
Zukunftspreis

Funktionsmorphologische Anpassungen des Innenohres bei Sciuromorpha (Rodentia, Mammalia)

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Funktionsmorphologische Untersuchungen am knöchernen Labyrinth des Innenohres der Säugetiere fokussieren sich insbesondere auf morphometrische Analysen der drei Bogengänge, dem Sitz des Gleichgewichtssinns. Ein solcher funktionsmorphologisch-vergleichender Ansatz kann genutzt werden, um Anpassungen an verschiedene Lokomotionsmodi zu detektieren. Aufgrund seiner geschützten Lage im Petrosum ist das knöcherne Labyrinth auch bei fossilen Arten oftmals vollständig erhalten und kann mittels hochauflösender Computertomographie (μ CT) zerstörungsfrei untersucht werden. Erstmals wurde in einer breit angelegten Studie das knöcherne Labyrinth der Sciuromorpha (Hörnchenartige), die sich durch ein breites Spektrum unterschiedlichster Lokomotionsmodi (fossorial, arboreal, gleitend, generalistisch) auszeichnen, im Hinblick auf Lokomotionsanpassungen untersucht.

Es wurden fossile Taxa der Sciuromorpha, u.a. *Heteroxerus costatus* (MP28) und *Palaeosciurus feignouxi* (MN2), sowie 30 rezente Taxa mittels μ CT non-invasiv analysiert. Zum Außengruppenvergleich wurden rezente Vertreter der Scandentia, Chiroptera und Marsupialia in die Untersuchung miteinbezogen. An virtuellen Labyrinthgüssen wurden diverse Messparameter erfasst, u.a. Höhe, Breite, Radius sowie Durchmesser der einzelnen Bogengänge, und statistisch analysiert. Mittels linearer Regressionsanalysen sowie Hauptkomponentenanalysen (PCA) wurde eine hoch signifikante Korrelation zwischen dem Durchmesser des anterioren und lateralen Bogenganges und dem jeweiligen Lokomotionstypus des entsprechenden Taxons ermittelt. Hierbei konnte gezeigt werden, dass sowohl gleitende wie auch arboreal lebende Taxa der Sciuromorpha signifikant dünnere Bogengänge mit einer höheren physiologischen Sensitivität gegenüber körperlichen Lageveränderungen besitzen, als ihre fossorial lebenden Schwesterntaxa. Vergleichende Analysen konnten sowohl die fossoriale Lebensweise von *Heteroxerus costatus* als auch die postulierte arboreale Lokomotion von *Palaeosciurus feignouxi* bestätigen, welche bisher auf Untersuchungen des Postcranialskeletts beruhten. Durch diesen funktionsmorphologischen Ansatz am Innenohr können nun auch Aussagen über die Lebensweise der Sciuromorpha getroffen werden, wenn von den entsprechenden Taxa keine postcranialen Elemente im Fossilbericht erhalten sind, sondern lediglich isolierte Petrosa gefunden wurden.

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Virtuelle Paläontologie

More than teeth and humeri: Analysis of partial skeletons of moles by computer tomography

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Three partial skeletons of moles were investigated by μ -CT for a detailed and non-destructive analysis of embedded bones. The first specimen, five associated bones of *Georhynchus montisasini* from the Lower Miocene of Southern Germany (SMNS 43499), was formerly described by JÄGER in 1850 and by ZIEGLER in 1990. They identified three of these bones as humerus, scapula and radius. The two remaining bones could be identified by μ -CT as a clavicle, lying on another bone fragment.

The second partial skeleton is the holotype of *G. montisasini* (SMNS 444523), similar in age and location to the first specimen. The description of this specimen includes the fragmented skull with the upper tooth row, mandibles with dentition, humerus, ulna and radius. Furthermore, a number of small bones were detected as carpals, metacarpals, phalanges, and unidentified bone fragments. Because they are half embedded in the matrix, it was not possible to give a detailed analysis of these bones. This problem could be solved by μ -CT. The anatomical positions of the carpals and metacarpals could be identified. Furthermore, a vertebra, part of the breastbone, and a fragment of the second humerus were detected.

The third specimen is a partial skeleton of the more basal *G. antiquus*, from the Upper Oligocene of Enspel. It contains the skull with both mandibles, distal ends of both scapulae, left clavicle, humeri, ulnae and radii from both sides, various carpals, metacarpals, phalanges, sesamoid bones, some vertebrae, ribs and the left femur. Thus, it contains most elements of the forelimb, which could be reconstructed in a digital way.

The forelimb of these basal moles includes highly evolved as well as more basal characters. In both species the scapula has a relatively long metacromion, which is not known from extant fossorial moles. The clavicle is short and stowed and articulates directly with the humerus, but its length to width ratio is even higher than in all extant fossorial moles. The large breastbone is only preserved at the holotype of *G. montisasini*. It is very similar to the breastbone of *Talpa europaea*, where it is an important area for approach of forelimb muscles. The digging hand

of *Geotrypus* was very wide, supported by sesamoid bones. An additional prepollex is known from *G. antiquus*. Os lunatum and Os scaphoideum were not fused like in modern fossorial moles.

These rare partial *Geotrypus* skeletons show some imported characters and evolutionary details of this early mole genus. Its life-style as a highly evolved fossorial mole could be supported by analysis of its digging hand and arm skeleton.

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Freies Thema

Melanosclerites from the Shiala Formation of the Tethyan Garhwal Himalaya, India

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Eisenack discovered a rod-shaped organic-walled microfossil from the Ordovician and Silurian glacial erratics of the Baltic region in 1932 and 1934. Later he assigned a formal name to these problematic rod-shaped microfossils as melanosclerites and considered them a similarity with hydrozoans. Melanosclerite is composed of two Greek words – melanos (black) and skleros (hard). Two groups of sclerites can be differentiated: the first group forms the skeleton and the second group represents the pleuridien (appendices) of a skeleton. The specimens' size ranges from 60 to 2000 µm. Melanosclerites have been reported from the marine sediments of the Ordovician to Devonian age. The biological affinity of melanosclerites is a problematic and has not been settled so far. Similarities with cnidarians like cubomedusa or an algal origin were speculated and noted.

The first Indian melanosclerites were noted from the Shiala and Yong Formations which were poorly preserved. The present study reveals a poor to moderate occurrence of melanosclerites from the Shiala Formation. This formation is well exposed in the Garhwal-Kumaon Tethyan Himalaya and lies very near to the International boundary with Tibet (China) and the village Sumna (30° 40' N, 80° 50' E) of the Chamoli district of the Garhwal Division, Uttara Khand. The Tethys sedimentary sequence is characterized by a continuous succession from Precambrian to Cretaceous, but the Permo-Carboniferous rocks are missing in the study section. The "Shiala Series" was described as 400 to 500 m thick sandy shale with inter-

calated grayish marly limestone containing brachiopods and other fossils. Remapping the area, the formation was described as a complete succession of shales with bands of calcareous arenites with an increasing arenaceous component towards the top. It is conformably covered by the Yong Limestone Formation and resting over Garbyang Formation. Based on brachiopod or bryozoan assemblage zones, Middle to Late Ordovician age was assigned to the formation. Samples were taken from the basal part of the Shiala Formation and large number of conodont elements was recovered. They dated the formation to the Caradoc based on a conodont index species *Amorphognathus tvaerensis*. The Ordovician-Silurian boundary lies with Shiala formation itself. Subsequently, a rich assemblage of acritarchs has been found.

In this study the melanosclerites have been recorded from the basal part of the Shiala Formation which is well preserved. The greenish grey silty shale has yielded prolific melanosclerites with several forms such as *Melanoporella* and *Melanostylus*. A new species of melanosclerites proposed as *Melanosteus indica* has been described. The macerated material has also yielded several fossil groups from the Shiala Formation such as chitinozoa, acritarch, scolecodonts, echinoids, ostracodes and calcareous algae.

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Freies Thema

Taphonomie und Ökologie der frühpermischen Wirbeltierfauna von Niederhäslich (Sachsen): Amphibien, *Palaeobacteria* (Sphenacodontia) und andere Reptiliomorpha

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Primitive Sphenacodontier (Haptodonten) sind nur mit einer geringen Anzahl von Funden vom spätesten Karbon (Gzhelien) bis in das frühe Perm (Sakmarian) von Nordamerika und Europa bekannt. Etliche Funde sind unbenannt. Mit Ausnahme von *Haptodus garnettensis* (später Missourian, Kansas) basieren diagnostizierte