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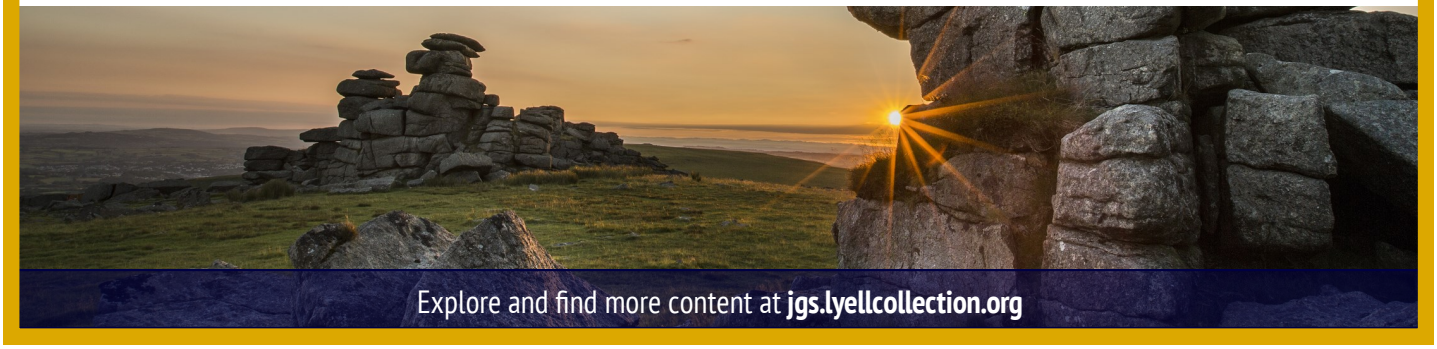
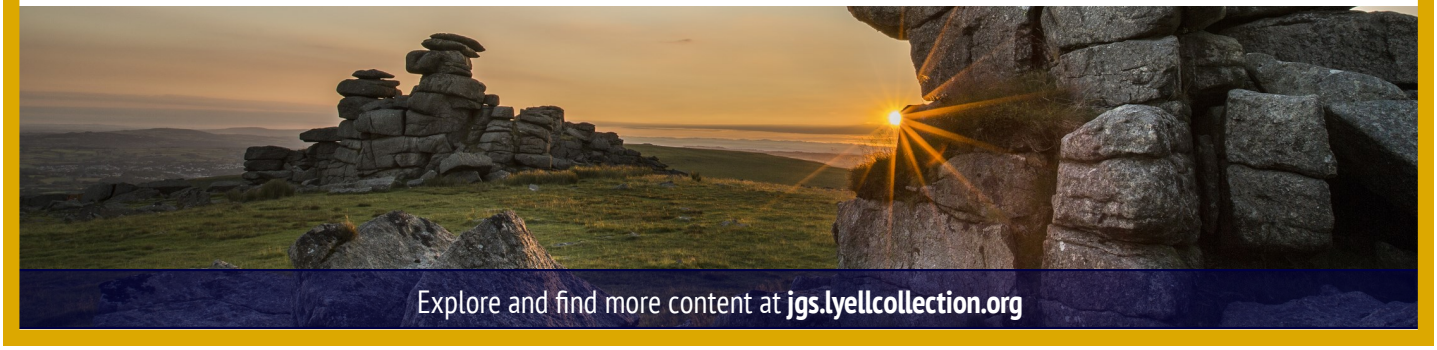


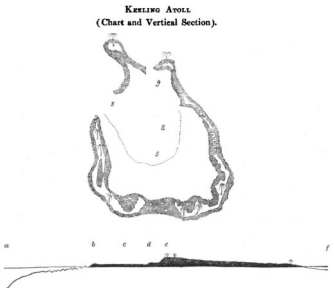


JGS Online Archive Paper Abstracts

Part 1 100 years of Geoscience 1845-1945

The Structure and Distribution of Coral Reefs ; being the first Part of the Geology of the Voyage of the Beagle under the Command of Capt. Fitzroy, R.N. during the Years 1832 to 1836

The Structure and Distribution of Coral Reefs; being the first Part of the Geology of the Voyage of the Beagle under the Command of Capt. _Fitzroy, R.N. during the Years 1832 to 1836. By Charles Darwin, M.A., F.R.S., Naturalist to the Expedition. London, pp. 214. 1842.



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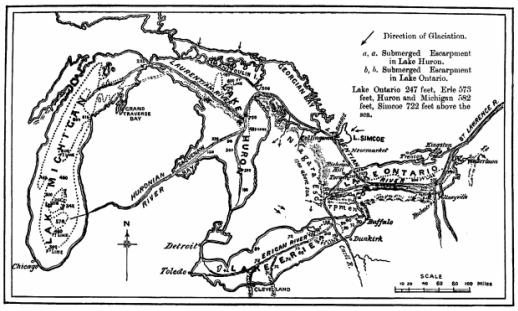
Origin of the Basins of the Great Lakes of America

Even as recent as a decade ago very little was known as to the origin of the Great Lakes of North America. Whilst we find such generalized statements as “most lakes are due to terrestrial crush-movements,” yet such crust-movements had not been tested in the American lake-region. Again, from the time of early geological investigations in America, statements are found that the basins werethe result of erosion; but the methods of erosion were not explained, and this was the more necessary as most of the basins have rockbound outlets. Later, in some geological literature, the method of excavation was hypothetically attributed to glaciers. Such was the unsatisfactory condition of our knowledge of the problem when the writer first commenced the study, in attempting to solve the origin of the Dundas Valley, at the western end of Lake Ontario, more than a dozen years ago. This investigation has developed results bearing not only upon the origin of the lake-basins, but also upon the physical history of the lakes, and broader questions of the building and sculpturing of the continent.



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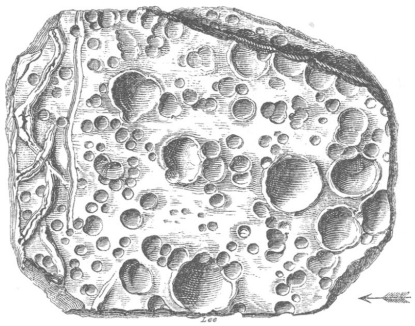
On Fossil Rain-marks of the Recent, Triassic, and Carboniferous Periods

When, in 1841, I visited the quarries of new red sandstone at Newark, in New Jersey, in company with Mr. W. C. Redfield, of New York, we observed some very distinct rain-prints on ripple-marked shales. Afterwards, in 1842, I saw similar impressions of recent date, which had been made between high- and low-water mark on the red sand and mud bordering the Basin of Mines, in the Bay of Fundy. Since that period I have been enabled to form a collection of specimens of this mud, hardened in the sun, through the kindness of Dr. Webster of Kentville, to which I shall presently allude. In 1843, Mr. Redfield, in a letter to the author which was read to this Society, stated that he had found impressions of rain-drops in another locality of the new red sandstone, called Pompton, in New Jersey, twenty-five miles from New York†; and in the same year he published in Silliman's Journal an account of the sandstone strata of that place, and of the Ichthyolites contained in them. In these beds, many of which are frequently ripple-marked exhibit the foot-prints of birds and shrinkage-cracks.



The arrow represents the direction of the shower.

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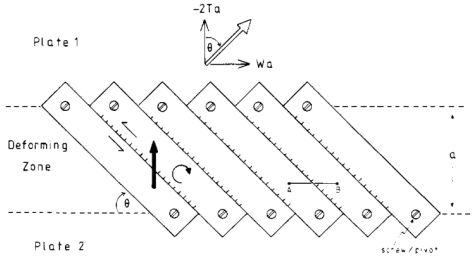
JGS Online Archive Paper Abstracts

Part 2 1946-1986

A block model of distributed deformation by faulting

It is clear from palaeomagnetic evidence that large and hitherto unexpected rotations about a vertical axis are common in regions of distributed continental deformation. We propose a simple two-dimensional model to illustrate how fault movement and block rotation within a zone of distributed deformation may be related to the relative motion of the rigid plates that bound the zone. One surprizing feature of this model is that the component of strike-slip motion on the faults within the deforming zone is in the opposite sense to the strike-slip component across the zone as a whole. Thus slip vectors within the zone are not the same as that between the bounding rigid plates: in contrast to deformation at oceanic plate boundaries. Examples of active fault geometries similar to those of our model can be seen in Greece, Iran and the western USA.



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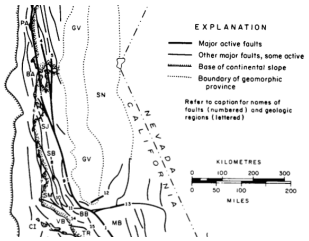
The San Andreas fault system through time

The active San Andreas fault system today lies at the splintered boundary between the Pacific and North American lithospheric plates, a tectonic arrangement that originated in California in the Oligocene. By late Miocene time sedimentary breccias derived from San Andreas scarps were being shifted laterally from their source areas. During the Pliocene the system extended from the Mendocino triple-junction to the head of the Gulf of California. The Big Bend in the San Andreas developed and the Transverse Ranges rose, in association with the opening of the Gulf of California.



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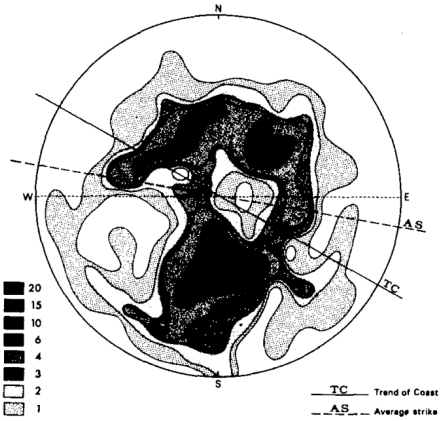
Ordovician and Silurian changes in sea level

The Arequipa Massif, between the Andes and the Pacific, is an extensive pre-Devonian metamorphic complex. The sequence of deformations, metamorphisms and magmatism in this complex has been established. Mollendo, Atico and Marcona events are distinguished by structural and metamorphic methods and dated by Rb-Sr whole-rock isochrons, at about 1918, 440 and 392 Ma respectively. The Mollendo event led to partial melting, followed by granulite-facies metamorphism, in sediments buried to about 30 km. Further NW, sillimanite-bearing migmatites and staurolite-andalusite schists are thought to represent the same event. The tectonic trend is uncertain but the structures and metamorphism suggest a collision orogeny which probably pre-dated the Pacific Ocean.

The early Caledonian Atico and Marcona events are associated with coast-parallel batholiths, amphibolite- to greenschist-facies metamorphism and penetrative deformations. The Atico and Marcona events are separated by the deposition of the Marcona Formation, which is therefore thought to be Lower Palaeozoic (between about 440 and 392 Ma). The early Caledonian deformations are attributed to a subduction zone near the present Pacific margin. There is no penetrative Hercynian or Andean deformation in the Arequipa Massif.

Palaeomagnetic study of Jurassic andesites and dykes suggests that there has been no latitudinal motion of the Arequipa Massif relative to the Brazilian shield during the evolution of the Andes.



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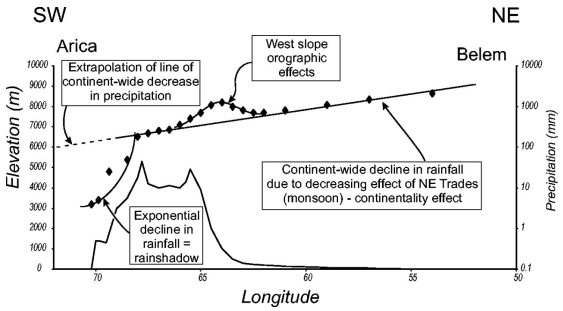
JGS Online Archive Paper Abstracts

Part 3 1987-2007

150 million years of climatic stability: evidence from the Atacama Desert, northern Chile

The sedimentary succession in the Atacama Desert records deposition under an arid to semiarid climate from the late Jurassic (150 Ma) to the present day. Palaeomagnetic data indicate no significant latitudinal movement of this area since the late Jurassic. The present-day location of the Atacama within the dry subtropical climate belt is the principal cause of aridity. This situation is likely to have prevailed since the late Jurassic, supplemented by (1) the continentality effect (enhanced by the Gondwanan landmass), and (2) the presence offshore of a cold, upwelling current (from at least the early Cenozoic onwards and possibly earlier), resulting in conditions promoting climatic stability and desert development. Rapid and extreme climatic fluctuations during the Plio-Pleistocene were not sufficient to destabilize the climate within the Atacama. Comparison with other long-lived deserts (e.g. SW USA, Namib, Sahara and Australia) suggests that the Atacama is the oldest extant desert on Earth.



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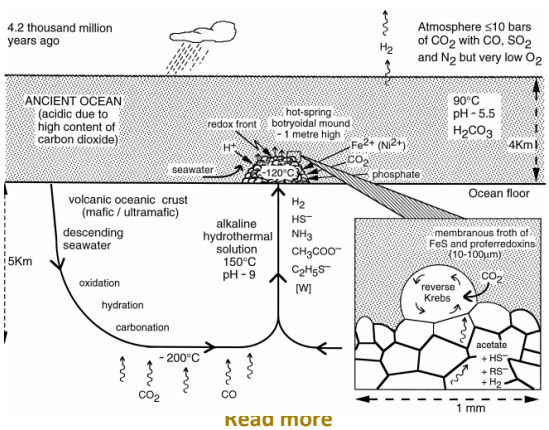
The emergence of life from iron monosulphide bubbles at a submarine hydrothermal redox and pH front

Here we argue that life emerged on Earth from a redox and pH front at c. 4.2 Ga. This front occurred where hot (c. 150°C), extremely reduced, alkaline, bisulphide-bearing, submarine seepage waters interfaced with the acid, warm (c. 90°C), iron-bearing Hadean ocean. The low pH of the ocean was imparted by the ten bars of CO2 considered to dominate the Hadean atmosphere/hydrosphere. Disequilibrium between the two solutions was maintained by the spontaneous precipitation of a colloidal FeS membrane. Iron monosulphide bubbles comprising this membrane were inflated by the hydrothermal solution upon sulphide mounds at the seepage sites. Our hypothesis is that the FeS membrane, laced with nickel, acted as a semipermeable catalytic boundary between the two fluids, encouraging synthesis of organic anions by hydrogenation and carboxylation of hydrothermal organic primers. The ocean provided carbonate, phosphate, iron, nickel and protons; the hydrothermal solution was the source of ammonia, acetate, HS −, H2 and tungsten, as well as minor concentrations of organic sulphides and perhaps cyanide and acetaldehyde. The mean redox potential (ΔEh) across the membrane, with the energy to drive synthesis, would have approximated to 300 millivolts. The generation of organic anions would have led to an increase in osmotic pressure within the FeS bubbles. Thus osmotic pressure could take over from hydraulic pressure as the driving force for distension, budding and reproduction of the bubbles.



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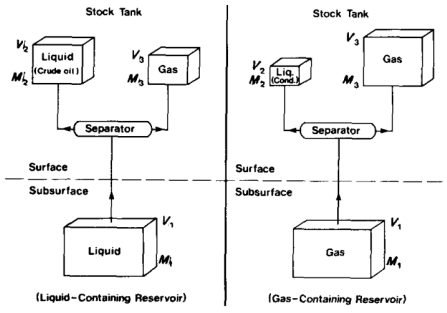
The movement and entrapment of petroleum fluids in the subsurface

This paper discusses the migration of petroleum from its formation in a source rock to its subsequent possible entrapment in a reservoir. The chemical and physical properties of petroleum gases and liquids are stressed, particularly their phase behaviour under subsurface conditions which is shown to be a very important factor in determining migration behaviour. Engineering correlations are presented for estimating the properties of petroleum fluids under geologically realistic conditions. The directions and magnitudes of the forces acting on migrating petroleum are deduced from the combined effects of buoyancy and water flow in compacting sediments. These forces are combined, using a fluid potential description. This procedure allows the direction of migration to be denned. The rate of migration is then estimated from the properties of the sediments involved, allowing a distinction to be made between 'lateral' and 'vertical' carrier beds. This simplified approach is suitable for rapid predictive calculations in petroleum exploration. It is compared with the more complex 3 -D computer modelling approaches which are currently becoming available. Migration losses are related to the cumulative pore volume employed by the petroleum in establishing a migration pathway.



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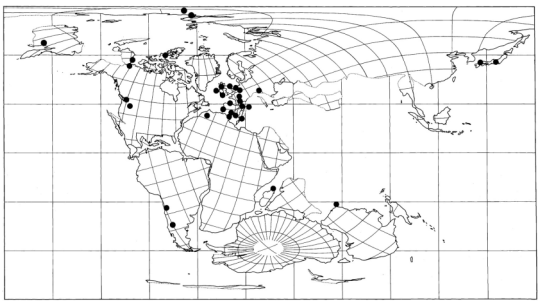
Part 3 1987-2007

Chemostratigraphy of the Jurassic System: applications, limitations and implications for palaeoceanography

Current chemostratigraphical studies of the Jurassic System primarily involve the use of one sedimentary component (marine organic carbon), one divalent transition metal substituted in carbonate (manganese), and two isotopic tracers: strontium-isotope ratios ($^{87}Sr/^{86}Sr$) and carbon-isotope ratios ($\delta^{13}C_{carb}$ and $\delta^{13}C_{org}$) in carbonate and in organic matter. Other parameters such as Mg/Ca and Sr/Ca ratios in calcite, oxygen-isotope ratios ($\delta^{18}O$) in carbonate, sulphur-isotope ratios ($\delta^{34}S$) in carbonate-hosted sulphate, nitrogen-isotope ratios ($\delta^{15}N_{org}$) in organic matter, osmium-isotope ratios ($^{187}Os/^{188}Os$) in black shales and neodymium-isotope ratios ($^{143}Nd/^{144}Nd$) in various mineral phases are also useful but at present give poor resolution because the database is incomplete or compromised by various factors. Stratigraphical patterns in total organic carbon (TOC) can be of either local or regional significance, depending on the lateral extent of the former nutrient-rich and productive water mass.



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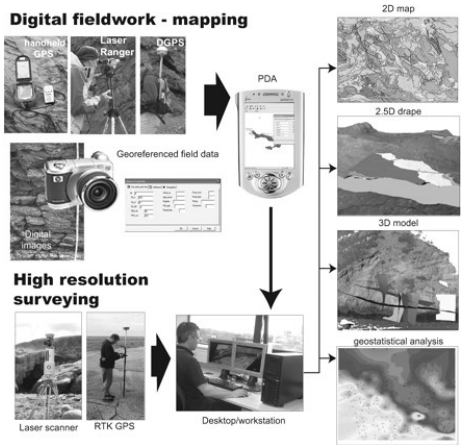
Unlocking the spatial dimension: digital technologies and the future of geoscience fieldwork

The development of affordable digital technologies that allow the collection and analysis of georeferenced field data represents one of the most significant changes in field-based geoscientific study since the invention of the geological map. Digital methods make it easier to re-use pre-existing data (e.g. previous field data, geophysical survey, satellite images) during renewed phases of fieldwork. Increased spatial accuracy from satellite and laser positioning systems provides access to geostatistical and geospatial analyses that can inform hypothesis testing during fieldwork. High-resolution geomatic surveys, including laser scanning methods, allow 3D photorealistic outcrop images to be captured and interpreted using novel visualization and analysis methods. In addition, better data management on projects is possible using geospatially referenced databases that match agreed international data standards. Collectively, the new techniques allow 3D models of geological architectures to be constructed directly from field data in ways that are more robust compared with the abstract models constructed traditionally by geoscientists. This development will permit explicit information on uncertainty to be carried forward from field data to the final product. Current work is focused upon the development and implementation of a more streamlined digital workflow from the initial data acquisition stage to the final project output.



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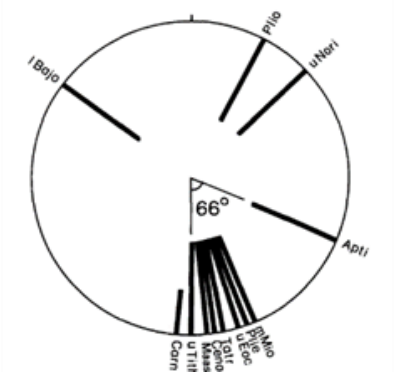
Periodicity in extinction and the problem of catastrophism in the history of life

The hypothesis that extinction events have recurred periodically over the last quarter billion years is greatly strengthened by new data on the stratigraphic ranges of marine animal genera. In the interval from the Permian to Recent, these data encompass some 13,000 generic extinctions, providing a more sensitive indicator of species-level extinctions than previously used familial data. Extinction time series computed from the generic data display nine strong peaks that are nearly uniformly spaced at 26 Ma intervals over the last 270 Ma. Most of these peaks correspond to extinction events recognized in more detailed, if limited, biostratigraphic studies. These new data weaken or negate most arguments against periodicity, which have involved criticisms of the taxonomic data base, sampling intervals, chronometric time scales, and statistical methods used in previous analyses. The criticisms are reviewed in some detail and various new calculations and simulations, including one assessing the effects of paraphyletic taxa, are presented. Although the new data strengthen the case for periodicity, they offer little new insight into the driving mechanism behind the pattern.



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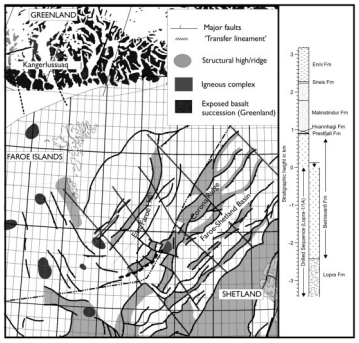
Part 4 2008-2012

Large-scale magmatic pulses drive plant ecosystem dynamics

The 6.6 km gross thickness of the Palaeogene lava field of the Faroe Islands Basalt Group was erupted in the initial phases of North Atlantic rifting. Thin interlava sedimentary rocks yield palynofloras that vary in composition and diversity with the duration of the interlava period. Long-term trends in plant ecological succession occur within the record, each reflecting initially rapid and subsequently slowing eruption tempo. TiO_2 and MgO plots derived from the basalt lava flows show corresponding fractionation trends. These link melt column processes to vegetation ecosystem dynamics via controls on eruption tempo, thermal support and substrate disturbance.



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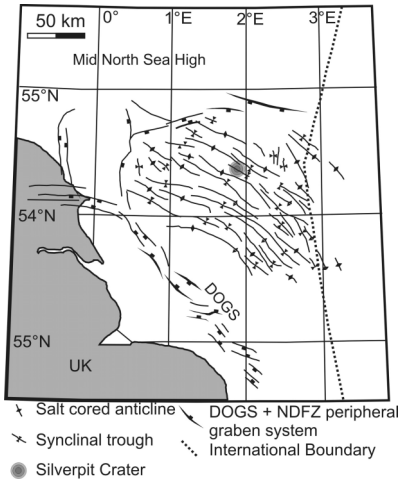
An Eocene age for the proposed Silverpit Impact Crater

Three-dimensional seismic analysis is used to describe the detailed morphology of the Silverpit crater, a proposed marine impact crater located in the southern North Sea, UK. We examine and constrain for the first time the geometry, extent and age of the post-crater sediment units that define the crater fill. A circular bowl-shaped depression has been mapped and interpreted to represent the upper limit of impact deformation and the geometry of the crater at the end of cratering processes. Reflections exhibit a parallel onlap fill onto the bowl-shaped crater floor, indicating that accommodation space was created instantaneously without any contemporaneous sedimentation. Using regional lithostratigraphic markers constrained by microfossil and calcareous nannofossil analysis, we have dated the first onlapping sediments onto the crater. The age of the onlapping sediments allows us to constrain the crater formation to be Middle Eocene in age. This date is *c*. 10–15 Ma younger than the previous ascribed age for the crater formation and rules out the Silverpit crater as a K–T boundary impact. The age of crater formation considerably predates regional folding and accompanying salt flowage, effectively ruling out a salt withdrawal origin for the Silverpit crater.



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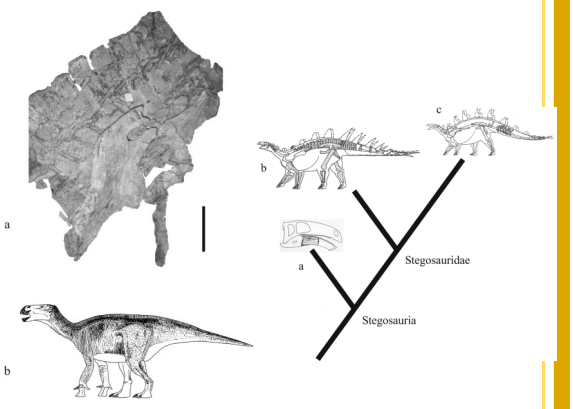
Dinosaurs of Great Britain and the role of the Geological Society of London in their discovery: Ornithischia

Completing our survey of British non-avian dinosaurs, we here review the ornithischians of Britain. Heterodontosaurids are present in the Lower Cretaceous Lulworth Formation of Dorset, and a few earlier possible records imply a long presence in the region of this clade. Britain's thyreophoran record is rich and includes the earliest well-represented taxon, *Scelidosaurus*, as well as Middle Jurassic stegosaurs and ankylosaurs including a reasonably good Cretaceous record of polacanthids and nodosaurids. Cretaceous stegosaurs are known only from fragmentary remains, but the proposal that stegosaurs were present as early as the Rhaetian is rejected. Among British iguanodontian ornithopods, the possible dryosaurid *Callovosaurus* is the oldest global record whereas the proposed synonymy of *Cumnoria* with *Camptosaurus* requires confirmation. *Iguanodon* has become a taxonomic dumping ground for assorted iguanodontians and is in need of revision: most of the British species referred to this genus are almost certainly not closely allied to the neotype species *I. bernissartensis* and require new generic names. Fragmentary remains suggest the early presence of hadrosaurids in Britain.



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