood Forest have yielded a plethora of new individuals following a recent casting and moulding project. These include fifty-seven well preserved specimens of *Primocandelbrum*, which was previously known from only a handful of specimens from Newfoundland. The new specimens show diversity in both morphological and branching characteristics, and can be grouped according to either set of characters, using outgroups of broadly similar but distinct taxa. Comparing the specimen composition of groups defined by each character set identifies those characters that generate the most robust taxonomic groupings. This will constrain our understanding of fundamental aspects of the communities such as species richness and diversity.

Quantitative stratigraphy of Late Devonian and Early Carboniferous ammonoid successions in the Rhenish Mountains (Germany)

***Carina Klein and Dieter Korn**

Museum fuer Naturkunde Berlin

The application of modern biostratigraphical methods, especially to ammonoid biostratigraphy, helps to clarify the stratigraphical order of the ammonoid occurrences and to minimize contradictions without new extensive sampling efforts being required. We investigated the occurrences of 64 late Famennian (Late Devonian) ammonoid species from 12 sections and 52 early Tournaisian (Early Carboniferous) ammonoid species from seven sections using three biostratigraphical methods, (1) Unitary Associations (UA), (2) Constrained Optimization (CONOP) and (3) Ranking and Scaling (RASC).

The three methods lead to similar outcomes and the fit with the empirical data is generally good. UA shows the lowest resolution, but leads to the most robust results; CONOP and RASC show a higher resolution. For the Devonian dataset, only the results of the RASC method coincide with the empirical data; the *Effenbergia lens*, *Muessenbiaergia parundulata* and *Muessenbiaergia sublaevis* zones cannot be resolved by the UA and CONOP methods. For the Carboniferous dataset, the results of all methods coincide with the empirical data.

We consider the faster RASC method to be the most suitable; it perfectly coincides with the empirical data. Nonetheless the UA method facilitates the separation of zones and can thus be seen as a useful method, too.

Functional morphology of non-mammalian cynodonts and their kin

***Stephan Lautenschlager[1], Emily J. Rayfield[1], Pamela Gill[1] and Michael Fagan[2]**

[1]*School of Earth Sciences, University of Bristol, Life Sciences Building, 24 Tyndall Avenue, Bristol BS8 1TQ*

[2]*School of Engineering, University of Hull, Cottingham Road, Hull HU6 7RX*

The evolution of mammals is a textbook example for the acquisition of morphological and functional modifications. They are most pronounced in the cranial skeleton, including a differentiated, heterodont dentition and the transformation of the jaw joint, resulting.

Although these osteological modifications are well-documented in the fossil record, the fossil remains of cynodonts are often subject to taphonomic deformation and incompletely preserved. Here we present digital reconstructions of the cranial osteology and myology of different non-mammalian cynodonts, including *Thrinaxodon* and *Probainognathus*.

the early 1900s, when these fossils were collected, and this will be compared with modern maps and satellite imagery to examine how exposure area has changed over the time palaeontologists have been sampling.

Changing morphospace occupation of the Ammonoidea from the Devonian to the Jurassic

***Sonny A. Walton and Dieter Korn**
Museum fuer Naturkunde, Berlin

Measurements taken from over 5,900 ammonoid species were used to calculate three cardinal conch parameters, the conch width index (CWI), umbilical width index (UWI) and the whorl expansion rate (WER). These three parameters are very descriptive in terms of the conch morphology of an ammonoid: the CWI affects the hydrodynamic properties of the conch, the UWI the shape of the whorl cross section, and the WER the length of the body chamber and the degree of coiling of the conch. A principal components analysis was performed on the conch parameters of all of the ammonoids and a two-dimensional empirical morphospace was plotted based on the first two principal components.

The PCA was broken down into the five major geological periods. The morphospace analysis reveals some interesting changes to the ammonoid conch morphs over time. The morphological range quickly fills out in the Devonian, the Carboniferous is heavily represented by globular conch morphs, and despite the Permian–Triassic mass extinction event there is a strong recovery and repopulation of the morphospace. The Jurassic shows a particularly interesting trend as there is a strong reduction in the globular conch morphs, leaving a morphospace heavily populated by serpenticonic and lenticular conch morphs.

posters

The first holomorphic fossil chimaeroid fish (Chondrichthyes, Holocephali) from the Mesozoic of Africa

David J. Ward[1], Emma L. Bernard[1], Martha Richter[1] and Evgeny V. Popov[2]
[1]*NHM UK*
[2]*Saratov State University, Russia*

In February 2014, at the Arizona Mineral and Fossil Show at Tucson, USA, the Natural History Museum, London purchased a slab of dark grey mudstone containing an impression of a chimaeroid fish. Following discussions with academics, commercial collectors and fossil dealers, the consensus was that the specimen could have come from one of the old Jebel Tselfat localities, most likely Aïn el Kerma, to the west of Fez.

With the kind assistance of Professor Driss Ouarhache, Faculty of Science, University of Fez, DJW visited Jebel Tselfat and located the Ain el Kerma excavation in the side of a badland erosion gulley. The sediment, a weathered black organic-rich shale, closely matched the specimen and incidentally yielded a couple of impressions of bony fish skulls.

The fish is most probably *Elasmodectes willetii*, only known from the English Cenomanian chalk.

Mesozoic holomorphic chimaeroids are an extremely rare occurrence in the fossil record and are only known from the Late Jurassic of southern Germany (Solenhofen, Eichstätt), from the Late Cretaceous (Cenomanian) of Lewes England, and the Lebanese Chalk